VOCABULARY DEVELOPMENT OF PRESCHOOL CHILDREN AND ITS

RELATION TO CHILDCARE QUALITY

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VOCABULARY DEVELOPMENT OF PRESCHOOL CHILDREN AND ITS RELATION TO CHILDCARE QUALITY

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Gracie Kelley Bell, daughter of Twiggs and Gail (Allred) Kelley, was born October 15, 1980 in Atlanta, Georgia. She graduated from Greater Atlanta Christian School in Atlanta, Georgia in May of 1999. After high school, she attended Peabody College at Vanderbilt University, majoring in Child Development. Gracie graduated from Peabody in May of 2003. She entered the Graduate School at Auburn University in August 2003. Gracie married Philip Wesley Bell in November 2003 in Atlanta, Georgia. She completed her Master of Science degree in Human Development and Family Studies in December 2005.

THESIS ABSTRACT

VOCABULARY DEVELOPMENT OF PRESCHOOL CHILDREN AND ITS RELATION TO CHILDCARE QUALITY

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In the past decade, there has been an increase of the numbers of children in childcare centers and in preschools. Because of this increase, there has been a renewed interest in the effects of childcare centers and preschool programs on children's cognitive and social development. This particular study focuses on one component of children's cognitive development – their vocabulary development. Children in this study were involved in the Childcare Quality Enhancement Project (CQEP), which was a three-year short-term, longitudinal study. A total of 502 children from 47 different classrooms participated in the study. Children were given two different vocabulary measures – the PPVT-R and the KDI - at the beginning and the end of the academic school year. Childcare quality was assessed using the National Association for the Education of Young Children Accreditation standards. Regression analyses were conducted to examine the association between various aspects of childcare quality and children's vocabulary development. There were significant differences in vocabulary scores between children

from different quality centers across the academic year. Two specific quality indices, teacher education and the verbal stimulation, had an effect on changes in children's vocabulary scores.

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I. INTRODUCTION

The 1990s saw a marked increase in the numbers of children enrolled in childcare centers. Approximately 2 out of 3 mothers with children under the age of 6 work outside the home. Over 12 million preschoolers are cared for by someone other than a parent or family member (Children's Defense Fund, 2005; Sonenstein, Gates, Schmidt, & Bolshun, 2002). In addition, 93% of preschool children are enrolled in childcare or preschool programs for an average of 28 hours per week or more. Because of the large numbers of children enrolled in early childhood programs, there has been an increased interest in the effects of childcare on children's development. Some common focuses of study are cognitive and language development, school readiness, emotional development, and social development.

Research on the effects of childcare on children's cognitive and language development has become an area of interest to parents, educators, and policy makers (May, Kundert, Nikoloff, Welch, Garrett, & Brent, 1994). Much research is fueled by a concern that children be "ready" to enter formal schooling. Children who are not "ready" (i.e., are unprepared) for school are often at risk for school failure (Donmoyer & Kos, 1993; McWhirter, McWhirter, McWhirter & McWhirter, 1993; May & Kundert, 1997). School readiness requires skills in many areas (May & Kundert, 1997), among them, good vocabulary development. Preschoolers experience a rapid explosion of vocabulary, and by the time children are 5-years old they have a vocabulary of over 15,000 words

(Bee, 1997). Vocabulary is an essential prereading skill, and a child's preschool vocabulary is a good predictor of early reading ability and achievement (Anderson, 1985). High-quality childcare programs have shown significant positive effects on language and cognitive development (Loeb, Fuller, Kagan, & Carrol, 2004). Because of its importance for school readiness and because of the ease and reliability with which it can be measured, vocabulary competence has been included in many studies.

Many (Ackerman-Ross & Khanna, 1989; Campbell, Helms, Sparling, & Ramey, 1998; Lee, Brooks-Gunn, & Schnur, 1988), but by no means all (NICHD & Duncan, 2003), reviews of empirical research on childcare effects conclude that childcare has overwhelmingly positive effects. In large part, the conclusions of positive effects are based on studies of high quality intervention programs that use well-controlled, experimental designs to evaluate the effects of the programs on children at risk for school failure. Random assignment used in many intervention designs allows researchers to isolate the effects of the program from effects of family, community, and other influences. Early childhood intervention programs often show large or moderate effect sizes for cognitive outcomes (Shoncoff & Phillips, 2000). Unfortunately, few of the millions of preschool-age children in the U.S. experience programs approaching the quality of experimental interventions.

It is less clear whether run-of-the mill community childcare programs have similar positive effects on children's cognitive competence. A number of studies show they do (Burchinal, Lee, & Ramey, 1989; Burchinal, Roberts, Riggins, Zeisel, Neebe, & Bryant, 2000; Phillips, McCartney, & Scarr, 1987) and others show they do not (NICHD & Duncan, 2003). Children are not randomly assigned to these programs and the quality

of community childcare centers is highly varied. For these reasons, it is difficult to draw conclusions about the effects of childcare centers on children's cognitive and social development. Despite the inherent difficulties of inferring causal effects from non-experimental designs, researchers have reached conclusions about the characteristics of childcare that are associated with the most positive outcomes for children. Early childhood programs that have the most positive effects on children's language development are those with smaller group sizes, better teacher-child ratios, teachers with more education, and teachers who verbally stimulate the children in their classrooms.

However, despite some research showing positive effects of childcare, there are at least two reasons to expect that community childcare programs would not typically have positive effects on cognitive competence. First, most children in community childcare are not at severe risk for school problems (Scarr, 1997). Thus, there is less room for improvement for the children on cognitive measures as a result of childcare attendance. Second, community childcare is of variable quality, with most programs being described as average (Vandell & Wolfe, 2003). Thus, there is usually less discrepancy between cognitive stimulation in the child's home environment and what the childcare program can offer. In short, many community childcare centers probably provide little enrichment for most children (Scarr, 1997).

Moreover, effects of childcare programs, even if present, are harder to detect when parents self-select programs, as is usually the case for community childcare. That is, without random assignment, parents typically select programs whose qualities are correlated with family characteristics. Thus, better-educated parents with higher incomes are likely to select more expensive, better quality programs (Scarr, 1997). It is not

feasible to remedy the selection effect limitation of community childcare studies by randomly assigning families to childcare centers of varying quality. Most studies of community childcare deal with this problem by statistically controlling for the effects of family characteristics known to be associated with children's performance on the relevant variables of interest. Many studies statistically control for family income, parent education, or quality of the home environment in an effort to identify the "pure" effects of early childhood programs (Newcombe, 2003). It is difficult to know, however, whether sufficient, or perhaps too many, controls have been included. Depending on what is controlled, childcare effects could appear to be positive, negative, or non-existent (Newcombe, 2003).

Another option is to try to better isolate the effects of childcare from effects of family factors by assessing relevant outcome measures at multiple times over the course of a single academic year during which children experience only one child care environment. Presumably, selection effects, which operate prior to the child's entry to the program, as well as over the course of the program (the family continues to influence the child), can be controlled or minimized by an early "pretest." Most studies evaluate the effects of community childcare programs on relevant cognitive or academic outcomes only once. The studies that do assess the variables of interest more than once generally do so at intervals that would incorporate more than one childcare setting for most children (e.g., on children's birth dates) (Campbell et al., 1998).

The purpose of this study is to examine the effects of the quality of community childcare classrooms on vocabulary development. Changes in vocabulary scores assessed through the Peabody Picture Vocabulary Test – Revised (PPVT-R) and the vocabulary

portion of the Kindergarten Diagnostic Inventory (KDI) across the academic year will be examined in relationship to the quality of the classroom. By using a short-term longitudinal design, conclusions can be drawn about how much the quality of the center influences children's language development.

For the purposes of this study, the National Association of Young Children (NAEYC) Accreditation Standards were used to assess the overall quality of the classroom as well as specific aspects of childcare associated in previous research with good language development. Specifically, items of the NAEYC instrument that assess teacher-child ratio, language stimulation, and class group size were also used as predictors. Trained researchers observed in the classrooms for a minimum of 10 hours and completed the NAEYC Accreditation Standards. Teachers provided information about their education on self-report questionnaires.

In this study, 502 4-year-old children from 47 classrooms over three different years (17 classrooms in Year 1, 16 classrooms in Year 2, and 14 in Year 3) were given vocabulary measures in the fall and the spring of the academic year prior to their entry into kindergarten. Trained researchers administered the PPVT-R and the KDI to each child who participated in the study. Because the children were in the same classroom in the spring as they had been in the fall, no systematic influences on the children's vocabulary should occur other than the child's experiences in the center. Family situations may change, but this should occur randomly and should not be a function of enrollment in the center. Thus, vocabulary changes should reflect variations across centers in center quality. Because children from low-income families have been found to benefit the most from good quality education, the families' socioeconomic status (SES)

also was examined as a predictor of change in vocabulary. In this study, it is expected that children from low SES families will gain more in vocabulary than will children from middle SES families in the same quality childcare.

II. HYPOTHESES

1. Overall childcare quality, as measured by the NAEYC Accreditation Standards, will be associated with gains in children's vocabulary from fall to spring.

2. Individual quality factors will be associated with changes in children's vocabulary. Specifically, better teacher-child ratio, more verbal stimulation, smaller class size, and more teacher training are expected to predict greater vocabulary growth.

3. SES will moderate the link between childcare quality and vocabulary growth. We expect a stronger positive association between vocabulary growth and quality for low SES children than for high SES children.

III. REVIEW OF LITERATURE

The primary purpose of this literature review is to examine the current research and theory on the effects of childcare on children, particularly in regards to vocabulary development. First, there will be a general discussion of children's vocabulary development and reading. The next section will examine research pertaining to center-based intervention studies in early childhood. Following this, there will be a discussion of the effects of community childcare centers on children's social and cognitive development. Finally, literature specifically examining the quality of childcare centers and children's vocabulary development will be discussed.

Vocabulary Development

A child's verbal ability has been found to be an important predictor of school readiness and academic achievement, particularly reading ability (Fewell & Deutscher, 2002; Morris, Vyner, & Perney, 2000; Shaywitz et al., 2004; Snow, Burns, & Griffin, 1998; Tankersley, 2003; Vellutino, Scanlon, & Lyon, 2000). The following section will provide a general overview of the development of vocabulary and reading skills among children. The importance of vocabulary and reading on children's achievement will also be discussed. Finally, measures of vocabulary will be summarized as well.

Vocabulary and Reading Development

During the preschool years, children begin to master many aspects of language. Children begin to improve their speaking skills. Pronunciation of words improves as

children develop better coordination between their lips and tongue, which improves articulation (Hughes, Noppe, & Noppe, 1988). Children's grammar also starts to emerge during the preschool years. Preschoolers approach grammar learning as a set of rules which they must learn and use. Young children form hypotheses about how language works, and are constantly testing these hypotheses and learning how language functions (Hughes et al., 1988). However, this review will focus on children's vocabulary.

The typical child says his or her first word around 12 months of age. The word may be a sound he or she consistently attributes to someone or something, such as "mama" for his or her mother. Children's vocabulary rapidly increases around 16-24 months of age when children being to figure out things have names. The average 16-month old has a vocabulary of 50 words, and by 24-months an average child's vocabulary consists of about 320 words (Fenson et al., 1994). Word learning is not linear; children do not learn words on an increasing scale every year. Rather, many psycholinguists believe word learning occurs in bursts over the child's development. By the time a child is 2 1/2 years old, his or her average vocabulary is 600 words. At age the 5 or 6, children have a vocabulary of approximately 15,000 words (Fenson et al., 1994).

Word learning depends on the child's ability to recruit and integrate information from the outside world (Dickinson, Cote, & Smith, 1993; Sternberg & Powell, 1983; Woodward & Markman, 1998). A child's ability to read is influenced by his or her vocabulary and general language and knowledge development. Scarborough (2001) found a significant correlation between vocabulary and reading comprehension. Vocabulary size is influenced by a broad-based and retrievable knowledge base about the world. Vocabulary, in turn, influences a child's ability to read. Reading comprehension

requires children to understand the words they encounter in books and other printed materials. The most effective programs in helping children learn how to read are those that provide the children many opportunities for background knowledge about the world (Dickinson et al., 1993). The exact relationship between vocabulary and literacy is difficult to determine. Children's vocabulary size is affected by their home environment, which is different for every child. Some children experience enriching verbal environments, while others do not have that type of experience (Dickinson & McCabe, 2001).

The Importance of Vocabulary for Reading and Achievement

Reading is considered to be a "tool skill" that children use to operate in their classroom environment. Without adequate reading skills, children are likely to have problems in science, math, literature, and social studies (Morris, Tyner, & Perney, 2000). Children are expected to learn how to read by parents and teachers, and this expectation is not always fully met. Children may learn basic reading skills, but may not be as proficient as they could be. Shaywitz et al. (2004) cites the importance of interventions for many readers to help them establish fluent reading, which the authors believe is a hallmark of skilled reading. Vocabulary proves to be among the best predictors of school success, especially reading (Shaywitz et al., 2004).

Numerous studies show that good vocabulary is essential to skilled reading and school success, but one such study will be described in detail. Kastner, May, and Hildman (2001) investigated the ability of the Early Prevention of School Failure (EPSF) battery to predict Stanford Achievement Test scores. EPSF was developed by Werner and used across the country to identify children with learning problems who needed support.

The EPSF is composed of a battery of measures commonly used to assess school readiness. These measures include: the Preschool Language Scale, the Motor Activity Scale, the PPVT-R, the Developmental Test of Visual Motor Integration-Revised, and the Draw a Man.

A total of 139 boys and 141 girls in kindergarten and first grade participated in the program. Each child was given the EPSF upon his or her entrance into kindergarten. The Stanford Achievement Test was given to each student at the end of the first grade year. Regression and factor analysis were used to explore the relationships between the scores on the measures (Kastner et al., 2001).

Kastner et al. (2001) found that the Preschool Language Scale and the PPVT-R had the strongest relationships with the Stanford Achievement Test. Through factor analysis, the authors found that verbal and language-based measures of the EPSF were more highly associated with later academic achievement and school success than were motor-based measures. Children who scored higher on the verbal components of the standardized tests were more likely to score higher on tests of academic achievement.

In that vocabulary is a good predictor of academic success, it is important to have valid, reliable measures of vocabulary. In the next section, the most commonly used measures of vocabulary development for preschool children will be described and their psychometric properties reviewed.

Vocabulary Measures

Several techniques are used to assess preschooler's vocabulary, but the most common will be reviewed.

The McArthur Child Development Inventory (CDI) was developed in 1975 by Bates and her colleagues with a freeform interview (Fenson, Dale, Reznick, Bates, Thal, & Pethick, 1994). The CDI has been revised many times, and was eventually developed into a self-administered checklist format. Parents are asked to indicate the words from a list that their child says on a regular basis. The CDI has been developed into three different forms for infants and two scales for toddlers. For infants, there are separate scales for the words the child understands and the words the child produces. The toddler form of the CDI has two parts. Part one asks parents to check the words their children use. Part two measures the child's morphological and syntactic development. The authors used Chronbach's coefficient alpha to determine the internal consistency for the measure. The alpha was .95 and .96 for the infant and toddler forms, respectively. Test-retest reliability was assessed approximately 1.35 months after the administration of the first measure. The Pearson correlations for the two administrations of the infant and toddler CDIs were .87 and .86, respectively. Even though the measure is reliable, it is not practical for use in research because the parent's recall of their child's vocabulary level is not always accurate.

The PPVT was initially developed by Dunn in 1959 using easy to illustrate words from *Webster's New Collegiate Dictionary*. The measure has been revised with different stimulus words than the original measure. The PPVT-R only retained 48% of the words in the initial version of the PPVT. The PPVT-R is a norm-referenced, individually administered measure of children's receptive vocabulary and is available in two forms – Form L and Form M. Receptive vocabulary is often defined as the comprehension vocabulary one has while they are silently reading or learning. There are a total of 175

items that are arranged in an order of increasing difficulty. The children are asked by the researcher to point to the particular graphic out of four that depicts the word asked about. For example, the children are asked to "show me sharing," and should point to an illustration of children sharing an object. In one psychometric study, the test-retest reliability for the PPVT-R ranged from .71-.89 with a median of .79 (Dunn & Dunn, 1997).

The Kindergarten Diagnostic Inventory (KDI) is another method of assessing verbal ability, but is less commonly used than the PPVT. The verbal component of the measure includes form/letter identification, memory for sentences, verbal associations, and vocabulary. In its entirety, the KDI is used to assess school readiness (Carter, 1994). The vocabulary subtest of the measure is given by a trained researcher. Children are asked what they think a particular word means. Responses are scored from 0 to 2 based on a set of predetermined correct responses. Test-retest reliability for the measure has been found to range from .87-.91.

This section has summarized several measures of vocabulary for young children. As will be seen in other sections of this review, these and other measures have been used to assess the effects of early childhood programs on children's cognitive development.

What is Quality? How is it defined and measured?

In community childcare, quality is often measured. Since research on childcare quality began, the notion of quality has been difficult to define. In research, quality has been assessed in several ways. A global measure of the quality of the classroom is often used which reflects the climate of the classroom. Specific measures are often used to measure structural aspects of childcare, dynamic aspects, and contextual aspects (Vandell

& Wolfe, 2003). The following section will describe various aspects of the construct of quality and its use in childcare research.

Process Quality

Process quality refers to the children's overall experiences in a classroom. Processes are defined as how and how much the teachers interact with children, the teacher's discipline style, and how the teachers encourage interactions between the children. Process quality also includes interactions between the teaching staff as well as interactions between the children and their environment such as space, schedules, and materials (Marshall, 2004; Vandell & Wolfe, 2003). Previous research has found that higher process quality is related to increased language and cognitive competence, fewer behavior problems among the children, and increased social skills (Marshall, 2004).

The ECERS is possibly the most common method used by researchers to measure the quality of a classroom. The ECERS is comprised of 7 different sections used to evaluate different aspects of the classroom environment - personal care routines, furnishings, language reasoning experiences, motor activities, creative activities, social development, and staff needs. Trained observers are in each classroom for a minimum of two hours, and evaluate each of the seven areas. Each area is rated as minimal, good, or excellent (Vandell & Wolfe, 2003).

The Observational Ratings of the Caregiving Environment (ORCE) is another common measure used in order to assess the process quality and overall caregiving environment in childcare settings. Trained observers examine the characteristics of the children's experiences in two different ways: by observing the frequency of certain caregiving behaviors and assessing the quality of the interactions. The ORCE is used to

assess the quality of the individual child's experiences. Observations are conducted in two 44-minute cycles of observing the child's behavior. The NICHD Child Care Network has used the ORCE, and found high internal consistency for two composite measures – the positive caregiving frequency and positive caregiving ratings (NICHD, 2003).

Structural Quality

The structural quality of the classroom is most often measured in terms of teacher-child ratio, group size, and teacher formal and specialized training. These structural indicators have been obtained by several national surveys including the National Child Care Survey, the National Household Education Survey, and the National Longitudinal Survey of Youth (Vandell & Wolfe, 2003).

Teacher-child ratios are an important aspect of the quality of community childcare. Classrooms with higher teacher-child ratios most often have teachers who are less stressed and are able to have more interaction with the individual children. There should be a greater opportunity for guided discovery. Children in these classrooms also tend to have a greater sense of attachment to their teachers. In addition, the group size of the classroom is an important aspect of the structural quality of the classroom. Smaller group sizes have been found to facilitate more constructive group behavior and better developmental outcomes (Vandell & Wolfe, 2003). Howes (1983) found larger groups had less social stimulation and responsiveness by the teachers. In addition, Howes and Rubenstein (1985) found that children enrolled in community childcare centers with smaller classroom size were more talkative.

Caregiver training is another important aspect of the structural quality of a classroom. Teachers who have had more training in child development and early

childhood education are more likely to have more developmentally appropriate materials and activities in their classrooms. These teachers are also more likely to have warm, appropriate interactions with the children (Vandell & Wolfe, 2003). Berk (1985) found that caregivers with at least two years of a college education were more likely to encourage the children and promote verbal interaction. Clarke-Stewart, Gruber, & Fitzgerald (1994) also report childcare home providers with formal training in child development are associated with higher social and cognitive competence in children who attended family day care homes.

Effects of Early Childhood Programs

Effects of early childhood programs have been studied in various ways. Most studies in this body of research can be classified as either an intervention study or a community childcare center study. Intervention studies investigate high quality programs and use experimental or quasi-experimental designs to evaluate the effects of the programs on children. The term "community childcare study" is used to refer to investigations of naturally occurring groups that are not developed to use specifically for research. Parents self-select programs into which their children are enrolled in community childcare studies. Typically, there is no attempt by researchers to influence programs or parent's choice of center. Community childcare center studies look at natural variations in childcare, particularly quality and how variations are associated with child outcomes.

In the following sections, early childhood interventions and studies of community childcare centers will be reviewed. The section will end with a discussion of studies that specifically focus on community childcare centers and vocabulary.

Intervention Studies

Many early childhood interventions have the goal of providing a unique, high quality program to a chosen population. Many early childhood interventions consist of selecting a target population, implementing a high quality education program, and comparing the gains of the children in the intervention program to those children in a control group that did not receive the intervention. The programs are usually of a very high quality and researchers commonly find positive effects of the program for the children and their families.

The following section will describe several studies of intervention programs for center-based early childhood interventions. Researchers often choose children from low-income families and communities as the target population for interventions. Intervention studies for lower socioeconomic groups are common in the early childhood literature; therefore, a selection of key interventions will be discussed in the following section. Several of the studies chosen for this review were outlined in an extensive review of interventions for disadvantaged children by Bryant and Maxwell (1997). The section will begin with a discussion of Head Start and several studies based off of previous Head Start research. After this discussion, several other key studies will be covered as well.

Head Start is the largest preschool intervention program in the Unites States. The program is the largest program for low-income children. Most children who attend do so because parents self-select, but there have been some experimental evaluations of Head Start. Head Start was created in 1964 as a result of President Johnson's War on Poverty, and has received federal support for the past three decades. The original goal of the program was to prepare children from lower income families for school, and "close the

gap" educationally between lower- and higher-income children. Because Head Start is a nationally funded program, it has been evaluated for its effectiveness on several occasions. Head Start has had positive effects for many children (Abbott-Shim, Lambert, & McCarty, 2003). But, some researchers caution that we cannot expect dramatic gains in achievement from only one year of intervention. Research has been conducted on the efficacy of the program, but very few studies have addressed the issue of "closing the gap" between the poor and more economically advantaged children (Bryant & Maxwell, 1997; Lee, Brooks-Gunn, & Schnur, 1988).

Lee et al. (1988) re-evaluated a study conducted by the Educational Testing Service (ETS) called the Head Start Longitudinal Study (HSLS). The study compared 969 disadvantaged children in three different programs: a Head Start program, a no preschool program, and children who attended a preschool program other than Head Start. The goal of the study was to assess changes across an academic year and cognitive differences among the three groups of children. The participants were children from two different regions of the United States and were eligible for 1st grade in 1971. Mother and child were seen several times during the year in order to provide family background and demographic information, to take achievement tests, and receive a physical examination. Researchers also observed mother-child interactions during specified tasks. Children were given the PPVT, Caldwell Preschool Inventory, Motor Inhibition Test, and the Eight-Block Sorting Task (Lee et al., 1998).

The authors found participation in the Head Start program produced significant gains on some ability measures. Children in the other preschool programs performed better than the Head Start program children on several achievement tests, but children in

the Head Start Program consistently had greater gains in scores. In addition, African American children tended to have greater gains in academic achievement than their white counterparts (Lee et al., 1988).

The study conducted by Lee et al. (1988) described above provides an overall picture of the effectiveness of Head Start without going into much detail. The children who participated in the Head Start Program had significant gains in their scores on the achievement measures across the year. For this particular population, the program fulfilled its goal of boosting the Head Start children's achievement score results.

Despite the academic gains by the children in the program, Head Start is not the typical care environment for many low-income children. All 3- and 4-year-olds from low-income families are eligible to enroll in Head Start, and the program serves approximately 905,000 children with a cost of approximately $5,400 per child per year (Head Start Program Fact Sheet, 2005). The Head Start program is large, but only serves about one-third of the eligible children (Garces, Thomas, & Currie, 2000). Admittance to the program may be difficult in some areas of the United States because of a high demand for the program.

The Family and Child Experience Survey (FACES) longitudinal study was created by the United States General Accounting Office (US GAO) to conduct a comprehensive study of the effects of Head Start on preschool children. Results of this study showed that children who participated in Head Start had better social skills, writing skills, letter recognition, word knowledge, and math skills. The FACES study is limited because it is not an experimental study. Random assignment was not used; therefore, selection factors could account for differences between groups.

Abbott-Shim et al. (2003) cited the FACES study as an example of one of the many studies of the Head Start program, noting there were, at that time, no recent experimental studies of the Head Start program. Therefore, the goal of the Abbott-Shim et al. study was to design an experimental study of the Head Start program. This particular study involved a partnership with Georgia State University Quality Research Center (GSU QRS) and Head Start. The project was a randomized, experimental design study, which involved a treatment and comparison group. The authors examined various outcome variables including school readiness, health, social, and cognitive and language skills of the children in the study (Abbott-Shim et al., 2003).

Children were randomly assigned to either the treatment or comparison group at the center level. In total, 87 children participated in the treatment group, and attended one of several specified centers, and 86 were in the comparison group that attended any other center. Forty-three children were automatically eligible to participate in the program because of either a disability or the fact that they had been enrolled in the program the previous year and were continuing participation in Head Start. These children were not included in the analysis. Measures were administered to the children three times during the academic year. The measures included: the PPVT, M-KIDS Preliteracy Inventory, and the Early Phonemic Awareness Profile. Parents were also given the FACES Parent Interview. There were no differences between the treatment and comparison groups at the beginning of the study (Abbott-Shim et al., 2003).

Abbott-Shim et al. (2003) found that children at the end of the year who participated in the program had higher scores and growth rates on receptive vocabulary and phonemic awareness measures than the children in the comparison group. In

addition, the authors discovered no significant differences in social skills and positive approach to learning measures between the treatment and comparison groups. Abbott-Shim et al. provided evidence of the success of the Head Start Program. The randomized, experimental design allowed the authors to confidently draw conclusions about the program's effects.

The Carolina Abecedarian Project began in the 1970s as a response to the disappointing results the Head Start program was producing at that time. This project was a randomized experimental trial of an intensive early childhood education program for children from low-income families. The educational program was child centered with as much parent involvement as possible. In addition, programs were available for parents and families on parenting skills, nutrition, and health (Campbell, Helms, Starling, & Ramey, 1998).

The base sample for the Abecedarian Study was 111 children from 109 families. Fifty-seven children were assigned to the treatment group, and 54 children were assigned to the control group. Children in the treatment group were enrolled in a program in the university-owned Child Development Center. The program was designed to enhance children's cognitive and social development. Children assigned to the control condition were enrolled in a different program of their parents' choosing. Children were given a variety of standardized achievement measures: Bayley Scales of Infant Development, Stanford - Binet Test of Intelligence, McCarthy Scales of Children's Abilities, and the Wechsler Preschool and Primary Scale of Intelligence (Spitz, 1992).

Campbell et al. (1998) examined process, context, and person variables for correlations with a variety of outcome variables including the children's academic

performance during elementary through high school. There were academic advantages for the children enrolled in the intervention program through high school. Interestingly, the authors found the school-age phase of treatment (i.e. without the preschool intervention) did not produce effects as large as the preschool intervention. Parental involvement and long term interventions had benefits beyond the preschool center-based intervention, but this review focuses on effects of the intervention during the children's preschool years.

Project CARE was conceptualized from the results of the Abecedarian Project (Ramey, Yeates, & Short, 1984). The authors believed the addition of a family support component would be effective in changing the children's home environment. That is, they believed that a more supportive home environment could have additional positive effects on a child's social and cognitive development beyond those conferred by the center. The program was designed to provide parent support and help parents learn effective problem solving strategies and learning skills related to positive child development. The authors hypothesized that children who were enrolled in quality center care and whose family participated in family education programs would perform better than children in either a parent education-only group or the control group (Wasik, Ramey, Bryant, & Sparling, 1990).

A total of 62 families participated in this research project and were randomly assigned to groups. Fifteen families were in the Child Development Center plus family education group, 24 were in the family education group, and 23 were in the control group. The Child Development Center was a university run childcare program that focused on the child's cognitive and social development using a systematic

developmental curriculum. The family education component of the program involved home visitors coming to the participants' homes to work on parent problem solving skills and teaching the parents techniques to the promote the child's social and cognitive skills. The home visitor also discussed the parents' concerns and goals for their children. Home visitors worked with both parents and the child with developmentally appropriate materials to foster the child's social and cognitive skills. The Bayley Tests of Infant Development, the Stanford - Bitnet test of Intelligence, and the McCarthy Scales of Mental Ability were administered to each child in order to assess cognitive development. The Home Observation for Measurement of the Environment (HOME) Inventory was used to assess the quality of the child's home environment, and mothers were also given the Childrearing and Education Research Instrument in order to determine their attitudes about childrearing (Wasik et al., 1990).

Consistent with the authors' hypothesis, children in the family education program plus the Child Development Center performed better on cognitive measures than the children in the other two groups. In addition, children in the control group performed better on cognitive measures than children in the family education program only group. The family education program alone was not sufficient to affect either the parents' or the children's behavior. The study does support positive outcomes for children in the Child Development Center up to age three (Wasik et al., 1990).

Wasik et al. (1990) attempted to show the importance of the link between the home environment and the childcare environment. Children and families with home and childcare assistance did perform better on achievement tests than their counterparts who were not involved in all aspects of the program. The center-only group had more positive

outcomes than the home only group; however, this suggests that high quality center care can have a significant impact on children's development.

Another well-known intervention for low-income children and families is the Chicago Child Parent Center and Expansion Program is a large-scale comprehensive preschool to 3rd grade intervention program for low-income students in Chicago Public Schools. The aim of the program is to improve children's school readiness and performance through structured instruction, parent involvement, with a focus on reading and language development. The aim of this study, referred to as the Longitudinal Study of Children at Risk, was to investigate three different research questions. First, does the duration of an intervention program affect outcomes? Does participation in a follow-up program improve children's adjustment in school? Finally, are the effects of the intervention program stable after 2 years (Reynolds, 1994)?

Children from the Longitudinal Study of Children at Risk were recruited to participate in the study. A total of 1,106 children and 20 centers were involved. The children in the study were enrolled in Chicago Public Schools for one or more years in preschool, kindergarten, or the primary grades. Like Head Start, the program provided health and nutrition services, literacy development programs, instructional coordination, and reduced class sizes. In addition, parental involvement was required of at least one half day per week. Involvement could be tutoring, serving as a teacher's aide, going on class field trips, and participating in workshops (Bryant & Maxwell, 1997; Reynolds, 1994). The children received follow-on interventions as long as they continued to participate in the program (Reynolds, 1994).

While the Chicago study did not have random assignment, the intervention group and the comparison groups were comparable on several demographic variables.Reynolds (1994) states the lack of random assignment is perhaps the biggest limitation of the Chicago study and results must be cautiously interpreted and cross-validated with other studies. Children involved in the program scored better on achievement measures, parent involvement, and grade retention by 4th grade when compared to the children who were not enrolled in the program. When the children were in 5th grade, program children scored significantly better on reading and math achievement measures than the children not involved in the program. Children in 5th grade who attended preschool scored significantly better on achievement tests than children who had not attended preschool (Bryant & Maxwell, 1997; Reynolds, 1994).

Reynolds (1994) believed this study contributed to the knowledge base on early childhood interventions and provided support for the need for interventions and follow-on interventions and assessments. The preschool program and the school programs were equally beneficial, but the main contribution of the study was the evidence that the children with the highest achievement scores were the children who participated in the preschool and follow-on interventions. The author concluded the duration of the participation is just as important in intervention theory as the age of the child at the onset of participation. Reynolds (1994) emphasizes the major contribution of this study is the evidence of an effect of the combination of the intervention program and follow-on interventions on the children's achievement.

Unlike the Chicago study, the High/Scope Perry Preschool Project made use of random assignment to study the effects of the program on children's cognitive and social

development. The goal of the study described here was to provide more recent follow up information on the children who participated in the preschool program at age 3 and 4 (Schweinhart & Weikart, 1997). Follow-up data were collected when the children were 23 years old. The Perry Preschool Project was designed to evaluate the effects of three theory-based early education models – direct instruction, high scope, and a traditional nursery school program.

The Direct Instruction curriculum was designed by Bereiter and Engelmann (1966) and was centered on improving the children's academic skills directly involved in achievement tests. The program involved 20-minute question and answer sessions with the teacher and students about various aspects of math, language, and reading. Teacher's guides and workbooks were the key materials used. Direct instruction was based on learning theory and relied on work sheets and frequent repetition of facts and grammatically correct statements. The traditional Nursery School model was developed by Sears and Dowley (1963). This program was child-centered and unit-based. Children learn using various themes throughout the year. This program places an emphasis on the improvement of children's social skills. The High/Scope program was developed by Weikart and his colleagues. The program is based upon Piaget's constructivist theory in which children are active learners in their environment. Children are able to plan out and evaluate their own daily activities, and have the opportunity to work in large and small groups (Hohmann & Weikart, 1995; Schweinhart, & Weikart, 1997).

Sixty-eight children were recruited to participate in the project. Children were eligible if they were from a lower socioeconomic status group and if they had low scores on the Stanford - Binet Intelligence Scale. Children were randomly assigned to

participate in one of the 3 curriculum models. Data were collected from the children at ages 3 to 8, 10, 15, and 23. For the purposes of this study, researchers conducted an age 23 interview, and obtained the participants' school and arrest records. Children in the Direct Instruction group had more problems with social and community behaviors than the children in the High/Scope and traditional Nursery School programs. Children in the Direct Instruction group had more years of special education for emotional impairment or disturbance, more sources of irritation, more acts of misconduct and more arrests. The authors found no advantages on any variable for children involved in the Direct Instruction program. Children in the High/Scope and the Nursery School models exhibited more positive community behaviors than children in the Direct Instruction groups. These children were more likely to vote, to finish more years of school, and do volunteer work (Schweinhart & Weikart, 1997).

When the children were age 10, the children in the Direct Instruction group had a higher mean IQ score on the Stanford - Binet Intelligence test than did the children in the traditional Nursery School program. The authors came to the conclusion that a well-implemented preschool program would have the same strong effects as the Direct Instruction group (Weikart, Epstein, Schweinhart, & Bond, 1978). When the children were 15, differences in social and community behaviors began to emerge. Children in the Direct Instruction groups committed 2 ½ times as many misconduct behaviors as children in the High/Scope group (Schweinhart, Weikart, & Larner, 1986).

The section above examined several key studies of interventions conducted by researchers on children in early childhood programs. Each study showed some positive effects of the program on children's cognitive and social development (e.g., Campbell, et

al., 1998; Reynolds, 1994). Despite these positive gains, the results of the studies may not be applicable to children in community childcare settings. Intervention programs are often of extremely high quality, and many children do not receive care or early education of such high quality. Most intervention programs are costly to implement because they employ highly trained teachers and have low teacher-child ratios and programs that serve low income children and families often do not have the funds to duplicate these practices. Therefore, it is difficult to draw conclusions regarding the effect of childcare centers on children's cognitive and social development from these intervention studies. These intervention studies do provide researchers and educators with a guide to what a quality program can do for children, but implementing intervention programs would be impossible under current funding conditions (Vandell & Wolfe, 2003).

Community Child Care Studies

The following section will examine studies of the effects of community childcare centers on children's cognitive and social development. Many studies focus on the children's experiences as a whole and the quality of the child care center (NICHD & Duncan, 2003). Others focus on specific outcomes such as cognitive effects or academic performances (Phillips, McCartney, & Scarr, 1987) or specific populations such as children from lower income families (Burchinal, Lee, & Ramey, 1989; Votruba-Drzal, Coley, & Chase-Lansdale, 2004). Because of the numerous studies of community childcare, a selection of recent studies will be reviewed. Studies for review were chosen because of their specific discussion of the effects of community childcare on the children's social, cognitive, and language development. The studies described in the following section are presented in chronological order.

Burchinal et al. (1989) conducted a study to compare the effects of the type of childcare on low-income children. Children from families in lower socioeconomic groups are more likely to show evidence of intellectual underachievement than are children from higher socioeconomic status groups. According to Burchinal and others (Burchinal et al., 1989; Lazar, Darlington, Murray, Royce, & Nipper, 1982), the detrimental effects of a poor environment may be offset by higher quality community childcare centers. The authors note most children in childcare are not enrolled in very high quality centers. Burchinal et al. (1989) chose to examine and compare the effects of three types of childcare on the intellectual development of disadvantaged children.

A total of 151 4- and 5-year-old children were recruited to participate, and 131 of these children were followed into kindergarten. Approximately 54% of the sample was male, and 98% of the children in the sample were African American. The children were either in a treatment group or a control group that the parents self-selected. Children in the treatment group were in a university run childcare center. Children assigned to the control groups were either in a community child care center, or had minimal experience of less than 12 months in a community childcare center. The children were given the Bayley Scales of Infant Development, Stanford-Binet Intelligence Scale, and the McCarthy Scales of Children's Ability. The children's day care history was collected each year of the study from the child's parent or guardian. Statistical analyses show children in university-based centers showed a different pattern of development from the other children. Children enrolled in university-based programs had the highest achievement out of the three groups. At least one year in a high quality center had a positive effect on the children's intellectual development (Burchinal et al., 1989).

The study provides evidence that higher quality childcare positively affects cognitive development of socioeconomically disadvantaged preschool children (Burchinal et al., 1989). University-based childcare centers had a positive effect on children's cognitive development, but many children in lower economic statuses do not receive this type of care. It is difficult to compare the children in the study to the population of children in community childcare centers. In addition, the sample of children was given the achievement measures at 24, 36, 48, and 54 months. While these are regular intervals of time, the intervals may not correspond with classroom placement. That is, a child could be in the same classroom at two time points, the child could have changed classrooms, or may be out of the center for part of the time period. This fact would make it difficult to attribute changes to a particular classroom experience.

Phillips et al. (1987) examined the effects of community childcare on children's cognitive and social development. The study was conducted with three goals: to examine the influence of quality of care on a child's development, to identify indicators of quality that may influence a child's development, and to determine whether associations between quality and child outcomes are affected by either the child care experience or family background. One hundred sixty-six children participated in this study conducted in Bermuda. The Early Childhood Environment Rating Scale (ECERS) and the Day Care Environment Inventory were used to assess day care quality. Verbal interactions were also examined using an observational coding system. The Classroom Behavior Inventory and the Preschool Behavior Questionnaire were used to assess the social behavior of the children. The PPVT-R, the Preschool Language Assessment Instrument, and the

Adaptive Language Inventory were used to measure the children's language development. Family environment was assessed by a parent questionnaire.

Phillips et al. (1987) state it is important to control for selection effects when examining the influence of quality on children's development. The authors conducted stepwise multiple regression in order to determine the relationship of family background variables and childcare quality. Parents who placed a high value on social skills tended to place their children in higher quality centers than parents who did not place as high an emphasis on social skills. Hierarchical regression was used to determine the contribution of quality on children's social development while controlling for the age of the child, family background, and childcare experience. Overall quality of the childcare environment influenced the children's adjustment and social development. More specifically, the director's experience and the amount of verbal interaction with caregivers were the strongest predictors of children's social skills (Phillips et al., 1987).

Although Phillips et al. (1987) controlled for various selection effects in their analyses, child outcomes were only measured once. Change across the academic year cannot be assessed when the measures were only given once during the year. This makes it difficult to determine the effect the quality of the childcare center has on the children's social and cognitive development. When an outcome measure is only measured once, we know what the children are like at that particular point in time and not how they changed across the year. Peisner-Feinberg et al. (2001) believe that a key issue parents, childcare providers, and policymakers must address is the long-term influences of the childcare environment on children's school readiness and social development. An examination of how well children from childcare perform in kindergarten may provide information on

the effects of the childcare environment. The authors state that few studies of community childcare centers have focused on long-term effects. Long-term effects are extensively examined during intervention studies, but not during studies of community childcare centers. Therefore, the goal of the study by Peisner-Feinberg et al. was to examine longitudinally, from ages 4 to 8, the effects of the childcare environment on children's social and long-term development.

Peisner-Feinberg et al.'s research is a part of the Cost, Quality, and Child Outcomes (CQO) in Child Care Centers Study. A total of 733 children participated in the research project. The study was conducted over a five-year period with five different phases of data collection that began when the children were in preschool and ended when the children finished 2nd grade. The first phase of data collection began the year before the child's last year in the community childcare center. The quality of the center was assessed using the ECERS, the Caregiver Interaction Scale, the UCLA Early Childhood Observation Form, and the Adult Involvement Scale. The kindergarten environment was assessed using a shortened form of the ECERS, and the 2nd grade classroom environment was assessed using the Instructional Environment Observation Scales. Child outcome variables were assessed each year by the PPVT-R, WJ-R in both reading and math, and the Classroom Behavior Inventory. Teachers and parents were also given questionnaires each year to assess a variety of outcome variables (Peisner-Feinberg et al., 2001).

Peisner-Feinberg et al. (2001) found classroom practices were related to children's language and math skills over time. There were also stronger positive effects of childcare quality for children from at risk populations. Classroom practices were related to reading and attention skills during the children's preschool years. Over the

length of the study, reading and math skills increased over time as expected. The WJ-R was not related to any of the childcare measures. The PPVT-R scores increased over time, and children in the higher quality classrooms had higher scores on the PPVT-R. However, the association between classroom practices and language development decreased from kindergarten to 2nd grade. The association was the strongest when the children were in kindergarten, and there was no association between classroom practices on quality and language development when the children were in 2nd grade.

Selection effects could have an influence on the results of the study by Peisner-Feinberg et al. (2001). Better educated parents are more likely to place their children in classrooms of higher quality. Families with fewer resources most likely do not have as many options as parents with greater resources. Childcare effects can be better detected if a short-term longitudinal design is implemented. Change across the academic year can be measured, and developmental changes would be a function of the children's experience in childcare.

NICHD and Duncan (2003) examined children's cognitive development in community child care centers that varied by type and quality using three different statistical methods: multiple regression models, change models, and residualized change models. The authors argued children in lower quality care come from lower income families, and do not have the enriching educational experiences they need. Higher income families were more likely to place their children in higher quality care and have more opportunities for a better education.

Participants were part of the NICHD Study of Early Child Care, which recruited mothers from hospitals at their children's birth from several different states. In total,

1,330 mothers and children participated in the study. The children in this study are a part of the greater NICHD study and were ages 3 to 4 at the time. Each child was given the Bayley Mental Developmental Index, the Woodcock-Johnson Picture Vocabulary and Memory for Sentences tests, and the Preschool Language Scale Expressive and Receptive tests to form a cognitive competence score which was administered when the children were approximately 54 months old. Childcare measures included the average quality, mean hours in childcare a week, proportion of occasions the child was in the center at least 10 hours per week, and whether the child was in his or her mother's care or in a community childcare center. The Observational Record of the Caregiving Environment (ORCE) was also used by the researchers to assess the quality of the childcare environment. Mothers were interviewed as well, and the quality of the home environment was measured using the HOME.

NICHD and Duncan (2003) concluded there was very little difference between the different statistical models when evaluating the effects on quality and cognitive development of the children. The authors believe the current literature may have overestimated the developmental consequences of child care quality, and more empirical studies of community childcare must be conducted before concrete conclusions are drawn (NICHD & Duncan, 2003). This study provides an excellent overview of the effects of childcare on children's cognitive development, but according to the authors, few children were observed in low quality settings. Therefore, it becomes difficult to assess the effects of all levels of quality of care and generalize to the population of children in community childcare centers. NICHD and Duncan (2003) follow the children over several years and observe changes in cognitive scores. However, it is difficult to conclude that changes in

vocabulary scores are the result of experiences in the childcare environment because of the intervals at which the measures were given.

In regards to assessment intervals, developmental changes may have influenced changes in children's cognitive scores. The most serious threat; however, is selection: better educated parents with greater resources are more likely to place their children in higher quality centers. By controlling for family background, childcare quality is also controlled, perhaps making any real childcare effects indiscernible (Newcombe, 2003). Short of an experimental design using random assignment to centers, the next best choice for detecting childcare effects in a community sample may be a short-term longitudinal study in which change across the year is documented. Selection effects should be captured in the initial competence scores in the Fall, and any changes should be a function largely of childcare experiences.

Votruba-Drzal, Coley, and Chase-Lansdale (2004) examined the effects of community childcare centers on a specific population – lower income children and families. The authors state most of the previous literature focused on the middle class socioeconomic groups and the findings from the research from these groups may not be applicable to lower income families. Lower income children are often in lower quality centers and have less consistent caregiving. Previous literature indicated childcare quality was just as predictive of children's cognitive and social development for the lower socioeconomic groups as for the middle- and upper- socioeconomic status groups. However, the authors note these studies only included children in community childcare centers and did not include children in less formal settings such as home childcare. The authors had three principal research goals: to provide an overview of the care children in

lower socioeconomic groups typically receive, to specifically examine the cognitive and social development of these children, and to determine what selection factors may influence the children's development.

Participants for this study were recruited from a larger research project – Welfare, Children, and Families: A Three City Study, which was a longitudinal study of the well-being of low-income children and their families during welfare reform. This study was conducted in two waves of data collection with a total of 204 children participating. Wave 2 of data collection was conducted approximately 16 months after wave 1 ended. Parents were given a questionnaire asking about their family and children. Children were given several social and cognitive development measures, including the Woodcock-Johnson Psychoeducational Battery Revised (WJ-R), Child Behavior Checklist, and the HOME. Children whose first language was Spanish were given the WJ-R in Spanish. The child care environment was assessed using the ECERS-R. The authors found a significant relationship between the number of hours children spend in a childcare center and the children's quantitative skills. In addition, the hours by quality interaction was not related to children's reading or quantitative skills over time. Child care characteristics were more strongly associated with children's socioemotional functioning over time (Votruba-Drzal et al., 2004).

In their conclusions, the authors state their findings add to the current child care literature by illustrating the importance of high quality care for children in low-income environments. High quality community childcare is not as accessible to children and families from poorer communities. The authors believe these are the children who need high quality childcare the most. Childcare quality had the strongest relationship with the

children's socioemotional development when controlling for the quality of the home environment (Votruba-Drzal et al., 2004). Despite their conclusions, the authors also did not evaluate the children's cognitive development across the academic year. The children were given the achievement tests two more times after an interval of 16 months. Once again, it becomes difficult to estimate the relationship between cognitive skill and childcare quality when children may experience several care arrangements between the initial and final developmental assessments. Other variables such as parental involvement and the home environment could exert a large influence on the child's cognitive ability.

A study by Loeb, Fuller, Kagan, and Carrol (2004) also focused on children living in low-income communities and addressed four research questions. What is the quality of community childcare available to women and children in the welfare system? How does the quality of childcare available to these families influence children's cognitive development? How is the children's social development affected? And do developmental effects hold up to controls for family differences in children's baseline proficiencies, mothers' cognitive skills, the home environment, and other family characteristics? The goal of Loeb et al.'s research project was to understand how home and childcare environments affect children in poorer communities.

Four hundred fifty-one families participated in the study. Participants were recruited during their first visit to a welfare office or from their participation in the Temporary Assistance for Needy Families (TANF) program. The first wave of data collection was conducted when the children were approximately 2 ½ years old and involved assessment of the children's baseline cognitive, language, and social development proficiencies. The ECERS, ITERS, and the Family Day Care Rating Scale

assessed the quality of the childcare environment. The second wave was conducted when the children were approximately four years old, and involved home visits and a wider battery of child-assessment measures. Mothers were interviewed at both phases of data collection.

Loeb et al. (2004) found a positive relationship between children's performance on cognitive measures and participation in a community based childcare center. The relationship was the strongest on measures of school readiness for children who were enrolled in a center at both waves of data collection. Most relevant to the current research project, the authors also found that childcare quality affected children's language development. The authors speculate this effect could have come from the character of the social interaction between the child and his or her caregiver in both community center and home-based child care. The education of the caregiver also had an influence on the child's language development. Loeb et al. state that future work may focus on how caregiver education may serve, as a moderator for children's cognitive and language development.

The article described above by Loeb et al. (2004) provides a comprehensive look at the influences of community and home based care on the social and cognitive development of children and families in the welfare system and low-income communities. But the authors only assessed the quality of the childcare center, both home and center based, once during the study. The quality of the childcare center could easily have changed over the two waves of the study. Therefore, it is difficult to draw conclusions about the influence of the quality of the care on the child's cognitive and

social development. While the battery of measures used was extensive, the authors did not administer these measures across an academic year.

Vocabulary and Quality

The effects of various childcare quality environments on children's cognitive development has been studied, and vocabulary has become a small area of focus. Many studies have come to the conclusion that higher quality centers are more beneficial to children's vocabulary development than lower quality centers (Schlieker, White, & Jacobs, 1991; Burchinal, Roberts, Riggins, Zeisel, Neebe, & Bryant, 2000). Several studies are longitudinal, and assess the children yearly over several years. Many of these particular studies have the goal of examining the children's readiness for school (NICHD, 2000; Peisner-Feinberg et al., 2001).

Schlieker, White, and Jacobs (1991) examined the effects of day care quality on children's language development while controlling for socioeconomic status and family structure. Attending child care expands a child's environment beyond the home, and the authors wanted to examine the family effects as well as child care effects. Ten day care centers were rated as either high or low quality by trained observers using the ECERS. Children's verbal ability was assessed by the PPVT-R once during the academic year. The Home Prestige Scale determined the socioeconomic status of the children's families. The authors evaluated the data in order to find relationships between the home and school environment as well as the children's academic performance.

Children in higher quality centers tended to have higher PPVT-R scores than children in lower quality centers (Schlieker et al., 1991). Children from two parent families tended to come from a higher socioeconomic status and were in higher quality

centers. Two parent families were more likely to place their children in higher quality centers, and their children's vocabulary comprehension was higher than children from single parent families enrolled in lower quality centers. The authors concluded that the children in lower socioeconomic status groups need the higher quality centers, but are less likely to receive higher quality care.

Burchinal, Roberts, Riggins, Zeisel, Neebe, and Bryant (2000) explored the various ways the quality of the child care center related to vocabulary in preschool children by looking at a specific population. At the time the study was conducted, there was very little longitudinal data on the effects of child care on children. Therefore, it was the authors' goal to add longitudinal data to the literature. Burchinal et al. (2000) wanted to describe how child care quality varies during early childhood, to follow the effects of child care on a child's long term development, to determine whether certain child or family factors may serve as protective factors for children in community child care centers of varying quality.

Eighty-nine African American preschool students participated in this follow-up study of a larger, longitudinal project that examined the effects of otis media and hearing loss on children's language development. The children all attended community child care centers for an average of 30 hours per week. Each child was given the Bayley Scales of Infant Development as well as the Sequenced Inventory of Communication Development-Revised (SICD-R) to measure language development. Trained observers used the Infant/Toddler Environment Rating Scale (ITERS) to assess the quality of the various community child care centers. The results from this research study replicate previous findings (Howes et al., 1992; Phillips et al., 1994, add others). The child care

environment contributes to cognitive development, specifically language development. Children in higher quality centers had higher scores on vocabulary measures. In addition, the authors also found that children in classrooms with higher teacher: child ratios had higher vocabulary scores than children in classes with lower ratios.

Ackerman-Ross and Khanna (1989) chose to examine the language scores of a specific socioeconomic status – the middle class population. This study compared children who were being raised in their home by a parent and children enrolled in community child care centers. The authors predicted the day care and home-reared children would not differ on the measures of language performance. In addition, the authors believed the mothers' level of education and quantity of parental verbal stimulation would be positively correlated with the child's language score. The authors chose to examine language performance for two reasons: language processes are an integral part of a child's cognitive development, and of all the major developmental areas, language development was one of the areas that was least represented in the child care literature.

Twenty-two children in two high quality community child care centers were recruited to participate in the research project (Ackerman-Ross & Khanna, 1989). The home care group consisted of 18 children who had never entered full-time day care or who had attended child care for less than 3 months. Parents were asked to provide answers to the Day Care Study Questionnaire, and children were given the Zimmerman Preschool Language Scale as well as the Stanford-Binet Scale of Intelligence. The authors failed to find a relationship between care type and receptive, expressive, and total language in the children. Variables other than the type of care were significantly related

to children's language. For example, IQ was determined to be a significant predictor of a child's language performance. However, the authors note this study is not generalizable to the population of children in home and community care. In this particular study, children in community care centers were in high quality centers, which are not representative of the quality of care most of the children who attend community child care receive.

The National Institute of Child Health and Human Development Early Childcare Research Network (2000) study is a national, longitudinal research project of the effects of child care on children's development. Previous research suggests high-quality care during the early years of development is associated with better social and cognitive development. The authors state that even though this finding is consistent across studies, there are questions about how to interpret the results. In this particular study, the effects of child care experiences on a child's cognitive and language development were examined in the frame of 5 different research questions. Do the cumulative quality, type and amount of child care predict children's language skills during the preschool years? What are the magnitudes of these effects on children's development? How do children raised exclusively by their mothers compare to the children enrolled in centers of varying quality? Does childcare in the first years of life have lasting effects on a child's cognitive and social development? Finally, are the relations of child care to cognitive and language outcomes different for children from different income levels, home environments, genders, or ethnic groups?

From the national sample of 1,330 mothers and children, 856 3- and 4-year-old children were used in this focus sample. Data were collected from 3 different settings –

the home, a laboratory, and the child's primary child care center. Demographic, maternal, child, and family characteristics were measured from questionnaires, and the HOME scale. Child care quality was assessed through the ORCE, and cognitive and language measures were assessed using the Bayley Mental Developmental Index (MDI), Bracken School Readiness Composite, and the Reynell Developmental Language Scale. The authors found that a child's time in child care was neither deleterious nor advantageous for a child's cognitive and language development. Furthermore, the association between caregiver's language stimulation to the child and the child's language development showed no direct or indirect effects.

Unlike other articles described in this review, this study did not find either positive or negative effects of the child's time in a childcare center. However, each measure was given to the children once over the academic year. It is difficult to determine differences between the quality of classrooms and track changes throughout the academic year.

Pence and Goelman (1991) conducted the Victoria Day Care Research Project in Canada – a 2 year study of children, families, and caregivers in licensed community child care centers, licensed family child care, and unlicensed family child care. Their study looks at the quality of the center in relation to the children's performance on standardized tests of language performance and the children's experiences in child care. One hundred five parent-child-caregiver triads were recruited to participate in this research project. There were 3 major components of this study – outcome measures, observations, and interviews. The PPVT was given to the children on 3 different occasions – each time being given 6 months apart. Classroom quality was measured using the ECERS and the

Day Care Home Environment Rating Scale (DCHERS). Parent and teacher questionnaires were also administered.

The authors state this particular research project replicates, complements, and extends results that have been presented in other literature of child care and family variables (Pence & Goelman, 1991). No single variable explained children's performance on measures of receptive and expressive language development. Maternal education was a predictor of children's performance on the PPVT, and there were significant correlations between most of the subscale and quality ratings on the ECERS. But, the authors found no direct relationship between the ECERS and PPVT scores.

Phillips et al. (1991) examined the effects of community child care on children's cognitive and social development. Their study was conducted with 3 goals: to examine the influence of quality of care on children's development, to identify indicators of quality that may influence children's development, and to determine whether associations between quality and child outcomes are affected by either the child care experience or family background. One hundred sixty-six children participated in this study conducted in Bermuda. The ECERS and the Day Care Environment Inventory were used to assess day care quality, and the verbal interactions were also examined using an observational coding system. The Classroom Behavior Inventory and the Preschool Behavior Questionnaire assessed the social behavior of the children. The PPVT-R, the Preschool Language Assessment Instrument, and the Adaptive Language Inventory were used to assess language development. Family environment was assessed by a parent questionnaire.

The authors found children in higher quality centers had larger expressive vocabularies (Phillips et al., 1991). Higher quality centers typically have a lower rate of teacher turnover, and a greater verbal interaction between caregivers and children. The amount of verbal interaction between caregiver and child was the strongest predictor of positive child outcomes in community child care. The time children spent in child care and the age children entered child care did not have strong relationship with the children's language development.

Conclusions and Future Directions

Current day care research on vocabulary development and day care quality leads to several inconsistent conclusions. Several studies have found that higher quality child care contributes to higher vocabulary scores (Burchinal et al., 2000; Phillips, Scarr & McCartney, 1991; Schlieker, White, & Jacobs, 1991). Despite these positive findings, many studies have found no difference in the vocabulary scores of the children as a function of different quality centers (Ackerman-Ross & Khanna, 1989; Pence & Goelman, 1991). Many of these studies only examined children's vocabulary scores at one point in time, and it is difficult to draw concrete conclusions regarding the children's development and rely on statistical controls to remove the effects of the home environment (Ackerman-Ross & Khanna, 1989; Schlieker, White, & Jacobs, 1991).

Several longitudinal studies (Burchinal et al., 2000) measured vocabulary over time, but in no case did the time interval correspond to a single childcare experience. That is, all longitudinal studies followed children over intervals that corresponded to multiple classroom placements. For instance, Campbell et al. (1998) evaluated vocabulary on children's birthdays, whereas children typically progress from one

classroom to the next on the same date for all children (e.g. at the beginning of a new academic year. Other studies evaluate children at longer intervals such as at 3, 5, and 10 years of age. Thus, again evaluation intervals do not correspond with children's experiences and changes in vocabulary may reflect any of the multiple experiences over the interval. To evaluate the effects of a single classroom experience, children should be evaluated twice during a single classroom placement, ideally in the fall and spring of the academic year.

The goal of this literature review has been to describe several key issues surrounding day care research and specifically focus on research with childcare quality and children's vocabulary. This literature review began with a discussion of the importance and linkages of language development between children's vocabulary and academic and reading ability. In addition, key articles in the current childcare literature in both intervention and community childcare studies were discussed as well. Finally, the literature review ended with a discussion of some of the current literature on the relationships between childcare quality and children's vocabulary and verbal ability.

IV. METHOD

Overview

The data for this research project were collected as a part of the Childcare Quality Enhancement Project (CQEP), which was funded by a grant from the National Science Foundation (NSF #0126584). The CQEP is approved by the Auburn University Internal Review Board (IRB #00-141 0006), and an IRB protocol for this research has been approved as exempt (#05-199 EX 0510). The CQEP is a short-term longitudinal study with the goal of assessing various aspects of the childcare experience, including the readiness of children for kindergarten. The examination of children's cognitive, social, and physiological experiences in childcare centers were also specific goals of the study. Three cohorts of 4-year-old children participated in this study, and follow-up data were collected for the children after they entered kindergarten.

This study specifically looks at children's vocabulary development over a school year as a function of the quality of the childcare centers. Each child's vocabulary level was assessed at the beginning of the school year in August or in September and again at the end of the school year in April or May. Childcare quality was assessed at the classroom level during the fall of each year of data collection. In addition, specific factors associated with quality and that were hypothesized to predict vocabulary growth were assessed and examined. These factors are teacher training, number of children in the class, and teacher language stimulation. Family SES was measured by parent self-report.

Sex and race of each child were examined as well, but no specific hypotheses were proposed.

Participants

Fourteen childcare centers were identified as possible participants through a community wide program designed to improve childcare quality. Each center was contacted and was informed of the nature of the study, and each director provided letters of support stating their intentions to participate. Only twelve of the initial fourteen centers were selected to participate in the project. Over three years, there were a total of 47 groups of children involved in the study.

Each child in the 4-year-old classrooms was eligible to participate in the study (n = 629). Parents and children were recruited to participate in August, at the beginning of the school year. The procedures involved in the study were explained to the parents, and they were asked to sign an informed consent form before their child could participate in any of the activities. Across the three years of the study, the average participation rate across classrooms was 81% (186/229 in Year 1, 167/205 in Year 2, and 154/195 in Year 3). There were no differences in the sex and the race of the children who agreed or declined to participate. A total of 502 children received parental permission and participated in the study. Of these children, 60% were European American, 33.5% were African American, and 6% were of other ethnicities. Boys comprised 52.6% of the sample, and the average age was 52.36 months as of September 1st of their participation year.

Center directors and teachers signed informed consent letters agreeing to participate in the study. Childcare centers were offered $5 for every family and child that

completed the study. The monetary incentive was set aside to purchase materials for the classrooms. An additional reward was given to centers whose participation exceeded 75%. Teachers received $20 for completing questionnaires about their background, teaching experience, and beliefs. Teachers were also given $5 per child for completing a set of questionnaires about each participating child.

Most teachers in the study served as the head teacher in the classroom for only one year. However, 13 teachers served as the head teacher for two different years, with two different groups of children. There were a total of 34 teachers involved in the study. All teachers were female.

Measures

Teacher Questionnaires. This study uses data provided by the head teacher in each classroom (i.e., no reports of assistant teachers are used for this study). Teachers were given a questionnaire that asked them about their attitudes toward early childhood education and their teaching practices (a copy is found in Appendix D). In addition, the questionnaires asked for basic demographic information as well as information about the amount of training the teacher had received in early childhood education. For the purposes of this study, only the teacher education component of the questionnaire was used. They were asked the highest degree certification they had earned so far (high school, associates, graduate, CDA), and, if they had attended college, what their major was (child development, early childhood education, elementary education, or other major).

A system for assigning points for each aspect of teacher education and training was developed. Degree points were assigned from 0 to 5 points for the *highest degree*

received (0 = high school; 1 = CDA; 2 = 1-year child development certificate; 3 = associates; 4 = bachelors; 5 = graduate). Each teacher was assigned a value of 0 to 4 points for her *major* in college (0 = did not attend; 1 = other; 2 = elementary education; 3 = early childhood education; 4 = human/child development). The teachers' degree and major were multiplied in order to compute an *education* composite for each teacher.

Family Socioeconomic Status. Parents were given a questionnaire upon their consent for their child to participate in the study. A copy of this questionnaire can be found in Appendix C. This questionnaire asked specific questions about their child's temperament and behavior as well as parents' attitudes about parenting and education. Demographic and education information was also requested. For the purposes of this study, only the socioeconomic status (*SES*) for each child was calculated. SES was calculated using methods prescribed by Entwisle and Astone (1994). SES was based on occupation of the members of the household. The Socioeconomic Index from Entwisle and Astone was used to designate a numeric value for the parents' occupation. Using this scale, higher scores represent higher occupational prestige. If there were two working parents, the parent with the higher occupational prestige score was used.

Vocabulary

Peabody Picture Vocabulary Test-Revised. The PPVT-R was given to each child at the beginning of the school year in August or September (*PPVT-Fall)*, as well as at the end of the school year in April or May (*PPVT-Spring)* to assess the child's receptive vocabulary. Form L was administered in the fall, and Form M was given in the spring. A team of trained undergraduate and graduate students gave the PPVT-R to each child. The child was taken out of the classroom to another area of the center that was quiet, and

researchers administered the test. In the administration of the PPVT-R, a researcher says a word (e.g., hat) and asks the child to point to a picture of the word; the child must choose the correct response from 4 pictures (e.g., bat, mitten, glove, and hat). Each child continues answering until a ceiling level is reached. The ceiling is the highest word answered correctly before answering six incorrectly. The child receives a raw score and a standard score; the standard score is based on the child's age. The PPVT-R has shown good validity and reliability. The test manual reports internal consistencies from .61 to .88, and alternate form reliability values from .71 to .91 in the standardization sample (Dunn & Dunn, 1997).

Kindergarten Diagnostic Instrument. The Kindergarten Diagnostic Instrument (KDI) also was given in the fall (*KDI-Fall)* and in the spring (*KDI-Spring)* of the academic year. The KDI is composed of several subtests assessing a child's readiness for kindergarten. The subtests measure both verbal and non-verbal aspects of a child's knowledge. The verbal sections include – auditory memory, body awareness, concept mastery, general information, numbers skills, verbal associations, verbal opposites, and vocabulary. For the purposes of this study, only the vocabulary component of the KDI was used. A copy of the vocabulary component can be found in Appendix B. Each child was taken out of his or her classroom to another area of the center and was given the measure by a team of undergraduate and graduate students. The vocabulary portion of the test involves the researcher asking the child the definition of a word (e.g., knife). The child's response is recorded and given a score of a 0, 1, or 2 based on scoring criteria in the manual. Test-retest reliability of the KDI has been found to range from .87-.91 by Carter (1994). A concurrent validity study of the KDI and the Woodcock-Johnson

Revised has been conducted and reports a correlation of $r = .80$ for the children's broad cognitive ability (Starzer, 1996).

Childcare Quality

NAEYC Accreditation Standards. The NAEYC standards for developmentally appropriate practices were used to assess the quality of each classroom. NAEYC wanted to promote developmentally appropriate practices, and help inadequate programs increase the quality of their care. The NAEYC standards assess both the process and structural components of the classroom.

Graduate student observers were trained in the NAEYC standards, and observed each classroom for a minimum of 10 hours. At least two graduate students were assigned to observe in each classroom. Observations were made in the fall of each school year. Observers made notes about teacher-child interactions, peer interactions, as well as the classroom environment. The NAEYC questionnaire regarding the standards of the quality of the childcare environment was filled out by each observer based on his or her observations. The questionnaire asks observers to rate various aspects of teacher-child interaction, physical environment, curriculum, health and safety, and nutrition and food service. The observer notes whether the standard is not met, partially met, or fully met, and these judgments are assigned values of 1, 2, and 3, respectively. There are a total of 72 items in the NAEYC protocol, meaning that, in principle, centers should be able to receive up to 216 points. However, some items were not applicable to the classrooms in this study (e.g., items focusing on infants) or could not be observed ("Teachers adjust to weather…" and "Teachers plan with families…") and, therefore, were skipped. Observers completed, on average about 62 to 63 of the NAEYC items. Variables used in

analyses are based on the items completed by the observers, rather than the number of items on the NAEYC protocol. *Possible points* refers to the total points a classroom could receive based on the number of items completed by the observer (number of NAEYC items scored by the observer x 3). Three items pertain to teachers' verbal stimulation and the promotion of verbal stimulation ("Teachers talk with individual children and encourage children of all ages to use language;" "Encourage language and literacy development;" and "Teachers speak with children in a friendly, positive, courteous manner") and were used to compute a continuous measure of the quality of *verbal stimulation*. Observers also noted the number of *children* enrolled in each classroom

The following variables were created: *total points* was the points received by a classroom (summed over the items completed by the observer); *percent points* was the percentage of possible points received by a classroom (total / possible points); *total full* was the number of items scored as fully met by the observer; *percent full* was the percent of completed items scored as fully met (total full / number of items completed); v*erbal stimulation* was the points (of 9 possible) received on the 3 verbal stimulation items. The variables *percent points*, *percent full*, and *verbal stimulation* were used in analyses of childcare quality.

V. RESULTS

The results will be presented in 6 sections. First, basic descriptive information about the measures will be presented, followed by associations within measurement domains. Next, variations in vocabulary and childcare quality as a function of child race, SES, and sex will be described. Growth in vocabulary as a function of childcare quality will be examined. The section ends with a discussion whether children's vocabulary and childcare quality varies as a function of SES.

Descriptive Findings

Vocabulary Measures. Descriptive analyses for the KDI and PPVT-R variables are presented in Table 1. The PPVT-R scores showed wide variation in both the fall and spring. For instance, in the fall some children scored almost 3 standard deviations above the mean and some almost 2 standard deviations below the mean on the raw PPVT-R scores. In the spring, scores ranged from more than 3 standard deviations above the mean to almost 3 standard deviations below the mean. The fall PPVT-R scores were significantly lower in this sample than in the most recently established norms for the PPVT-R, $\underline{M} = 95$ $sd = 16.5$, for 4-6 year-olds, $t_{(125)} = 2.37$, $p < .05$. The mean for PPVT-R scores in the spring was not significantly different than the national mean.

The scores for the KDI were variable as well. Children scored as high as 3 standard deviations above the mean and as low as 2 standard deviations below the mean score in both the fall and the spring. Norms for subtests of the KDI are not available, so comparison with national vocabulary subtest data is not possible.

Quality Measures. Overall, the individual classrooms scored an average of 148.27 points on the NAEYC (range 94-190). On average, classrooms earned 79% of the

maximum points that could have been earned. NAEYC points earned will not be used in these analyses because it partly reflects the number of items an observer completed. Using a stricter method for assigning quality points, the centers "fully met" (received a score of 3 on) an average of 34 items, or 55%, of the items that were scored on the NAEYC protocol. The average number of points for the verbal stimulation of the children in the classroom was more than 6 points of 9 possible points. There was an average of 13 children in each of the classrooms. Descriptive statistics for the classroom-level quality variables can be found in Table 2.

The teachers' degrees ranged from high school to graduate degrees. Almost one-third of teachers had a 1-year child development certificate; another one-fourth had only a high school degree, and another fourth had college degrees. Of those that attended higher degree programs, the most common majors were child development or early childhood education. The average education composite score for the teachers was 6.56. Teachers could receive an education score of 6 by completing an associate's degree with a major in early childhood education. The teacher-level variable descriptive statistics can be found in Table 2.

Associations Within Measurement Domains

Associations among measures within domain were as expected with a few exceptions (see Table 3). As expected, vocabulary measures were all significantly correlated. There were moderate correlations between the KDI and the PPVT-R. Correlations among the PPVT-R variables were high (across fall and spring, raw and standardized, r = .77 - .94), indicating good stability. KDI scores were only moderately stable from fall to spring, however.

Most childcare quality indices were modestly, but significantly, correlated. Because verbal stimulation was one component of the NAEYC quality composite score, it is not surprising that verbal stimulation was highly correlated with total quality points and the percentage of points fully met. Overall quality measures (as indexed by total points and percentage of points fully met) also were moderately correlated with teacher education, but were only modestly related to the number of children in the class. Teachers in classrooms with more children had less education and engaged in less verbal stimulation; their classrooms scored lower on the percentage of items fully met. In addition, teachers with more education provided more verbal stimulation and received higher scores on the NAEYC measures.

Variations in Childcare Quality and Vocabulary as a Function of Child Age, Sex, Race, and SES

Age, sex, race, and SES effects were not specifically hypothesized, but because previous research has shown variations in child care quality or language development as a function of these demographic factors, we examined associations among each of these and our study variables. Associations of age and SES (both continuous variables) with vocabulary and childcare quality were examined through correlational analyses. Association with child race and sex were examined with ANOVAs, MANOVAs, and *t*-tests.

Age and SES effects. Although child age was correlated with vocabulary (with the exception of standardized PPVT-R scores, which is adjusted for age), age was not associated with any of the quality indices. As expected, SES was significantly associated with most quality measures, in that children of higher SES parents experienced higher

quality care (see Table 3). SES also was associated with vocabulary measures (with the exception of the fall KDI) in the expected direction, with children from higher SES families scoring higher.

Race effects. Race differences in vocabulary scores were explored using MANOVA, which indicated a significant overall effect F (12, 618) = 9.15, $p < .001$. Means for vocabulary measure are presented as a function of race in Table 4. Univariate tests showed that each individual vocabulary measure contributed to the overall significant MANOVA effect; that is, there was a significant effect of race on each of the six vocabulary measures. Post-hoc comparisons (LSD) were computed and these revealed that in the fall, African-American children scored lower than European-American children on all vocabulary variables, and lower than children from the "other" category on the raw and standardized PPVT scores. European-American children did not differ from children in the other ethnic-group category on any fall measure. In the spring, African-American children again scored lower than European-American children and also lower than children from other ethnic groups on all vocabulary variables. There were no differences between European-Americans and children from the other ethnic group category in the spring.

Whether or not children of different racial groups experienced differing qualities of childcare was not a specific research question proposed for this study. However, it became of interest to examine this issue. Quality differences as a function of child race were examined through a MANOVA in which the number of children, verbal stimulation, percent points, percent full, and teacher education were used as the independent variable. Significant univariate effects were found on teacher education, F (2, 415) = 10.31, $p <$

.01, of total points F (2, 415) = 7.28, $p < .01$, percent of items fully met, F (2, 415) = 11.71, $p < .01$, verbal stimulation, F (2, 415) = 12.17, $p < .01$, and the number of children, F (2,415) = 3.63, $p < .05$. The overall F was significant F (10, 824) = 6.14, $p < .01$. There were no differences between European-American children and children in the "other" category on any of the childcare quality indices. However, there were differences between African-American children and European-American children on percent of items fully met, verbal stimulation, and teacher education. Means and standard deviations for the different ethnic groups are summarized in Table 5. African-American children tended to be in centers of lower quality than their European-American counterparts.

Sex differences. A one-way MANOVA revealed no significant effect of child sex on vocabulary F (6,309) = 1.69, $p = .12$. Because the null findings for sex differences in the multivariate test is contrary to a large body of research indicating that girls tend to show more advanced language development during preschool (Bornstein, Han, & Haynes, 2004**)**, and because several cases were lost due to missing data by using MANOVA, we conducted a series of *t*-tests in which each individual vocabulary measure was examined for sex effects. These analyses yielded effects of sex on raw and standardized PPVT scores in both fall and spring, but no effects on KDI scores. Boys outperformed girls on all measures for which there was a difference (t (367) = 2.23; t (365) = 2.42; t (367) = 2.35; t (367) = 2.26, all ps < .05, for raw fall PPVT, standardized fall PPVT, raw spring PPVT, and standardized spring PPVT, respectively) . Means for boys and girls on all vocabulary scores are presented in Table 6.

A MANOVA was used to determine whether boys and girls experienced child care of different quality. There were no multivariate or univariate effects of sex on any quality measure.

Do Children Experience Growth in Vocabulary Over the Year?

It was assumed that children would experience significant growth in vocabulary over the year, but it was of interest to determine whether sex or race moderated these gains. To address these questions, a series of three 2 (time of year) x 2 (sex) x 3 (race; European-American, African-American, Other) repeated measures analyses of variance were computed, one for each set of vocabulary measures. Children showed significant gains on all vocabulary measures from fall to spring, F (1, 360) = 15.17, $p < .001$; F (1, 360) = 15.17, $p < .001$; F (1, 361) = 12.90, $p < .001$, for raw and standardized PPVT-R and KDI scores. There also were significant time by race interactions for raw and standardized PPVT-R scores, F (2,364) = 3.62, $p < .05$ and F (2,364) = 6.42, $p < .01$ for raw and standardized PPVT-R scores, respectively. The time by race effect on KDI scores was marginally significant, F (2,361) = 2.46, $p = .09$. Follow up tests revealed that European-Americans showed significant growth in KDI and raw PPVT-R scores, but not with the standardized PPVT-R scores. African-American children and children from other ethnic groups showed gains in all vocabulary measures from fall to spring. Means, standard deviations, and *t*-values for children in each ethnic group as a function of season are presented in Table 4. A series of ANCOVAs revealed that African-American children's vocabulary scores were lower than those of other groups even when SES was controlled.

A series of repeated measures analyses of covariance were computed to determine whether children of different racial backgrounds gained differentially in vocabulary, controlling for SES. In these analyses, each pair of vocabulary scores (Fall and Spring) was used separately as the repeated factor, race was used as the between groups factor, and SES was used as the covariate. There was a significant race by time interaction in the analyses for standardized PPVT scores F (2, 269) = 3.07, $p < .05$, and a near significant race by time interaction for raw PPVT scores F (2,270) = 2.46, $p < .09$. Follow-up contrasts for the standardized PPVT scores indicated that African-American children gained significantly more than did European American children and children in the "other" category, but that EA children and children in the "other" category did not differ from each other.

Does Childcare Quality Predict Vocabulary Gains?

The KDI was not associated with any quality measures, except for the number of children in the class, and this was not in the expected direction. The childcare quality indices were moderately associated with PPVT-R scores (both standardized and raw) in the Fall and Spring. Children in classrooms with higher levels of verbal stimulation scored higher on the PPVT-R in the fall and spring. In addition, teachers with higher levels of education were likely to have children with better vocabulary scores on the PPVT-R. Correlations among the variables can be found in Table 3.

In order to investigate the research questions about whether the childcare quality factors predicted growth in vocabulary, a series of multiple regression equations were computed in which fall vocabulary scores and a single index of childcare quality were used to predict spring vocabulary scores. Of the global indices derived from the NAEYC,

only the percentage of items fully met was used in these analyses because it showed a pattern of slightly stronger associations with the vocabulary measures than did the other global index, percent of possible points.

A total of 12 equations were computed from the three vocabulary measures (KDI, raw and standardized PPVT-R) with four of the quality indices (education, verbal stimulation, number of children in the class, and percentage of the NAEYC items fully met). As expected, in all equations the fall vocabulary score predicted the spring score significantly. In three of the regression equations, the quality index incremented the prediction of spring scores. Results of these three equations are shown in Table 7. Specifically, verbal stimulation added to the prediction of spring standardized PPVT-R scores and teacher education also added to the predication of spring scores. Children of teachers who provided more verbal stimulation had higher scores on the spring standardized PPVT-R scores after controlling for fall PPVT-R scores (see Table 7). Higher teacher education predicted greater gains in the children's standardized and raw PPVT-R scores after controlling for fall scores (see Table 7).

Because both education and verbal stimulation incremented the prediction of spring standardized PPVT-R scores, and verbal stimulation and teacher education were significantly correlated, an additional regression equation was computed in which fall standardized PPVT-R scores, verbal stimulation, and teacher education were used to predict spring PPVT-R scores. As expected, fall scores predicted spring scores. Education also contributed significantly, but verbal stimulation was no longer significant. Results are summarized in Table 8.

Neither the number of children in the classroom nor the percent of items fully met predicted spring PPVT-R scores after controlling for fall scores.

Do children from lower SES families gain more from quality childcare than do children in higher SES families?

To examine questions about differential benefits for children from lower SES families, particularly in better quality childcare, a series of multiple regression equations were computed. In each equation, to predict spring vocabulary scores, the corresponding fall vocabulary scores, SES, and a single childcare quality indicator were entered in the first step, and the interaction of SES and childcare quality indicator was entered in the second step. A separate equation was computed for each quality indicator (education, verbal stimulation, percent points, percent full, and number of children). In all equations, the fall scores significantly predicted spring scores. In only two equations, however, were any other predictors significant after controlling for fall scores. Specifically, teacher education continued to predict spring scores for both standardized and raw PPVT-R scores even after controlling for fall PPVT-R scores and SES. These results mirror 2 of the 3 previously presented equations in which quality significantly predicted spring PPVT-R scores after controlling for fall scores. There were no significant effects for SES or for the SES by quality interaction terms. Thus, SES did not predict gains or lack thereof in vocabulary, and children of different SES groups did not benefit differentially from care of varying quality. The results of the equations in which the quality indices were significant are presented in Tables 8 and 9.

VI. DISCUSSION

This study provides evidence for the influence of the quality of the childcare environment on children's language development. The short-term longitudinal design of this study, in which fall vocabulary scores were controlled, allowed for greater confidence that individual differences in vocabulary in the spring were a function, at least in part, of variation in child care experiences, rather than simply reflecting preexisting differences in children's family backgrounds. Specific, rather than more global, indices of quality predicted vocabulary gains across the academic year. Teacher education and the verbal stimulation of the classroom environment predicted children's scores on the PPVT-R in spring, even after controlling for fall PPVT-R scores. Although the global quality indices were correlated with the PPVT-R, they did not predict growth in spring vocabulary scores after controlling for fall scores.

As with previous studies (Burchinal et al., 2000; Loeb et al., 2004; Phillips et al., 1987), this study found that the quality of care experienced by children was associated with children's vocabulary. Children in centers with more NAEYC quality points had higher scores on the PPVT-R. However, despite the within-time correlations, none of the regression equations using global quality indices predicted spring scores on the PPVT-R when controlling for the fall PPVT-R scores. Rather, only specific indices that related to the language environment predicted gains in vocabulary.

Many items on the NAEYC Accreditation Standards do not specifically pertain to the educational or language climate of the classroom, which may explain the lack of association between the overall quality indices and changes in vocabulary score. For instance, there are items asking about the safety procedures of the center, composition of the playground, the diet of the children, and the organization of the classroom. Perhaps most of the variance in the global NAEYC measures (such as percent of NAEYC points and percent of items fully met) are attributable to aspects of the center that have no impact on children's language. The construct of quality has been difficult to define, and perhaps not all aspects of the quality of the environment affect vocabulary in the same way (Vandell & Wolfe, 2003). More specific indices of the quality of the environment that reflect the verbal or language environment may play a larger role in changes in children's vocabulary across the year. This seemed to be the case in the current study, given that it was observed that the teachers' education and the verbal stimulation of the classroom predicted growth in vocabulary. The regression analyses using the standardized and raw PPVT-R scores showed that teachers with more education and teachers who engaged in more verbal stimulation had students who performed better on the spring PPVT-R when controlling for the fall scores. These findings suggest that children in classrooms in which teachers have more education and training are more likely to provide contexts for word learning (Arnett, 1989; Girolametto, Weitzman, & Greenberg, 2003). Previous research suggests that children in these types of classrooms are more likely to use a greater number of words and more complex word combinations (Girolametto et al., 2003).

However, in regression analyses, when both education and verbal stimulation were used to predict vocabulary gains, teacher education continued to predict gains in spring standardized PPVT-R scores but the verbal stimulation of the classroom did not. Given that teacher education and verbal stimulation shared considerable variance, it is understandable that only one of the two would significantly predict vocabulary growth. It is less clear why education, rather than the more proximal variable, verbal stimulation, was the significant predictor. One possible explanation is the limited variability of the verbal stimulation scores compared to the education scores. The verbal stimulation index was a composite of only three items from the NAEYC measure, and scores had a possible range of 3 – 9, with the majority of the classrooms receiving a score of 6. The education variable, in contrast, had a possible range of 1 – 16. The coefficient of variation (standard deviation/mean) for the verbal stimulation and education variables were 0.32 and 0.70, respectively, suggesting that there was more power to detect an association with education.

It is important to recall that the education variable used was a composite constructed by multiplying the number of years and major in college. Moreover, major was assigned point values that training in child development received higher points. Future research with the data should decompose this variable to identify what aspects were most predictive of vocabulary gains. It also would be useful to examine other aspects of teacher self report such as intention to remain in the field, training opportunities as well as teacher reported beliefs as predictors of vocabulary gains.

Another explanation for the failure of the verbal stimulation measure to predict growth in vocabulary when teacher education was controlled is that the NAEYC measure

may not sensitively tap the language to which the child is actually exposed. The NAEYC items ask the observer to indicate if there are language materials in the classroom, if the teacher speaks warmly to the children, and if the teacher encourages the children to use language. While these items do assess the verbal climate of the classroom, they do not necessarily assess the quality of the teacher–child interaction or the complexity of language to which the child is exposed. A more detailed observation system might yield a measure that would show a stronger relationship between the verbal climate of the classroom and the changes in the children's PPVT-R scores across the academic year.

Children's SES was correlated with all of vocabulary measures and with most of the quality measures except for the number of the children in the classroom. Children from higher SES families were more likely to be enrolled in classrooms with better global quality scores, more verbal stimulation, and better-educated teachers. In addition, these children tended to score higher on the vocabulary measures. These correlations are consistent with previous research on children's cognitive development and socioeconomic status. More affluent parents are more likely to value education and select higher quality centers (Kontos, 1997), and also are more likely to talk to their children using rich language, and to read to their children, practices that stimulate children's language skills (Baker, Scher, & Mackler, 1997). The fact that parents are likely to choose childcare with characteristics that match those they value has been called a selection effect. Selection effects are well-documented in the child care literature, but make it difficult to disentangle the effects of child care from the effects of the family environment. One strength of the current study is that, by assessing vocabulary at two points in the same academic year, it was able to document growth in vocabulary as a

function of the quality of care children received. Assuming children's family environment remained similar over the year, this approach gives more confidence that differential growth in vocabulary reflected variations in childcare quality rather than selection effects.

It was expected that children from lower SES families would show larger growth in vocabulary (Kontos, 1991). However, statistical analyses of the interaction of SES with the quality indices did not yield any significant interaction effects on vocabulary changes. Thus, the vocabulary scores of children from lower SES families did not change more than those of children from higher SES families. In other words, the quality of the childcare center seemed to affect children from all levels of SES in the same manner. It is possible that had low SES children not been enrolled in childcare, however, they would have experienced a decline in vocabulary scores in relation to children from higher SES families and in relation to low SES-children who were enrolled in childcare (Burchinal et al., 1997). Research on interventions for low-income children has found that once children are out of the enriching program, their scores are more likely to decline and the effects of the intervention to wash out. Low-income children who are not involved in an enriching program do not have scores as high as low-income children who are involved in a high-quality program (Campbell & Ramey, 1994; Ramey, Campbell, Burchinal, Skinner, Gardner, & Ramey, 2000). It is possible that the low-income children who attended childcare centers still were in a more linguistically enriching environment when compared to their home environment.

Although it was not a specific research question for this study, sex and race effects on changes in vocabulary score were examined. Most studies have shown

differences between the sexes on vocabulary measures (Bornstein, Han, & Haynes, 2004; Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991), with girls outperforming boys. However, the current study found that boys outperformed girls on changes in vocabulary across the academic year which has not been found in previous literature. Several hypotheses were examined to include race, age and SES. There were no differences between boys and girls within these factors. Previous literature has shown that as children age, differences in vocabulary begin to decrease (Huttenlocher et al., 1991). Perhaps, the boys received more benefit from the verbal stimulation of the classroom than the girls.

Similar to previous research (Howes et al., 1995), differences were found among children from different racial backgrounds on the PPVT-R and the KDI. With one exception, the fall KDI, there were no differences between European Americans and children in the other-ethnicity group on any of the vocabulary measures. Many children in the "other" category were of Asian descent, and may have been new English-language learners in the fall. The vocabulary portion of the KDI requires language production, unlike the PPVT-R, which measures only receptive language. The requirement to produce a definition of words in the KDI may have exceeded the new English-language learners' abilities in the fall, whereas the same children may have been better able to point to the correct picture of objects in the PPVT. By spring, new language-learners may have been sufficiently competent to be indistinguishable from native speakers.

There were differences between scores for the African American children and children in both the other-ethnic group category and the European American group. African American children scored significantly lower on the PPVT-R (both raw and standardized) and the KDI than did European American children, and lower than children

from other ethnic groups with one exception (fall KDI scores for the "other" group). Consistent with previous research, African American children scored about one standard deviation lower than European American children on the PPVT in both fall and spring (Howes et al., 1995). African American children's disadvantage maintained even when SES was controlled statistically.

The lower vocabulary scores of African American children could possibly be due to the differences in the quality of the classroom environment. As with previous research (Howes et al., 1995), this study found that African American children were more likely to be enrolled in lower quality centers. On the other hand, African American children tended to show greater growth in vocabulary scores than did European American children. Previous research has indicated that African American and low–income children are very eager to learn, but are far behind their European American and middle class peers in achievement (Howes et al., 1995). Children's cognitive competencies in kindergarten have been shown to be predictive of school achievement scores, and previous research has argued that a failure to improve low–income children's early childhood experience does them a disservice and may prevent them from later school success (Stipek & Ryan, 1997).

Patterns of results tended to be stronger and clearer with the PPVT-R when compared with results for the KDI. The KDI was correlated with only one of the childcare quality measures, the number of children, and then in the counter–intuitive direction, whereas the PPVT-R was correlated with the global and specific quality measures as expected. The vocabulary component of the KDI may not be a less valid measure than the PPVT-R of the child's vocabulary. The KDI vocabulary subtest

measures the students' declarative vocabulary and relies on the child to give a verbal response. Therefore, a nervous or shy child may be hesitant to give a response and may, therefore, fail to provide an answer. In this case, the child would not receive the score they should on that particular item. For this study, only the vocabulary subtest of the KDI was used and future research may examine the entire verbal component of the KDI or the measure as a whole.

The KDI is often used by educators as an overall assessment of children's readiness for kindergarten and to inform programs of instruction (Conohan, 2002). It is not often used in empirical studies of children's cognitive development, but has been the subject of previous research. Fletcher (1996) found the KDI over identifies children as gifted, in need of special education, and as eligible for a reading recovery program. The KDI was most successful at identifying children who were at-risk for academic difficulties. The PPVT-R is the most commonly used measure of vocabulary in empirical research. Its advantages include the ease of administration but also the large standardization sample. The KDI may give a broad picture of children's school readiness, but may be less useful than the PPVT-R in studies focusing on vocabulary.

An advantage of this study is the measurement of vocabulary across two points in time, fall and spring, which may allow changes in vocabulary score to be attributed with greater confidence to the classroom environment. Selection factors would be controlled by the pretest at the beginning of the academic year. Changes in family environment and structure that might influence the children's vocabulary are likely to be random across classrooms. Although there were no significant associations between changes in vocabulary score and the global indices of classroom environment, more specific quality

indices were significant predictors of growth in vocabulary. Teachers' education and the verbal stimulation of the classroom were found to have a significant effect on the growth in children's vocabulary across the academic year. We are able to measure changes in children's vocabulary skills change the year in the same classroom with the same teacher.

Implications

In recent years, the effects of children's preschool experience on cognitive development have become an area of interest to parents and educators (May et al., 1994). There is concern about whether or not preschool children are "ready" to enter formal schooling. Previous research has shown that children who are unprepared for school are at risk for school failure (Donmoyer & Kos, 1997). School readiness requires skills in many areas, among them is good vocabulary development (May & Kundert, 1997).

According to previous research, a positive preschool experience can have an effect on children's readiness for kindergarten and formal schooling (Phillips, McCartney, & Scarr, 1987; Schleicher, White, & Jacobs, 1991). The quality of the preschool classroom environment is correlated with children's cognitive development. While several global quality measures have been studied (Burchinal, Lee, & Ramey, 1989; Burchinal et al., 2000; Phillips, McCartney, & Scarr, 1987), more specific indices of the quality of the environment are correlated with children's cognitive and more specifically, vocabulary development (Vandell & Wolfe, 2003). These specific indices include the verbal stimulation, class size, and teacher education (Vandell & Wolfe, 2003).

For this particular study, a global quality measure did not in predict changes in children's vocabulary scores. Instead, two specific quality indices, teacher education and verbal stimulation, were found to be significantly linked to changes in children's

vocabulary scores across the academic year. In particular, teacher education was found to predict changes in children's spring vocabulary scores when controlling for fall scores. Teachers with more education and training are more likely to have knowledge about the skills children should acquire during their formative preschool years. They are more likely to know what developmentally appropriate practices are and create a more verbally stimulating environment for their students. We cannot tell from our data whether education influences teachers to engage in more verbal stimulation in the classroom, or whether individuals who are more verbal are more likely to attend college. This issue has implications for childcare policy. If education in child development causes teachers to engage in more appropriate verbal interaction with children, then it could be argued that preschool teachers should be required or encouraged to obtain further education in child development at the university level. On the other hand, if the correlation between verbal stimulation and education reflects selection factors (i.e., more verbally skilled individuals are more likely to attend college, or people who enjoy interacting with children are more likely to study child development in college), then the policy implications are less clear. However, better pay for childcare providers would likely attract better-educated individuals to the profession and encourage them to remain in the field longer. In the long run, better education for childcare providers will likely be cost effective in its effects on the competence of the nation's children as data from this study suggest.

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APPENDIX A

TABLES

Table 1

Descriptive Statistics for Vocabulary Measures

	M	SD	Minimum	Maximum
R PPVT – F	42.72	17.42	8.00	92.00
R PPVT – S	51.31	17.44	3.00	104.00
Z PPVT – F	89.88	20.10	42.00	150.00
Z PPVT – S	93.03	20.10	27.00	159.00
KDI – F	10.31	3.41	2.00	20.00
KDI - S	11.16	3.33	2.00	18.00

Note. F and S after each vocabulary measure stand for fall and spring, respectively. Z before the PPVT represents the standardized score, and R before PPVT represents the raw score. N = 367 for PPVT-R; N = 366 for KDI.

Table 2

	M	*SD*	Minimum	Maximum
Verbal	6.43	2.18	3.00	9.00
Children	14.00	3.70	6.00	20.00
Education	6.56	4.99	1.00	16.00
NAEYC Items	62.51	2.16	53.00	64.00
Percent Points	0.79	0.14	0.49	0.99
Total Full	33.93	16.37	10.00	62.00
Percent Full	0.55	0.26	0.17	0.98

Descriptive Statistics for Quality Indices

Note. Verbal represents teacher verbal stimulation in the classroom, children stands for the number of children enrolled in the classroom, education is the education variable (degree * major), degree is the highest degree earned (1 = high school; 1.5 = other; 2 = CDA; 2.5 = certificate; 3 = associate's degree; 4 = bachelor's; 5 = graduate), and major is the teacher's major in college (0 = did not attend; 1 = other; 2 = elementary education; 3 = early childhood education; 4 = human/child development). Items scored refers to the number of items validly completed by the Research Assistant. Percent points represents the percentage of total points based on the items coded for the classroom. Total full stands for the number of items endorsed as fully met, and percent full is the percentage of these items. Percent full refers to the number of items marked as fully met divided by the number of items marked. N = 47.

Table 3

Intercorrelations Between Quality Indices and Vocabulary Measures

	2	3	4	5	6	7	8	9	10	11	12	13
1. SES	.10	.13**	.34**	.32**	.39**	.35**	-.05	.16**	.20**	-.09	.12*	.19**
2. KDI – F		.40**	.51**	.41**	.43**	.34**	.18*	.02	.10	.27*	.08	.06
3. KDI – S			.40**	.36**	.35**	.30**	.05	.05	.06	.24**	.10	.04
4. R PPVT – F				.82 **	.94**	.77**	-.04	.22**	.23**	.26**	.25**	.21**
5. R PPVT – S					.78**	.94**	-.05	.22**	.23**	.25**	.29**	.22**
6. Z PPVT – F						.78**	-.07	.20**	.22**	.02	.24**	.19**
7. Z PPVT – S							-.06	.22**	.19**	.01	.29**	.18**
8. Children								-.17**	-.11*	.07	-.16**	-.19
9. Verbal									.77**	.01	.28**	.81**
10. Percent Full										.05	.83**	.97**
11. Child Age											.01	.07
12. Education												.32**
13. Percent Points												

Note. F and S after each vocabulary measure stand for fall and spring, respectively. Z before the PPVT represents the standardized score, and R before PPVT represents the raw score. Children represents the number of children in the classroom, verbal represents teacher verbal stimulation of the classroom. Items scored refers to the number of items validly completed by the Research Assistant. Total represents the total points each classroom received on the NAEYC measure, and percent points represents the percentage of total points. Total full stands for the number of items endorsed as fully met, and percent full is the percentage of these items. Percent full refers to the number of items marked as fully met divided by the number of items marked, $*p < .05$. $**p < .01$.

Table 4

Means and Standard Deviations on Vocabulary Measures as a Function of Race

			t	n
	Fall KDI	Spring KDI		
Race				
European-American	10.95 (3.24)[a]	11.61 (3.33)[a]	2.65**	241
African-American	9.08 (3.40)[b]	10.05 (3.11)[b]	2.93**	105
Other	9.30 (4.82)[b]	11.44 (3.23)[a]	3.40**	18
	Fall R PPVT-R	Spring R PPVT-R		
Race				
European-American	49.66 (14.91)[a]	57.17 (15.59)[a]	10.83**	234
African-American	29.00 (13.68)[b]	39.46 (14.57)[b]	10.30**	113
Other	39.60 (16.97)[a]	50.10 (19.08)[a]	7.04**	20
	Fall Z PPVT-R	Spring Z PPVT-R		
Race				
European-American	98.45 (17.10)[a]	99.71 (17.46)[a]	1.48	234
African-American	72.31 (18.88)[b]	79.13 (17.51)[b]	4.72**	112
Other	88.42 (19.77)[a]	93.00 (20.10)[a]	2.79**	19

Note. Within measure and column, means sharing the same superscript do not differ significantly. T values test the difference in fall and spring scores within measure and race *t*s are paried comparison t-values for fall and spring scores within measure and ethnic group.

** $p < .01$ for fall to spring change within a row

Table 5

Means and Standard Deviation of Childcare Quality Indices as a Function of Race

	European-American	African-American	Other
Quality Index			
Percent Points	0.84 (0.15) [a]	0.78 (0.14) [b]	0.80 (0.12) [a,b]
Percent Full	0.65 (0.28) [a]	0.51 (0.25) [b]	0.55 (0.23) [a,b]
Education	7.36 (4.77) [a]	5.19 (3.86) [b]	7.60 (5.83) [a]
Verbal	6.98 (2.18) [a]	5.87 (1.97) [b]	6.78 (1.97) [a,b]
Children	14.0 (3.42) [a]	13.66 (1.97) [a]	12.0 (4.55) [b]

Note. Total full stands for the number of items endorsed as fully met, and percent full is the percentage of these items. Education is the education composite of the teacher, and verbal is the verbal stimulation of the classroom. Within a row, means sharing the same superscript are not significantly different ($p < .05$).

Table 6

Means and Standard Deviations on the PPVT-R as a Function of Sex

	Fall R PPVT-R	Spring R PPVT-R	n
Sex			
Boys	44.60 (16.66)	53.29 (15.67)	197
Girls	40.56 (18.05)	49.05 (19.05)	172
	Fall Z PPVT-R	Spring Z PPVT-R	n
Sex			
Boys	92.40 (19.69)	95.05 (18.64)	197
Girls	87.02 (22.89)	90.30 (21.67)	172
	Fall KDI	Spring KDI	n
Sex			
Boys	10.39 (3.43)	10.92 (3.50)	193
Girls	10.23 (3.41)	11.42 (3.12)	173

Note: R = Raw; Z = Standardized Scores on the individual measures.

Table 7

Regression Equations Predicting Spring PPVT-R Scores from Single Classroom Characteristics

	$R^2\Delta$	β	*t*
Predicting Raw Spring PPVT-R			
Raw Fall PVT-R	0.67	0.79	25.62***
Education	0.01	0.08	2.82**
Predicting Standardized Spring PPVT-R			
Z Fall PPVT-R	0.61	0.76	22.96***
Verbal	0.04	0.06	1.98*
Predicting Standardized Spring PPVT-R			
Z Fall PPVT-R	0.61	0.76	22.63***
Education	0.11	0.10	3.11**

Note. Z Fall PPVT-R represents the fall standardized PPVT-R score. Education equals the education composite, and verbal is the verbal stimulation of the classroom. * $p< 0.05$. ** $p < 0.01$. *** $p < 0.001$.

Table 8

Regression Equations Predicting Spring Standardized PPVT-R Scores from Fall Scores and Teacher Education and Classroom Verbal Stimulation

Independent Variable	$R^2\Delta$	β	t
Step 1			
Fall Z PPVT	0.61	0.75	22.20***
Step 2			
Education	0.13	0.10	2.75**
Verbal		0.05	1.35

Note. Fall Z PPVT represents the fall standardized PPVT-R score. Education represents the education composite score of the teacher, and verbal is the verbal stimulation score of the classroom.

* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

Table 9

Regression Equations Predicting Standardized Spring PPVT-R Scores from Classroom Characteristics and the Interaction of SES and Classroom Characteristics

	$R^2\Delta$	β	t
Spring Z PPVT			
1. Fall Z PPVT		0.74	17.57***
2. SES		0.05	1.13
3. Education	0.60	0.11	2.77**
4. Education * SES	0.00	0.01	0.12
Spring Z PPVT			
1. Fall Z PPVT		0.75	17.91***
2. SES		0.04	1.02
3. Verbal	0.61	0.07	1.70**
4. Verbal * SES	0.00	-0.01	-0.32

Note. Spring and Fall Z PPVT are the standardized spring and fall PPVT-R score, respectively. Verbal represents the verbal stimulation score and education represents the teacher education composite. ** $p < 0.01$. *** $p < 0.001$.

Table 10

Regression Equations Predicting Raw Spring PPVT-R Scores from Teacher Education and the Interaction of Education and SES

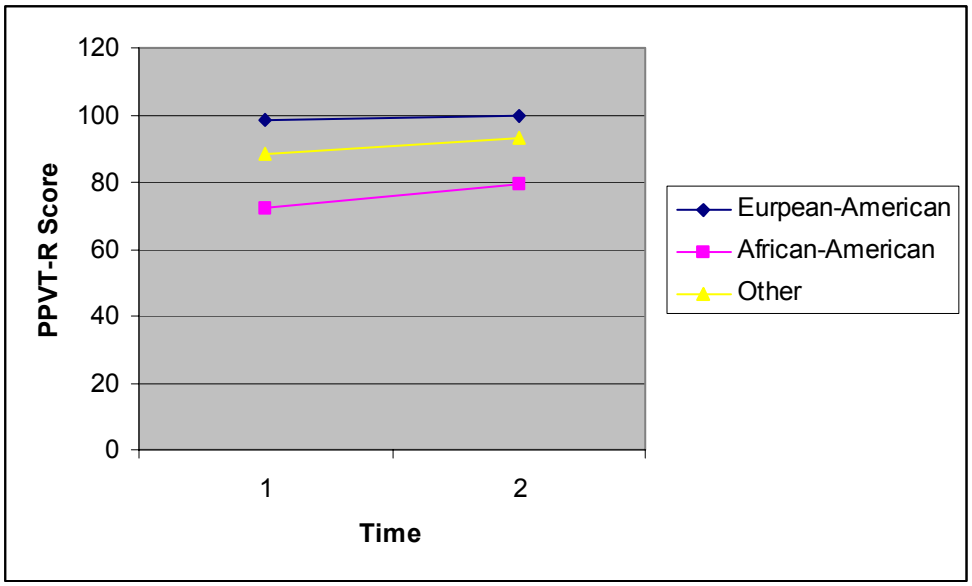
	$R^2\Delta$	B	t
Spring R PPVT			
1. Fall R PPVT		0.80	19.25***
2. SES		0.04	1.24
3. Education	0.65	-0.07	1.96^{+}
4. Education * SES	0.65	-0.01	-0.17^{+}

Note. Spring and Fall R PPVT represent the raw spring and fall PPVT-R scores, respectively. Education represents the composite teacher education score.

** $p < 0.01$. *** $p < 0.001$. $^{+}p < 0.06$

Figure 1

Gains in Standardized PPVT-R Scores Across the Academic Year by Ethnic Group



APPENDIX B

KINDERGARTEN DIAGNOSTIC INVENTORY

VOCABULARY SUBTEST

Vocabulary

DIRECTIONS:

Read each question and record response. If a (Q) appears after a response, ask the child to tell you more.

SCORING: 2, 1, and 0 point responses.

1. *What is a book?* _____ _____

   2 pts: read, has pages in it, tells a story
   1 pt: paper, story (Q), look at (Q)
   0 pts: dk

2. *What is a pencil?* _____ _____

   2 pts: a writer, write with, draw with
   1 pt: yellow with eraser, use it, color with
   0 pt: dk

3. *What is a knife?* _____ _____

   2 pts: to cut, cut with, peel with
   1 pt: eat with, sharp, sticks into the ground
   0 pt: comes out of a drawer, dk

4. *What is a watch?* _____ _____

   2 pts: what time it is, tells time
   1 pt: has hands, put on your arm, hands go around, has numbers, wear it, a clock
   0 pt: to look at (Q), dk

5. *What is a rose?* _____ _____

   2 pts: flower
   1 pt: smell, water it, needs water to grow
   0 pt: a bush, a leaf, pick it (Q), petal it, goes in dirt (Q), put in water (Q), dk

6. *What is a penny?* _____ _____

   2 pts: cent, money
   1 pt: spend, buy candy, put in piggy bank, pay with, save
   0 pt: metal, a circle (Q), steel, a nickel, dk

7. *What is an apple?* _____ _____

   2 pts: fruit, worms crawl inside and it comes off trees, food
   1 pt: to eat, a circle, round thing with white in it (Q), worm in it, comes off trees, red and juicy, bite into (Q)
   0 pts: dk

8. *What is a hammer?* _____ _____

2 pts: tool, pound nails into wood
1 pt: build with, hit nails, hits stuff-nail it, pound with (Q), work with it, puts nails in stuff, needles into wood, fixes things
0 pt: you hammer with it (Q), a nail, you band with (Q), dk

9. *What is a doctor?* _____ _____

2 pts: physician, medicine man
1 pt: fixes people, heals you, makes you better, put bandage on, helping patients, checks eyes and ears, operates on, gives shots
0 pts: hospital (Q), a nurse, dk

10. *What is a season?* _____ _____

2 pts: time of the ear
1 pt: fall, winter, spring, summer, deer hunting season
0 pt: Christmas, weather, leaves come down, dk

Total Raw Score _____
Raw/20 _____

APPENDIX C

PARENT DEMOGRAPHIC QUESTIONNAIRE

Information About You, Your Family, and Your Child

I am this child's:

_____ mother

_____ father

_____ stepmother

_____ stepfather

_____ other relative

Who lives in your house?

_____ mother _____ father _____ stepmother _____ stepfather

_____ brothers or sisters of this child

How many? _____

Ages? _____

Other adults: _____

What is your job? _____

If you have a spouse or significant other who lives with your family, what is this person's job? _____

What is the highest level of schooling you have completed (circle one)?

Some High School High School Degree Vocational Training

Some College College Degree Post College N/A

What is the highest level of schooling has your *spouse* or *partner* completed?

Some High School High School Degree Vocational Training

Some College College Degree Post College N/A

APPENDIX D

TEACHER EDUCATION QUESTIONNAIRE

About You as a Teacher

What is the highest degree or certification you have earned so far (circle one)?

High School	CDA	Associates
1 year Child Development Certificate		Bachelors
Graduate	Other	

If other, please describe

_____

If you attended or are attending college, what is/was your major (circle one)?

Human/Child Development (CD)	Early Childhood Education (ECE)
Elementary Education	Other

If other, please describe

_____