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# Program, Classroom, and Teachers Characteristics: Their Associations with Classroom Quality in State-Funded Pre-K Classrooms

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To the Graduate Council:

I am submitting herewith a dissertation written by Mi-Hyang Ryu entitled "Program, Classroom, and Teachers Characteristics: Their Associations with Classroom Quality in State-Funded Pre-K Classrooms." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Ecology and Evolutionary Biology.

Deborah W. Tegano, Major Professor

We have read this dissertation and recommend its acceptance:

Rena A. Hallam, Mary Jane Moran, John G. Orme

Accepted for the Council:

Dixie L. Thompson

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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Deborah W. Tegano

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Major Professor

We have read this dissertation  
and recommend its acceptance:

Rena A. Hallam

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Mary Jane Moran

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John G. Orme

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Accepted for the Council:

Carolyn Hodges

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Vice Provost and Dean of the Graduate School

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**Program, Classroom, and Teacher Characteristics: Their Associations  
with Classroom Quality in State-Funded Pre-K Classrooms**

A Dissertation  
Presented for the  
Doctor of Philosophy  
Degree  
The University of Tennessee, Knoxville

Mihyang Ryu

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## ABSTRACT

With data from the NCEdL Multi-State Pre-Kindergarten Study, the relationship between the characteristics of program, classroom, and teachers and classroom quality was examined in this study. Classroom quality was measured by the *Classroom Assessment Scoring System* and the *Emerging Academics Snapshot*. The sample consisted of 227 pre-k teachers in state-funded programs from six states. The percentage of children from low-income families in the classroom and the number of children with limited English proficiency (the only two predictive variables that described children's characteristics) were found to be statistically significant predictors of classroom process quality. These findings were discussed with regard to the need for more in-depth thinking about research on the relationship of structural quality and process quality in early childhood classrooms. The Snapshot was eliminated from the analyses because of low means and limited variances. In contrast to some literature, teacher qualification variables were not statistically significant predictors in this study. This was discussed with regard to the need for consistent definitions and measures of teacher qualifications and teacher training.

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## INTRODUCTION

The recent educational accountability movement has rapidly moved into the field of early childhood education. Most states are investing more and more state and federal funds to provide quality education for young children. Evidence of this is seen in the availability of state-funded pre-kindergarten programs for young children (especially low-income, minority children). Federal legislation such as the No Child Left Behind Act highlights the importance of quality in early education and emphasizes accountability, particularly noting school-level and classroom-level responsible for student achievement.

Based on data from the National Center for Early Development and Learning's (NCEDL) Multi-State Pre-Kindergarten Study, the current study addressed issues of accountability by examining the indicators of classroom quality, specifically, teachers' classroom behaviors. For this study, indicator variables at multi-levels (school, classroom, and teacher variables) and classroom quality variables were drawn. The mechanisms by which multi-level variables influence classroom quality were examined. In addition, the interrelationships among these variables were studied.

The federal government, states, local school districts, and communities are investing tremendous resources in early childhood education (Doherty, 2002). In 1998-1999, for example, state spending on pre-k initiatives totaled approximately \$1.7 billion, up approximately \$1 billion from 1992-1993 (Schulman, Blank, & Ewen, 1999). In 2005, 38 states had state-funded pre-k programs (Barnett, Hustedt, Robin, and Schulman, 2005).

Nearly all state legislation aimed at ensuring access and equity to high quality pre-k programs relies on structural features of programs (e.g., teacher-child ratio, class size, and wages) or teacher characteristics (e.g., credentials and teacher education) as the primary targets of regulation yet. In order to examine the effectiveness of the pre-k programs, it may also be necessary to assess process features of programs and their relation to children's outcomes. Historically, the assessment of classroom quality focused on the physical settings of the classroom such as adequacy of materials for children, space for play, and safety; or, it relied on more distal factors such as teacher-child ratio and credentialing. Nevertheless, the literature in child care and elementary education shows that comprehensive models of classroom quality include predictors from several levels such as program (or school) features, classroom attributes, and teacher characteristics (e.g., Burchinal, Roberts, Riggins, Zeisel, Neebe, & Bryant, 2000).

Despite the tremendous emphasis on accountability in early childhood education and investment of state and federal funds to public pre-k programs to provide quality education for more young children (especially at-risk children), little has been done to document the quality of those programs (e.g., Bryant, Clifford, Early, Pianta, Howes, Barbarin, et al., 2002). Likewise, little has been done to examine the extent to which program quality is related to program characteristics that are often mandated by law or that are the focus of training and professional development and support. Moreover, there is a need to know more about how different indicators of quality in varying levels contribute to overall classroom quality.

In the current study, the mechanism through which classroom quality (i.e., learning climate and emotional/instructional support driven by the Classroom Assessment

Scoring System and the teachers' interaction and engagement to promote children's higher-order thinking measured by the Emerging Academics Snapshot) is shaped was examined. Multi-level factors including school features, classroom attributes, teacher characteristics, and teachers' psychological characteristics were included in statistical models to examine the factors contributing how classroom quality is shaped through teacher practice in the classrooms. Teachers' self-efficacy beliefs, beliefs about children (i.e., attitudes toward childrearing), and emotional state (i.e., depressive feelings) have been found to be significant predictors of how teachers interact with children in the classroom. Teachers are active agents in decision making and they construct knowledge through their daily experiences (Cochran-Smith & Lytle, 1993; Connelly & Clandinin, 1986, 1995a, 1995b). In this vein, teacher characteristics, the context within which they work, and their psychological characteristics are interrelated and may be expected to play an important role in how they behave in the classroom and thus on how they likely impact on the children in their classroom. The complete variable lists are shown in Tables 1 and 2.

### Definition of the Terms

#### *Classroom Quality*

For the current study, classroom quality focuses on the features of process quality in the classroom. Specifically, it is conceptualized as what is constructed through teachers' classroom behaviors. Specifically, teachers' behaviors are defined as (a) how teachers create learning environment (i.e., learning climate), (b) how teachers create the emotional climate of the classroom (i.e., emotional support), (c) how they instructionally

Table 1. List of Independent Variables

Concepts	Variables
Program Characteristics (Program-level)	
Location of the classroom	Classroom located in a public school or not
Program type	Head Start or not
Length of the program	Full day/Half day program (more or less than 20 hours /week)
Program Characteristics (Classroom-level)	
Class size	Class size
Teacher-child ratio	Observed teacher-child ratio
Children from low-income family	Proportion of children in classroom below 150% poverty line
Children with special needs	# of students with Limited English Proficiency (LEP) # of students with Individual Education Program (IEP)
Teacher Characteristics (Demographic variables)	
Teacher education	Highest level of education (Less than Associate's/ Associate's/ Bachelor's/ More than Bachelor's)
Teaching experience	Years of experience with Pre-k through K children Years of experience with children above K
Teacher major	ECE & Child development/ Other/ No degree
Certificate of teaching	State certification to teach 4-yr old



Table 2. Mediating and Dependent Variables and the Instruments

Variables	Instrument
<b>Mediating Variables (Teachers' Psychological Characteristics)</b>	
Self-efficacy beliefs	Teacher Self-Efficacy
Attitudes toward child-rearing	Modernity Scale
Depressive feelings	CES-D
<b>Dependent Variables (Classroom Quality-Teacher Behaviors)</b>	
Learning climate (1-factor solution)	Classroom Assessment Scoring System (CLASS)
Emotional support (2-factor solution)	
Instructional support (2-factor solution)	
<b>Teacher interaction</b>	
Routine	Emerging Academics Snapshot (Snapshot)*
Minimal	
Simple	
Elaborating	
<b>Teacher-child engagement</b>	
Encouraging	Emerging Academics Snapshot (Snapshot)*
Scaffolding	
Didactic	

\*. The seven variables from the Snapshot were excluded from regression analyses in this study because of limited variances and low means.

respond to children (i.e., instructional support), (d) how they interact with children to promote children's higher-order thinking (i.e., teacher interaction), and (e) how they engage in children's activities (i.e., teacher-child engagement).

### *Learning Climate*

Learning climate refers to how teachers create learning environment of the classroom. It is a factor variable driven from the Classroom Assessment Scoring System (CLASS) and includes all the nine scales. Learning climate consists of emotional support and instructional support. Definitions of emotional and instructional supports are followed.

### *Emotional Support*

Emotional support is defined as how teachers create emotional climate of the classroom. Positive emotional supports refer to (a) teachers' sensitivity (i.e., providing comfort, reassurance, and encouragement), (b) positive climate (i.e., enthusiasm, enjoyment, and respect during interactions between teachers and children), and (c) flexibility of classroom activities. Negative emotional supports indicate (a) a lack of teachers' sensitivity, (b) negative climate (e.g., displays of anger, aggression, and/or harshness), and (c) over-control of classroom activities.

### *Instructional Support*

Instructional support refers to (a) the strategies teachers employ to promote children's higher order thinking skills and creativity through problem-solving, integration, and instructional discussions, (b) the available activities, methods of presentation, use of

groupings, and range of materials that teachers use to maximize children's engagement, and (c) the quality of verbal evaluation provided to children about their work, comments, and ideas.

### *Teacher Interaction*

Teacher interaction refers to whether teachers' interaction with children is characterized as (a) routine, (b) minimal, (c) simple, or (d) elaborating. Routine interaction refers to routine caregiving activities such as passing out materials or opening a milk container; minimal interaction refers to teachers' response to children's direct request for help or giving verbal directives with no reply encouraged; simple interaction refers to teachers' simple answer for the children's verbal bids without any elaboration or asking children simple questions. Elaborated interaction refers to teachers' engagement in reciprocal conversation that validates a child's feelings or demonstrates teachers' interests in what children are saying.

### *Teacher-Child Engagement*

Teacher-child engagement refers to teacher behaviors in regard to (a) encouraging, (b) scaffolding, and (c) using didactic instruction with children (see the Snapshot in Table 1). Teachers' encouraging behaviors include reading to children or engaging children to read, motivating through personal engagement, and praising children's work and/or their ability to resolve conflicts. Teachers' scaffolding behaviors include using a child's initiation as an opportunity to add to his/her learning, asking open-ended questions, and helping children expand on their answers and thoughts. Teachers' didactic behaviors include engaging children in rote activities such as counting or saying the days of the

week, asking children questions or posing problems that have one correct answer, and giving rules of conduct or lecturing about behavior or social expectations. Finally, teacher-child engagement refers to teachers' behaviors in regard to speaking in a language other than English.

### *Teachers' Self-Efficacy Beliefs*

Albert Bandura defined perceived self-efficacy as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3). According to Bandura (1993, 1997), people make causal contributions to their own functioning through mechanisms of personal agency. Self-efficacy belief is most crucial in this process, because it mediates human motivation, affect, and action. Unless we believe desired effects are possible by our action, we are hardly motivated to act.

### *Teachers' Attitudes toward Child-Rearing (Beliefs about Children)*

Teachers' attitudes toward child-rearing (or beliefs about children) are defined as their traditional or authoritarian or progressive or child-centered approaches to child-rearing. If a teacher believes that children should absolutely obey their parents or teachers, if she believes that the major goal of education is to put basic information into the minds of the children, or if she believes that preparing the future is more important for a child than enjoying today, the attitudes of this teacher are characterized as traditional or authoritarian ones. On the other hand, if a teacher believes that children have a right to their own point of view and should be allowed to express it or that children learn best by

doing things themselves rather than listening to others, the attitudes of this teacher reflect progressive or child-centered ones.

### *Depressive Feelings*

Depressive feelings are defined as teachers' self-reported feelings of emotional distress. Depressive symptoms include feeling lonely, sad, happy, and depressed as assessed through a questionnaire in which teachers were asked to report how often they felt the emotion or behaved in the way described during the past week.

The primary purpose of the study was to identify statistical models of the relationships between multi-level factors and teacher practice (i.e., classroom quality)

Based on this purpose, two, overall research questions were provided:

Question 1: Which and to what extent do program/teacher characteristics and teachers' psychological characteristics have main and interaction effects in predicting of 10 measures of classroom quality (three CLASS variables and seven Snapshot variables)?

Question 2: Which and to what extent is the relationship between the program/teacher characteristics and classroom quality mediated by teachers' psychological characteristics?

## LITERATURE REVIEW

### Introduction

This literature review is focused on seven main topics: (a) description of classroom quality; (b) observational measures of classroom quality; (c) how classroom quality has been measured in large-scale research; (d) how various factors are related to classroom quality; (e) classroom quality in state-funded pre-kindergarten programs; (f) an overview of the NCEDE Multi-State Study of Pre-Kindergarten; and (g) the variables selected from the NCEDE study. In the section on the NCEDE study, the detailed information about the study including sampling, data collection procedures, variables, and instruments are explained.

### Conceptualization of Classroom Quality

Classroom quality has been widely recognized as an important factor related to children's outcomes and assessed by many researchers in the field of early childhood education. Numerous studies have demonstrated that higher quality care is predictive of a range of positive developmental outcomes for children including language development, cognitive functioning, social competence, and emotional adjustment (NICHD ECCRN, 2000b; NICHD ECCRN, 2003). While there is consensus that quality matters, there is little consensus about the way in which the researchers define and measure quality (La Paro, Pianta, & Stuhlman, 2004; Sakai, Whitebook, Wishard, & Howes, 2003).

There are a variety of indicators of quality in early childhood educational settings cited in the research literature. In defining classroom quality, three different kinds of quality are considered: (a) structural quality, or the quality of the resources used; (b)

process quality or the quality of the services taken as a whole; and (c) child outcomes or the effect of these services on the children (Helburn, 1995).

Structural features of classrooms such as teacher-child ratio, group size, and the training of the child care providers are sometimes regulated by public agencies or by states. These features are believed to set the stage for the child's day-to-day experience in classrooms. Process features of classroom quality are related to more direct experiences of children such as children's social interaction with adults and with other children as well as their activities with materials.

The structural quality of the classroom is an important factor in children's quality education, however, the tendency to view this component of the classroom quality as the only means for ensuring accountability of classrooms and schools may be limited. Process features of classroom are also related to the quality of education and they do play an important role in children's achievement. For example, teacher-child relationships are found to influence many school-related outcomes (Birch & Ladd, 1996; Howes, Matheson, Hamilton, 1994; Pianta, 1992; Wentzel, 1996).

In fact, structural features of classroom are considered indirect indicators of quality of the child's experiences in care, while process features of classroom are seen to provide more direct information about the children's classroom experiences (NICHD, 2006). In general, the structure of child care predicts the process features or the children's daily experiences of child care. The process features, then predict children's behavior and development. The more standards a child care setting meets, the more positive the caregiving. The more positive the caregiving, the higher the quality of care and the better the children's outcomes.

## Observational Measures of Classroom Quality

Observation measures of classroom quality used in early childhood education research use two different approaches. The first approach attempts to measure the global or overall quality of the classroom environment. The observational measures of global or overall quality of the classroom environment instruments including the Early Childhood Environment Rating Scale (ECERS; Harms & Clifford, 1980), the Early Childhood Environment Rating Scale-Revised (ECERS-R; Harms, Clifford, & Cryer, 1998), the Infant-Toddler Environment Rating Scale (ITERS; Harms, Cryer, & Clifford, 1990), and the Assessment Profile for Early Childhood Programs: Research Edition I (Abbot-Shim & Sibley, 1987) measure quality of the physical setting, curriculum, caregiver-child interactions, health, safety, scheduling of time, indoor and outdoor play spaces, teacher qualifications, play materials, center administration, and meeting staff needs. These measures primarily focus on the structural quality of early childhood programs but they do not measure instructional practices. On the other hand, observational measures of global ratings of classroom dimensions such as the Classroom Observation System for First Grade (COS-1; NICHD SECC, 1997), the Classroom Observation System for Kindergarten (COS-K; NCEDL, 1997), and the Classroom Assessment Scoring System (CLASS; La Paro & Pianta, 2003) mainly focus on classroom dimensions such as instructional/academic as well as emotional/social aspects of the classroom.

The second approach to assessing classroom quality focuses on specific process indicators. These measures identify one indicator associated with quality care and assess that single indicator in some depth. For example, the Caregiver Interaction Scale (Arnett, 1989) measures caregiver sensitivity. The Observational Record of the Caregiving



Environment (ORCE) (NICHD Early Child Care Research Network, 1996; 2000) measures frequencies and quality of positive caregiving and the Adult Involvement Scale (Howes & Stewart, 1987) measures caregiver responsiveness.

*The Early Childhood Environment Rating Scale (ECERS)/The Early Childhood Environment Rating Scale-Revised (ECERS-R)*

The ECERS is a global rating of classroom quality based on structural features of the classroom (Harms & Clifford, 1980). It has been widely used in child development research and high scores are associated with positive child outcomes. The revised version of the ECERS (ECERS-R) provides improvements of the items (i.e., higher reliability) and allows for a more standardized approach to assessing scores. In addition, the ECERS-R is easier to train observers to obtain inter-rater reliability.

The original ECERS contains seven subscales and 37 items and the ECERS-R contains seven subscales with 43 total items. The seven subscales of the ECERS are: (a) space and furnishing; (b) personal care routines; (c) language reasoning; (d) activities; (e) interaction; (f) program structure; and (g) parents and staff. Each item is presented as a 7-point Likert-type scale from 1 (inadequate) to 7 (excellent) based on indicators.

*The Infant-Toddler Environment Rating Scale (ITERS)*

The ITERS is an adaptation of the ECERS that is designed to assess global quality of the classroom for children under 30 months of age. It is based on a broad definition of the child care environment including organization of space, interaction, activities, schedule for children, and provisions for staff and parents. This instrument consists of

seven subscales with 35 items and gives a comprehensive picture of the quality of care provided in one room or for one group of children.

*The Assessment Profile for Early Childhood Programs: Research Edition I*

The Assessment Profile for Early Childhood Programs: Research Edition I is a structured observation guide. It is designed to provide a quantitative assessment of classrooms and teaching practices that facilitate the learning and development of children. This instrument is an observation checklist with dichotomous items and includes five subscales. The learning environment scale assesses provision and accessibility of classroom materials and space that support a variety of learning experiences and child independence. The scheduling scale assesses the written plans for classroom scheduling and how classroom activities are implemented. The individualizing scale measures whether the teacher plans classroom activities to meet the varying learning needs of each child. The curriculum scale encompasses both child directed and teacher directed learning strategies. The interacting scale measures teachers' initiation of positive interactions with children, teachers' responsiveness to children, and teachers' positive management of children's behavior.

*The Caregiver Interaction Scale (CIS)*

The Arnett Caregiver Interaction Scale is a rating scale that measures teacher behavior towards the children in the classroom. It consists of five subscales with 30 items. The five subscales are sensitivity, harshness, detachment, permissiveness, and independence. This instrument is rated based on 4-point scale from 1 (never seen) to 4 (always or almost always).

### *The Observational Record of the Caregiving Environment (ORCE)*

The ORCE is an instrument designed to assess the frequency and quality of caregivers' behaviors. Observers using this instrument focus on caregivers' behavior with a specific child rather than on what happens in the setting at large. The indicators of positive caregiving of the instrument include showing a positive attitude, having positive physical contact, asking questions, responding to vocalization, and eliminating negative interactions.

The ORCE consists of 44-minute cycles, each broken into four observational periods. During the observational intervals, the observer focuses on the study child's behavior, activities, and interaction with the caregiver or other people. At the end of each 44-minute cycle, the observer makes final qualitative ratings based on all four 10-minute periods using a 4-point scale that ranges from 1 (not at all characteristic) to 4 (highly characteristic).

### *The Classroom Observation System (COS)*

The Classroom Observation System (COS-1; NICHD SECC, 1997) (COS-K; NCEDL, 1997) is an adaptation of the ORCE used in the National Institute of Child Health and Human Development (NICHD) study of early child care. This instrument focuses on the classroom as well as a target child and his or her experiences in the classroom. Specifically, this instrument measures teacher interaction with a target child, the activities the child engaged in, global features of the classroom to which that child, and all other children in the class, were exposed.

Global ratings of classroom dimensions consist of eight dimensions: (a) overcontrol, (b) positive emotional climate, (c) negative emotional climate, (d) classroom management, (e) literacy instruction, (f) evaluative feedback, (g) instructional quality, and (h) encouraging child responsibility. By using a principal components analysis with varimax rotation, Pianta et al. (2002) reported that these eight classroom-level ratings include two factors. These two-factor solutions accounted for 62% of the variance.

The high end of the first factor, child-centered climate, is characterized by high ratings on emotional climate, classroom management, and encouraging child responsibility and by low ratings on negative emotional climate and classroom overcontrol. The high end of the second factor, instructional climate, is characterized by high ratings on literacy instruction, evaluative feedback, and instructional conversation.

#### Measurement of Classroom Quality in Large-Scale Research

This section of the review shows how classroom quality is measured in large-scale research. Classroom quality is measured by more than one observational measure. Every study reviewed in this section includes both the measures of structural and process features of classroom quality. The purpose of this section is to compare which measures are consistently used across the large-scale studies and which measures are used in specific research.

Numerous studies have demonstrated that higher quality care is predictive of a range of positive developmental outcomes for children including language development, cognitive functioning, social competence, and emotional adjustment (Burchinal, Roberts, Nabors, & Bryant, 1996; Howes, 1988; NICHD Early Child Care Research Network,

2000). In recent years, there has been increasing interest in the effects of earlier experiences in child care on children's later performance in school (Downer & Pianta, 2006; Peisner-Feinberg, Burchinal, Clifford, Culkin, Howes, & Kagan et al., 2001). Although these studies show that classroom quality matters, there is a big variation in measuring classroom quality. This section of literature review focuses on how classroom quality has been measured in large-scale research.

### *The Cost, Quality, and Child Outcomes Study*

The Cost, Quality, and Child Outcomes Study (CQCO Study Team, 1995) brought early childhood issues closer to the forefront of public attention by documenting the status of center-based child care in America. The study team observed a total of 400 child care centers across four states: North Carolina, Colorado, Connecticut, and California. The CQCO Study was designed in part to examine the influence of typical center-based child care on children's development during their preschool years and then subsequently as they moved into the formal elementary education system. Researchers followed a group of children from the time they were 3 years old in preschool through the early elementary years. Researchers looked at two aspects of quality in the preschool year: observed classroom practices and teacher ratings of their relationship with each child.

Four observational measures of classroom quality were used in the study: (a) the ECERS; (b) the Caregiver Interaction Scale (CIS); (c) the UCLA Early Childhood Observation Form (ECOF; Stipek, Daniels, Galuzzo, & Milburn, 1992); and (d) the Adult Involvement Scale (AIS; Howes & Stewart, 1987). The ECOF was used to examine five

areas such as child initiation, academic emphasis, discipline, performance pressure, and negative evaluation and it was designed to rate the extent to which the teaching style was didactic versus child-centered.

In addition, a fifth measure of classroom quality was used in this study. The Peer Play Scale (Howes & Matheson, 1992) was used to rate children's peer relations. It examined the level of peer play, from solitary play to complex pretend play. Finally, another aspect of children's classroom experiences was measured through teachers' reports on their relationship with children. The Student-Teacher Relationship Scale (STRS; Pianta, 1992) consisted of three factors representing different aspects of teacher-child relationship: closeness, conflict, and overdependency.

#### *The NICHD Study of Early Child Care*

The NICHD study is a longitudinal study on child care experiences and its effects on various outcomes. Since 1991, the study followed the development of children from one month of age. Its major purpose was to examine how differences in child care experiences relate to various child outcomes such as social, emotional, intellectual, and language development, and their physical growth and health.

In this study, classroom quality was measured in two ways. First, structural features of the classroom were measured. These features included adult-to-child ratio, group size, and the training of the child care provider. Next, process features of the classroom quality were measured by an observational instrument, the Observational Record of the Caregiving Environment (ORCE) (see p. 13).

*The Head Start Family and Child Experiences Survey (FACES)*

The Administration for Children and Families first launched the Head Start Family and Child Experiences Survey (FACES) in 1997. FACES includes three cohorts: FACES 1997, 2000, and 2003. It provides longitudinal information on the characteristics, experiences, and outcomes for children and families served by Head Start as well as the characteristics of the Head Start program. FACES 2000 and 2003 employed similar measures as those used in the 1997 cohort in order to make some comparisons in quality, but several key measures were added.

Quality was considered to include not only the structural features of classroom such as number of children and adults in each classroom, but process factors such as the availability of learning materials, the types of classroom activities, the scheduling, and the variety of learning opportunities provided to all children. In the FACES, overall quality of the classroom was measured by the ECERS or ECERS-R and the three subscales of the Assessment Profile for Early Childhood Programs (i.e., scheduling, individualizing, and learning environment subscales). In addition, teacher sensitivity was measured by the CIS. In addition, information about teacher background, curriculum, classroom activities, and attitudes and knowledge about early childhood education practices were collected through teacher interviews.

*The NCEDL Multi-State Study of Pre-Kindergarten*

To date, few studies of state-funded pre-kindergarten have fully addressed questions about the association between various factors with classroom quality or children's positive developmental outcomes. The NCEDL Multi-State Study of Pre-K

had two primary research purposes: (a) to describe the variations of experiences for children in public pre-kindergarten and kindergarten programs and (b) to examine the relations between variations in pre-kindergarten/kindergarten experiences and children's outcomes in early elementary school.

As with the other studies reviewed in this section, the NCEDL study used the ECERS-R to assess global quality of the classroom. In addition, the Classroom Assessment Scoring System (CLASS; La Paro & Pianta, 2003) and the Emerging Academics Snapshot (Ritchie, Howes, Kraft-Sayre, & Weiser, 2001) were added in this study. The CLASS is an observational measure to assess emotional climate, classroom management, and instructional supports for learning. The Emerging Academics Snapshot provides information of presence or absence of the specific behavior. The items in this instrument are divided into sections including children's activity setting, children's engagement, and children's interaction with adults. More detailed information about these measures is found the section on instruments.

#### Relationship between Various Factors and Classroom Quality

##### *Structure Variables: Program and Teacher Demographic Characteristics*

A number of studies have reported a strong relationship between classroom process quality and structural quality variables at school, classroom, and teacher levels (e.g., Galinsky, Howes, Kontos, & Shinn, 1994; Whitebook, Sakai, & Howes, 1997). For example, Phillipsen, Burchinal, Howes, and Cryer (1997) found strong associations between global quality and structural features of the classroom. Centers with teachers who had at least some college education, lower teacher-child ratio, and higher pay were



found to have higher scores on a measure of global quality of the classroom (i.e., ECERS). Burchinal, Cryer, Clifford, and Howes (2002) examined the relationship between caregiver sensitivity and caregiver education. They showed that classrooms with teachers who had a Bachelor's degree scored significantly higher on a global measure of classroom quality (i.e., ECERS-R) than classrooms with teachers with less education. Phillips, Mekos, Scarr, McCartney, and Abbott-Shim (2000) found that classroom quality, especially the quality of teacher-child interactions, was positively related to structural factors such as teacher training and education, parent fees, teachers' wages, and teacher-child ratio, and was negatively related to group size.

A large-scale study of child care centers showed that four factors were associated with sensitive, warm, and responsive care from caregivers: (a) the number of children in the care group or class; (b) the ratio of children to adults in the care settings; (c) the caregiver's beliefs about childrearing; and (d) the safety and stimulation of the physical environment (NICHD ECCRN, 2000a). Among these four factors, teacher-child ratio was the strongest and most consistent predictor of observed positive caregiving. Caregivers provided more sensitive, positive, and frequent care when they were responsible for fewer children. In addition, caregivers' education and beliefs were significant predictors of observed positive caregiving. Caregivers with more education and more child-centered beliefs about childrearing provided more positive caregiving. Even though there were associations between caregivers' experiences and positive caregiving, these associations were less strong and consistent than those for caregivers' education and beliefs.

Abbott-Shim, Lambert, and McCarty (2000) proposed a structural model for Head Start classroom quality. Classroom quality was measured by the Assessment Profile for

Early Childhood Programs: Research Version. Teacher beliefs and their instructional activities were measured by teachers' self-reports (i.e., the Teacher Beliefs Scale and the Instructional Activities Scale). They found that teacher's education level had indirect effects on classroom quality through their beliefs and activities. Moreover, teachers' beliefs also had only indirect effects on classroom quality through their instructional activities. Based on the findings, these authors suggested that enhanced education level of teachers would manifest itself in higher classroom quality only when teacher beliefs became more appropriate as a result of educational experiences.

A great amount of research has shown that of the structural indicators, teachers' education have strong relationships with process features of classroom quality (Helburn, 1995; Howes et al., 1995). The Cost, Quality, and Outcomes Study (Helburn et al., 1995) reported that teachers' education level was positively related to child care quality. In this study, higher quality centers had a higher proportion of their teaching staffs with at least a Bachelor's degree and a modest correlation between quality and the teachers' training in early childhood care and development was found. According to Howes, James, and Ritchie (2003), teachers with a Bachelor's degree were effective teachers (more effective in their responsive involvement and in being engaged with children in activities that promote language development and emergent literacy) than most teachers without Bachelor's degree. Maxwell et al. (2001) found that teacher education was a significant predictor of developmentally appropriate practice. According to Maxwell et al., classrooms taught by teachers with a Master's degree were observed to be more developmentally appropriate than those taught by teachers with a Bachelor's degree.

In addition to teachers' formal education, research showed that teacher training has positive relationships with classroom quality. The Cost, Quality, and Outcomes study provided evidence that "pure" training (that occurred entirely outside of formal education systems) contributed to environmental quality and interactions between teachers and children even after controlling for education with ECE content. In addition, research showed that regular participation in training was related to classroom quality. Burchinal and colleagues (2002) found that teachers who participated in a workshop in the past year had significantly higher scores on a classroom quality measure. Norris (2001) distinguished those who had never completed a workshop, those who had participated intermittently, and those who had participated continually. In the Norris study, higher classroom quality was found for those who had participated continually than for either intermittent participants or nonparticipants. This speaks to the need to measure training very specifically, which was not done in the NCEDL study.

Furthermore, Arnett (1989) examined the effects of training on teachers' attitudes toward child-rearing and their interactive behaviors with children in the classroom. Teachers who participated in a half or entire training program at a college were less authoritarian in their child-rearing views than teachers with no training. In addition, these teachers with training were rated higher on positive interaction and lower on detachment in their interaction with children. Moreover, teachers with a 4-year degree with ECE content were different from the other three groups of teachers in the study (teachers with half participation in a training program, teachers with full participation, and teachers with no training). These teachers with 4-year degree tended to have less authoritarian child-

rearing views and their interactions with children were rated as higher on positive interaction, and lower on punitiveness and detachment.

Until now, little research has included teacher beliefs as a potential factor for classroom quality. As reviewed from the NICHD study (NICHD ECCRN, 2000a) and Abbott-Shim et al.'s study (2000), teacher beliefs may significantly contribute to how teachers provide quality care for children. Process feature of classroom quality are significantly related to how teachers behave in the classroom. In addition, for the current study, classroom quality was conceptualized as what is constructed through teachers' classroom behaviors. Therefore, in the following section of literature review, more detailed information concerning the associations between teachers' psychological characteristics and teachers' classroom behaviors will be provided.

#### *Process Variables: Teachers' Psychological Characteristics*

Research has shown that teachers' practices are related to their beliefs (e.g., Charlesworth, Hart, Burts, & Hernandez, 1991; Charlesworth, Hart, Burts, Thomasson, Mosley, & Fleefe, 1993; Smith & Shepard, 1988; Stipek, Daniels, Galluzzo, Milburn, 1992). More specifically, researchers argue that teachers' philosophies about education (i.e., beliefs about the impact of teaching in general, as well as their understanding of how children learn), perceptions of themselves as teachers (e.g., teacher efficacy), and beliefs about how events in the classroom are contingent upon their own actions each play a critical role in actual teaching practices and classroom decisions (Brantlinger, 1996; Brookhart & Freeman, 1992; Kagan, 1992; Pajares, 1992; Smith, 1993; Spodek, 1988).

However, researchers also consistently report a discrepancy, or at best only a small correlation between self-reported beliefs and actual classroom practices (Bryant, Clifford, Peisner, 1991; Charlesworth, Hart, Burts, & Hernandez, 1991; Hatch & Freeman, 1988; Hyson, 1991; Kagan & Smith; 1998; Kemple, 1996). This discrepancy partly depends on a number of environmental or work-related stresses such as teachers' lack of support from parents, school administrators, or other teachers (McMullen, 1999), years of experience, work conditions (i.e., isolation, inadequate support, high stress), difficulty in working with parents, and difficult work loads (Veenman, 1984). Moreover, Bandura and Jourdan (1991) identified teacher efficacy beliefs as mediators of teacher behavior. In order to behave as what one believes he or she should do, this person should be self efficacious about his or her ability to fulfill the goal.

#### Teacher Efficacy Beliefs

Efficacy beliefs are concerned not only with the exercise of control over action but also with the self-regulation of thought processes, motivation, and affective and psychological states. Such beliefs influence thought patterns and emotions that enable actions through which people expend substantial effort in pursuit of goals, persist in the face of adversity, rebound from temporary setbacks, and exercise some control over events that affect their lives (Bandura, 1993, 1997).

In this vein, teachers' behavior in the classroom (e.g., environmental setting, instruction, and classroom management) may heavily depend on teachers' self-efficacy beliefs. Teacher's self-efficacy belief refers to a teacher's generalized expectancy concerning the ability of teachers to influence students, as well as the teacher's beliefs

concerning his or her own ability to perform certain professional tasks (Ashton & Webb, 1986; Bandura, 1997; Gibson & Dembo, 1984). We can assume that a highly efficacious teacher may be confident and motivated to pursue his or her goals, exercise control over events that affect his or her life, and maintain and pursue the goals in the face of any difficult situations (e.g., presence of difficult children, lack of support, or pressure from other people).

According to Bandura (1997), teachers' self-efficacy beliefs affect their general orientation toward the educational process as well as their specific instructional activities. For example, those who have a low sense of instructional efficacy favor a custodial orientation that takes a pessimistic view of students' motivation, emphasize control of classroom behavior through strict regulations, and rely on extrinsic inducement and negative sanctions to get students to study (Woolfolk & Hoy, 1990; Woolfolk, Rosoff, Hoy, 1990). Teachers who believe strongly in their instructional efficacy tend to rely on persuasory means rather than authoritarian control and to support development of their students' intrinsic interest and academic self-directedness (Kipnis, 1974).

Furthermore, teachers with high self-efficacy beliefs are more likely to value individual differences among children (Vartuli, 2005) and build positive relationships with the children they teach through promoting children's sense of personal confidence and social competence (Bandura, 1997). On the other hand, teachers with low self-efficacy beliefs are more likely to distrust their ability to manage their classrooms, are stressed and angered by students' misbehavior, and resort to restrictive and punitive modes of discipline (Melby, 1995).

Research also reveals that the various teacher, school, and student characteristic variables explain teachers' self-efficacy beliefs. Specifically, teachers' experience is continuously found to be a significant factor of teachers' efficacy beliefs (Knobloch & Whittington, 2002; Lamorey & Wilcox, 2005; Safran, 1985). In addition, teachers' sense of support (Knobloch & Whittington, 2002), class size (Safran, 1985), and teachers' involvement in a cooperative teaching situation (Ginns & Watters, 1996) are found to be significant predictors of the teachers' self-efficacy beliefs.

#### Personal Practical Knowledge and Local Knowledge

Connelly and Clandinin (1986) point out that we do not understand teacher practice by beginning with theory but by studying practitioners and classrooms as they are. The heart of teaching is action, performance, and the composite of belief, attitude, values, personality, and background experience of the teacher that surrounds and contributes to each lived moment of practice.

The main focus of personal practical knowledge is "teachers in their classrooms" with a consideration of teachers as "intellectually autonomous" (Connelly & Clandinin, 1984, p. 135) human beings. In this context, teachers become active agents, pulling themselves into the future with their own inevitable social agendas, rather than passive agents merely pushed into the future by others' social agendas. In addition, they become knowing persons with their own epistemological relations to their milieu and to their students, rather than persons merely responsible for transmitting socially valued knowledge.

Similarly, Cochran-Smith and Lytle (1993) argue that current “research on teaching” constrains, and, at times, even makes invisible teachers’ roles in the generation of knowledge about teaching and learning in classrooms. On the other hand, they emphasize teaching as the process of generating knowledge with students. In this context, they highlight teacher research as a significant process of constructing teachers’ own knowledge and understanding how knowledge is constructed.

The main research agenda of Cochran-Smith and Lytle is to examine teacher research as a way of generating both local knowledge and public knowledge about teaching, learning, and school. The former refers to knowledge that is developed and useful to teachers themselves and their immediate communities and the latter indicates teacher knowledge that is useful to larger school and university communities.

By conducting inquiry on their own practices, teachers may identify discrepancies between their theories of practice and actual practices, between their own practices and those of others in the schools, and between their ongoing hypotheses of what is going on and more distant retrospective interpretations. Through such inquiry, teachers acquire knowledge about teaching and their teaching practice and curriculum may be changed and improved.

In sum, teachers’ personal practical knowledge, professional knowledge landscape, and local and public knowledge are the terms reflecting the new research tradition in the relationship between theory and practice in teaching. These types of teacher knowledge share a common view of teachers as knowers who create their own knowledge not as knowledge known or transmitted from the outside. Rather, teachers actively construct knowledge through interactions with children, other teachers,



administrators, parents and others in everyday experiences. Their knowledge, in turn, will impact how they behave in the classrooms. In this way, the context of teaching, various characteristics of significant others (i.e., children, parents, other teachers, and administrators), and teachers' interactions with these people influence how teachers construct knowledge and how they behave in their classrooms.

### State-Funded Pre-Kindergarten Programs and Classroom Quality

Over the past decade, the importance of quality care for young children has been widely recognized. Research has shown that children's early education experiences have lasting effects on their academic achievement, social development, and behavioral competencies (e.g., Clifford, Peisner-Feinberg, Culkin, Howes, Kagan, 1998; Downer, & Pianta, 2006; NICHD ECCRN, 2000b; NICHD ECCRN, 2003).

The growing number of state-funded pre-kindergarten across the States partly represents this recognition about the importance of quality education for young children. During the 2004-2005 program year, 38 states offered state-funded pre-kindergarten (NIEER, 2005). A total of 801, 902 children were enrolled in state-pre-kindergarten initiatives and funding for state pre-kindergarten was about \$2.8 billion during this program year. The percentage of 4-year-olds enrolled in state pre-kindergarten grew by three percent from the 2001-2001 school year to the 2004-2005 school year, with 17 percent of the nation's 4-year-olds enrolled in 2004-2005 year.

Moreover, in recent years, millions of public and private dollars have been dedicated for enhancing the quality of child care (Whitebook & Eichberg, 2002; Scott-Little, Kagan, & Frelow, 2003). In 1998-1999, for example, state spending on pre-

kindergarten initiatives totaled approximately \$1.7 billion, up approximately \$1 billion from 1992-1993 (Scott-Little et al., 2003).

Despite the growing popularity of state-funded pre-kindergarten programs, relatively little has been known about what these programs are actually like such as who is being served, who is teaching, and what is the quality of the service provided (Clifford, Bryant, & Early, 2005). Gilliam and Marchesseault (2005) pointed out that the recent growth of state-funded pre-kindergarten programs was “not accompanied by broad-based research reaching beyond the policy and regulatory mandates of state programs to evaluate implementation and classroom practice. Yet, it is in policy implementation and the classroom itself where early childhood education succeeds or fails” (p. 2).

A recent study on state-funded pre-kindergarten documented the remarkable diversity across states in the way in which pre-kindergarten education is being implemented (Bryant, Clifford, Saluja, Pianta, Early, Barbarin, Howes, & Burchinal, 2002). According to Bryant et al. (2002), the location of state-funded pre-kindergarten classrooms varies. These classrooms are found in school buildings and in non-school settings. Clifford, Early, and Hills (1999) estimated that nearly a million pre-kindergarten children were in programs physically located in a school building. These programs included Head Start, Title I, programs for children with disabilities, and local and state pre-k initiatives.

In order for a program to receive state funding, certain program standards should be met, but these requirements also vary widely. Adult-child ratios range from 1:6 to 1:10 and group size from 15 to 24, and teacher qualifications from a CDA credential to a BA with certification (Bryant et al., 2002). The National Institute for Early Education

Research (2005) created 10 benchmarks based on research review and compared state quality standards against these benchmarks. Only one state (i.e., Arkansas) met all 10 quality benchmarks for the 2004-2005 program year; five state preschool initiatives (i.e., those in Alabama, Illinois, New Jersey, North Carolina, and Tennessee) met nine out of the 10 benchmarks. On the other hand, Pennsylvania's new initiative met only one of the 10 benchmarks. The median number of benchmarks met by state pre-kindergarten programs in the 2004-2005 program year was six.

Based on the noted diversity in state-funded pre-kindergarten programs, it should come as no surprise that variation exists between state-level policies and mandates and classroom-level implementation (Gilliam & Marchesseault, 2005). With a lack of evaluation of these programs, the diversity of quality of the programs can not be easily estimated.

In 2001, the National Center for Early Development and Learning (NCEDL) initiated a large-scale study of 240 state-funded pre-kindergarten programs in six states. This study was designed to provide information about the characteristics of children enrolled in the programs, teachers of the programs, and the programs themselves. In the following section, the NCEDL study is reviewed in more detail.

### NCEDL Multi-State Study of Pre-Kindergarten

#### *Overview of the Study*

The National Center for Early Development and Learning (NCEDL) conducted a study on state-funded pre-kindergarten programs during the 2001-2002 school year in six states: California, Georgia, Illinois, Kentucky, New York, and Ohio. The NCEDL Multi-

State Study of Pre-Kindergarten included center-based pre-kindergarten programs for four-year-olds that were fully or partially funded by state education agencies and that were operated in schools or under the direction of state and local education agencies.

The primary purposes of the NCEDL study were to describe the variations of children's experiences in state-funded pre-kindergarten and public kindergarten programs and to examine the relationship between children's experiences in the programs and their outcomes. Data was collected from multiple sources such as teachers, parents, administrators, and children.

### *Sample*

#### Selection of the States

Out of 41 states that invested state funds in pre-kindergarten initiatives in 1999, the 19 states that had significant pre-kindergarten initiatives (i.e., states that served 15% of their state's 4-year-olds or served at least, 15,000 4-year-olds) were selected first. From the 19 selected states, 13 states were chosen to maximize diversity with regard to geography, program settings (i.e., in schools versus in community settings), length of program (i.e., full day versus part day), and teacher credentialing requirements. Finally, six states were invited to participate in the study.

In the academic year of 2001-2002, 43% of all children across the States who were participating in state funded pre-k programs were from these six states and 42% of state dollars spent on pre-kindergarten were in these six states.

## Sampling

Within each state except for California and New York, 40 sites (centers or schools) were randomly selected from the entire state. For the states of California and New York, however, a random selection of the sites from the entire state was not assured because of budget and time constraints. Instead, the selection was limited to 20 sites in the greater Los Angeles area, 20 sites in California's Central Valley, 20 sites in New York City, and 20 sites within a 50-mile radius of Albany, New York.

Within each state, 20 zip codes were selected and then two sites from each zip code were selected (i.e., stratified random sampling). In total, 40 schools or centers were randomly selected from the list provided by the state education agencies of all centers/schools receiving state pre-k funds and one classroom from each of the selected schools or centers was included. The selection of the sites and classrooms was done in order to maximize within state classroom-level diversity for three key variables: (a) programs in public school buildings versus not in public school buildings, (b) full day versus part-day programs, and (c) lead teachers with and without Bachelor's degrees.

In order to obtain 240 sites, 335 sites were initially contacted. Selected sites that were found to be ineligible or declined to participate were replaced by another randomly selected site from the same zip code. Among the sites initially contacted, 26 were ineligible (e.g., did not receive state funds or did not serve 4 year-olds), 58 declined, and 11 never responded. In total, 238 pre-kindergarten sites participated in the fall of the pre-kindergarten year, 2001. The children who participated in the study during their pre-k year were followed in their kindergarten year. These children were spread across 800 kindergarten classrooms and complete data was collected from 778 classrooms (81%).

Among the selected pre-k sites, 53% were located in public schools and 47% were located in other type of community centers. An average of seven children was assigned to one teacher at each site. The average length of class time per week was 22.9 hours ( $SD = 1.38$ ).

Two hundred thirty eight teachers comprised the final sample for pre-kindergarten teachers. Most of the teachers (98%) were females. The mean age was 42 years ( $SD = 1.0$ ) with a range from 22 to 70. The majority of the teachers (61%) were Caucasian, 17% were African American, 10% were Hispanic, 3% were Asian/Pacific Islander, and 10% were identified as other ethnic groups. Teaching experience at grade levels below kindergarten ranged from 0 to 33 years with a mean of 9.40 years ( $SD = .70$ ). The majority of the teachers (68%) had at least a Bachelor's degree, 15% of the teachers had Associate's degree, 14% had some college experience but no degree, and 3% had high school degrees.

### *Data Collection*

Data was collected in several ways: (a) teacher questionnaire, (b) parent questionnaire, (c) administrator questionnaire, and (d) observation of the classroom. From the teacher questionnaire, information about demographic characteristics of teachers, class/student characteristics, teacher training, working with parents, and curriculum used in their classroom was gathered. In addition, teachers' attitudes toward child rearing, their self-efficacy beliefs, and depressive feelings also were gathered.

From the pre-k administrator questionnaire, information regarding school/program characteristics, services provided, pre-k program goals, pre-k teacher

characteristics, funding, teacher wages and benefits, program eligibility and recruitment, parent involvement, home visiting, and demographic characteristics of the administrators were obtained. In addition, a parent questionnaire was used to gather information about household income, ethnicity, maternal education, children's experiences of child care prior to the pre-kindergarten program, children's mother language, and the language currently spoken by the children.

The process quality of the classroom and children's experiences within the pre-k and kindergarten classroom were assessed by classroom observations. Two trained data collectors visited each classroom on two days each semester. One conducted child assessments on the first day and the ECERS on the second day; the other completed two observation measures, The Classroom Assessment Scoring System (CLASS) and the Emerging Academics Snapshot on both days. The observers stayed in each classroom from the time the program began until the children began their naps or the program ended. The CLASS was rated roughly every 30 minutes throughout the two observation days. Then, observers had 15 minutes to complete the CLASS ratings before beginning the next cycle. The number of CLASS observation cycles completed ranged from four to eight per day. Each Snapshot observation consisted of a 20-second observation period followed by 40-second coding period. Each child was observed five times over 20-minute period. The number of 20-minute Snapshot observation periods completed per classroom ranged from four to six.

### *Training of Data Collectors and Reliability*

Data collectors trained on the CLASS measure by using video footage. They watched and coded a tape consisting of six 25-minute segments chosen randomly, from 1-2 hour video footage gathered in a variety of early childhood classrooms in several states. Their ratings were compared to a “gold standard,” prepared by the instrument’s authors. To be considered reliable, each data collector had to reach a standard of 80% of responses within one scale point of the correct ratings from the gold standard (La Paro et al., 2004).

Similarly, the training of the Snapshot was done by using videotape footage. After watching videotaped classroom scenes, data collectors coded all sections of the Snapshot except one (i.e., activity setting). Data collectors’ responses on the Snapshot sections were compared with a gold standard that had been prepared by the instrument’s first author. Each data collector was required to reach an overall kappa of .60 across all codes, a median of .55 on the child engagement and adult interaction codes, and a median kappa of .50 on the teacher-child engagement codes (La Paro et al., 2004).

It was not possible to accurately determine the activity setting from the videotaped segments, so those codes were not tested prior to the fall of pre-k data collection. However, they are very straightforward codes and when data collectors were tested using live visits in the spring, their reliability was very high (i.e., the range of mean kappa across the activity setting section ranged from .62 to .99). Almost all of the data collectors for the spring pre-k were the same from the fall pre-k data collection, so, the fall activity setting data were considered reliable.



Data collectors' responses on the CLASS were found to be reliable. Across all the training sessions, more than 80% of their answers were within one scale point of the correct answer. A mean (with a standard deviation in a parenthesis) of weighted kappa was .67 (.13). Moreover, the data collectors' responses on the Snapshot were also found to be reliable. Mean scores of the data collectors' rating for the overall kappa across the four training sessions were higher than .60.

### *Instruments*

#### Teacher Self-Efficacy

In order to measure teachers' self-efficacy beliefs, a modified version of Bandura's Teacher Self-Efficacy was used. Bandura (1977) conceptualized the two dimensions of self-efficacy: (1) outcome and (2) efficacy expectations. Outcome expectations are related to causal beliefs about action-outcome contingencies or a person's estimate that a given behavior will lead to certain outcomes. Efficacy expectations refer to the personal expectations about his or her own ability to execute certain outcomes. He argued these expectations are differentiated because individuals can believe that certain behaviors will produce certain outcomes, but, if they do not believe that they can perform the necessary activities, they will not initiate the relevant behaviors; or if they do they will not persist.

Research supported these two dimensions (Ashton & Webb, 1986; Gibson & Dembo, 1984). Based on the teacher interview and correlational data, Ashton and Webb (1986) argued that there are two different efficacy dimensions: (1) teaching efficacy and (2) personal teaching efficacy. The sense of teaching efficacy refers to teachers'

expectations that teaching can influence student learning and the sense of personal teaching efficacy indicates individual's assessment of their own teaching competence. Gibson and Dembo (1984)'s factor analysis also yielded two substantial factors that corresponded to Bandura's two-factor theoretical model of self-efficacy.

The modified version of Bandura's teacher self-efficacy scale was specifically designed to measure teachers' sense of personal efficacy (i.e., efficacy expectations). The scale consisted of 10 items that were rated from 1 (nothing) to 5 (a great deal). Sample items included in this scale were: How much can you do to get through to the most difficult students? How much can you do to control disruptive behavior in the classroom?

#### Modernity Scale

For measuring teachers' traditional attitudes toward child rearing, the Modernity Scale (Schaefer & Edgerton, 1985) was used. This scale consisted of 16 items and each item was measured on a five-point Likert-type format that ranged from strongly disagree to strongly agree. The items described "traditional" or relatively authoritarian approaches to child rearing or more "modern or progressive" child-centered approaches. Scores were derived by taking the mean of all items, with non-traditional beliefs reverse-coded. Therefore, the higher the score, the more modern or progressive child-centered were the teachers' beliefs.

Teachers holding traditional, authoritarian child-rearing attitudes agreed with statements such as "children should be treated the same regardless of difference among them" and "the most important thing to teach children is absolute obedience to whoever is in authority." On the other hand, teachers holding more progressive, child-centered

attitudes toward child rearing agreed with statements such as “children should be allowed to disagree with their parents if they feel their own ideas are better” and “children have a right to their own point of view and should be allowed to express it.” Cronbach’s alpha for this scale was reported as .84 by the scale’s authors and was .78 in the NCEDL study.

#### Center for Epidemiological Studies Depression Scale (CES-D)

Teachers’ depressive symptoms were measured through CES-D (Radloff, 1977). The scale includes 20 items that survey mood, somatic complaints, interactions with others, and motor functioning. The response values are 4-point Likert scales, with range 0-3, with anchor points in terms of days per week ‘most of the time’ to ‘none of the time.

Scores were created by taking the mean of all the items, with the positive items reverse-coded. Therefore, teachers with higher score on this measure were the ones with more emotional distress. The final score spans from 0 to 60, with a higher score indicating greater impairment. People with a final score of 16 or higher are typically identified as a depressive case. This generally represents someone that has reported at least six items to be frequently present over the course of the previous week, or most of the 20 items to be present for a shorter duration.

#### Classroom Assessment Scoring System (CLASS)

Teachers’ practice of creating emotional climate and instructional support was measured through an observation tool, the CLASS (La Paro & Pianta, 2003). This observation tool was used to measure specific types of quality of pre-k through early elementary (3<sup>rd</sup> grade) classrooms. It included nine scales: (1) positive climate, (2) negative climate, (3) sensitivity, (4) over-control, (5) behavior management, (6)

productivity, (7) concept development, (8) instructional learning formats, and (9) quality of feedback. Using a seven-point Likert-type format, ratings of 1 or 2 indicated the classroom was low on that dimension, and 3, 4, or 5 indicated that the classroom was in the mid-range, and 6 or 7 indicated the classroom was high on that dimension.

Three scales of the CLASS focused on the emotional climate of the classroom. Positive climate dimension examined the enthusiasm, enjoyment, and emotional connection that the teacher had with the children as well as the nature of peer interactions; negative climate reflected the evidence of anger, hostility, or aggression that the teacher and/or children exhibited in the classroom; and sensitivity indicated how responsive the teacher was to children's academic and emotional needs and the degree to which the teacher served as a secure base for children to volunteer answers and responses.

The CLASS incorporated three scales to examine classroom management. Over-control examined the flexibility teachers displayed related to children's interests and classroom schedules and the degree to which teachers fostered autonomous behavior in children; behavior management reflected how well teachers monitored, prevented, and redirected behavior; and productivity indicated how well the classroom ran with respect to routines, how well children understood routines, and the degree to which teachers provided activities and directions so that maximum time might be spent in productive learning activities.

The rest of the three scales from the CLASS focused on instructional support provided in the classroom. Concept development reflected the degree to which teachers promoted higher-order thinking and problem solving, going beyond fact and recalled discussions with children. Instructional learning formats measured how teachers engaged

children in activities and facilitated activities so that learning opportunities were maximized; and quality of feedback indicated how teachers extended children's learning through their responses about children's learning and understanding.

A principal components analysis with varimax rotation revealed two factors from the CLASS: (1) emotional and (2) instructional support (La Paro et al., 2004). The high end of the first factor (i.e., emotional support) was characterized by high ratings on positive climate, teacher sensitivity, and behavior management and by low ratings on negative climate and over-control. The high end of the second factor (i.e., instructional support) was described by high productivity, concept development, instructional learning formats, and quality of feedback. The first factor accounted for 36.7% of the variance and the second factor accounted for 34.0% of the variance. The internal consistency of the scales that made up the two factors was efficient ( $\alpha = .85$  for the first factor and  $\alpha = .88$  for the second factor) and the correlation between these factors was  $r = .59$  ( $p < .01$ ).

In order to examine the validity of the tool, La Paro et al. (2004) compared factor scores from the CLASS compared to the scores of the two other observational measures: the Early Childhood Environmental Rating Scale (ECERS) (Harms, Clifford, & Cryer, 1998) and the Emerging Academics Snapshot (Ritchie, Howes, Kraft-Sayre, & Weiser, 2002). Both emotional and instructional support factor scores of the CLASS were moderately correlated with the ECERS total scores,  $r = .52$  ( $p < .001$ ) and  $r = .40$  ( $p < .001$ ), respectively. In particular, the factor scores of the CLASS were most strongly related to the ECERS interactions and language-reasoning subscales, however, the relationship of the scores between these two measures was diminished when the scores of

the ECERS program structure, space and furnishing, and activities subscales were compared with the factor scores of the CLASS.

The factor scores of the CLASS were not highly related to many of the scale scores of Snapshot. The significant relationships were only found between the emotional support score from the CLASS and scaffolding (positive relationship) and didactic (negative relationship) teacher-child engagement scores from the Snapshot; and between the instructional support score from the CLASS and simple adult interactions (positive relationship) from the Snapshot.

#### Emerging Academics Snapshot (Snapshot)

Children's activities and teachers' practices were measured through the Emerging Academics Snapshot (Ritchie et al., 2001). The Snapshot consisted of 27 items. The items were divided into sections including (a) children's activity setting, (b) child engagement, (c) adult interaction, and (d) teacher-child engagement. For the current study, only the scores of the last two sections (i.e., adult interaction and teacher-child engagement) were used. Adult interaction examined whether teachers' interaction with children during the observation period was characterized as routine, minimal, simple, or elaborating; and teacher-child engagement examined if teachers' engagement with children was characterized as encouraging or scaffolding, if teachers used didactic instruction with children, or if teachers spoke in a language other than English. In the current study, the last scale (i.e., speaking second language) was excluded, since it was not relevant to the conceptualization of classroom quality in the study.

The scores of the Snapshot measure included in the NCEDL data were summarized in two ways. First, the mean score was computed across all observations of a given child to represent that child's experiences. Second, the mean score was computed across all observations in a classroom to represent practices at the classroom level. The Snapshot primarily depended on the observation of the four study children per classroom and the engagement and interaction between these children and their teacher. It should be noted that because the focus of the current study was teachers, not children, and teacher practice (e.g., teachers' engagement and interaction with children, not an individual child's engagement in activities). Only the mean scores at the classroom level were used in the analyses of the current study.

The items in the Snapshot were originally designed to be coded as present (coded as 1) or absent (coded as 0) within a twenty-second period. For the mean score at the classroom-level, the scores were obtained by the equation of the total amount of time any of the observed children were engaged in the interaction divided by the total number of times children in that room were observed, for each time point. For example, if the four children in a classroom were observed a total of 200 times in the fall of pre-kindergarten and the total number of times any one of them engaged in didactic instructional activity was 20, that classroom's fall score for pre-k didactic interaction would be .10. The potential range of the score for the classroom mean is between 0 and 1 (scores are proportions).

*Preliminary Findings of the NCEDL study*

Clifford, Barbarin, Chang, Early, Bryant, Howes, Burchinal, and Pianta (2005) examined the characteristics of public pre-k programs in the six states participated in the NCEDL study. They found that slightly more than half of the programs were part-day and slightly more than half were located outside of school buildings. In addition, they showed that these programs served ethnically, linguistically, and economically diverse population of children, although about a half of the children were from low-income families (i.e., defined as family household income below 150% of the federal guideline).

Moreover, the teachers in these programs were identified mostly as White and overwhelmingly females, and on average were 42 years old. Nearly 70% had at least a bachelor's degree, about 15% had a 2-year degree, and 16% had no formal degree past high school. All teachers spoke English in the classroom, however, many of them (27%) spoke Spanish in class in addition to English and a few of them (4%) spoke some other language in addition to English.

Clifford et al. (2005) also indicated that the mean teacher-child ratios of these programs were 1:8 with an average class size of 18. This is within NAEYC accreditation standards of a 1:10 adult:child ratio and maximum class size of 20 for 3- and 4-year-old classrooms (NAEYC, 1998). Even though most of the classrooms in the study met these standards, 14% exceeded the maximum class size recommendation of 20. Classroom process quality of the programs in the six states was also examined. The average ECERS-R score of 3.86 from the Clifford et al. study was lower than what has been found in other large-scale studies of early childhood programs (e.g., the Cost, Quality, and Outcomes study or the 1997 cohort in the Family and Child Experiences Survey).



Pianta, Howes, Burchinal, Bryant, Clifford, Early, and Barbarin (2005) examined the effects of the program, classroom, and teacher attributes on classroom quality and teacher-child interactions. They found that state differences accounted for the largest increment of explained variance for the global process quality indicators except for the CLASS emotional quality score. In addition, state was a significant predictor of activity settings measured by the Snapshot.

Classrooms with more than 60% of the children from low-income families were rated as significantly lower in quality measured by the ECERS-R. Moreover, teacher characteristics were found to be significant predictors of the CLASS emotional climate, ECERS-R interactions, and ECERS-R provisions scores. Particularly, they found the association between teacher attitudes and ECERS-R scores and this association remained significant after adjusting for all other variables in the model. Additionally, teachers reporting adult-centered (i.e., traditional) perspectives about interactions with children were rated significantly lower on the CLASS instructional and ECERS-R interactions scores, whereas teachers with more depressive symptoms were rated nonsignificantly lower on the CLASS emotional climate score.

As the predictors of activity settings, the location of classrooms, a percentage of children from low-income families in the classroom, and teachers' psychological characteristics were found to be significant. Classrooms located in a school building and with at least 60% of the children from low-income families offered less time in free choice-center settings and more time in whole group settings. Moreover, teachers with higher levels of depression and holding more child-centered attitudes provided more time in free choice-center settings.

Early, Bryant, Pianta, Clifford, Burchinal, Ritchie, Howes, and Barbarin (2006) examined predictors of the classroom quality and children's academic gains in pre-kindergarten. Their analytical focus was on the teacher characteristics such as teachers' education, major, and credentials. They argued that there is no consensus about operationalizing teachers' education and training. So, they used variously operationalized education variables (i.e., teachers' highest degree, years of education, and Bachelor's versus no Bachelor's degree). Early et al. found that teachers' education, regardless of how it was operationalized, was linked to gains in children's math skills across the pre-k year and the CDA credential was linked to children's gains in basic skills. However, they indicated that education, training, and credentialing were not *consistently* related to classroom quality or other academic gains (aside from math and basic skills) for children.

#### Selecting NCEDL Variables to Create Meaningful Research Questions

##### *Evaluation of the NCEDL Study*

In the NCEDL study, classroom quality was measured by two new scales (the CLASS and Emerging Academics Snapshots) as well as the ECERS-R. The CLASS provides a framework for observing key dimensions of teacher behaviors, specifically, how they create classroom processes such as emotional climate, management, and instructional supports. The Emerging Academics Snapshots provides information about the teachers' engagement and their interaction with children.

According to Pianta (1999), teacher-child relationships contribute to children's social and academic competence. Teachers who engage in sensitive and responsive interactions with children are more likely to develop nurturing relationships that are

essential to children's security (Elicker & Fortner-Wood, 1995). Children who have a more secure relationship with their teacher are, in turn, more likely to explore their environment and, therefore, have more opportunities to learn. A number of studies have reported that children who have less directive, less harsh, and less detached teachers, experience more positive interactions, are more considerate and sociable (Phillips, McCartney, & Scarr, 1987), display higher levels of language development (Whitebook, Howes, & Phillips, 1990), and are observed to be more competent in cognitive activities (Howes & Stewart, 1987).

Furthermore, sensitive teachers and teachers who create a positive climate in their classrooms tend to be more familiar with the academic needs of individual children in their classrooms (Helmke & Schrader, 1988). For example, teachers recognize the moment when children are struggling to understand a lesson or activity and so they are able to modify their responses to fit the academic and emotional needs of children. Moreover, teacher behaviors such as feedback and warmth have been found to be significantly correlated with children's development and to produce gains in children's classroom performance.

As such, interactions between children and their teachers provide a powerful context for early learning and development. Much of the research investigating relationships between teacher-child interactions and child outcomes has primarily focused on the warmth and sensitivity of interactions. However, there is another piece of the story that bears explaining in understanding teacher-child relationships. Even though a tremendous amount of research using various measures of teacher-child relationship has shown the affective effects of teacher-child relationship on children's outcomes, this

research only tells a part of the story. One often ignored aspect of the story and one that is probably more directly related to children's outcome is the instructional quality of teacher-child relationships.

In research on schooling as a moderator of children's background characteristics, it is important to assess variation in the nature, quality, and quantity of teachers' interactions with children as they may be related to schooling variables. Recently, large-scale observational studies of pre-k to elementary classrooms revealed two important dimensions for further investigation: instructional and emotional support (NICHD ECCRN, 2002; Pianta, La Paro, Payne, Cox, & Bradley, 2002; Pianta et al., 2005).

Hamre and Pianta (2005) examined the effects of instructional and emotional support of teachers on the achievement of children at risk and the children's relationship with the teachers. According to their research, children who were identified as at risk for school failure displayed lower levels of achievement at the end of first grade than did their low-risk peers, even after controlling for achievement performance at 54 months. However, not all children displaying early risk displayed academic problems at the end of the first grade. By the end of the first grade, at-risk children who were placed in first-grade classrooms offering strong instructional and emotional support had achievement scores and student-teacher relationships commensurate with their low-risk peers. On the other hand, at-risk children who were placed in less supportive classrooms had lower achievement and more conflict with teachers.

In sum, the literature shows that teachers' emotional and instructional support is positively related to children's socioemotional development and academic achievement. In addition, high-quality experience in the classroom played an important role in the

achievement of at-risk children. Therefore, the NCEDL study provides rich information about children's experiences in classroom.

To recap, preliminary findings of the NCEDL study provide information about the public pre-k programs in the six states of the NCEDL study (e.g., where they are located, who are teaching, which children are served in the programs, and what is the quality of these programs) and some preliminary information about the relationship between the various school, classroom, and teacher characteristics and classroom quality. However, there is still much to understand about classroom quality. The NCEDL study is not an experimental study. Therefore, in order to validate findings, it is necessary to include a variety of possible predictors and statistically control them. As noted early in the literature review section, teacher practice is partly shaped by how teachers' experiences are shaped by interacting with children, parents, other teachers, and administrators. In this context, multi-level factors need to be included in the statistical model to develop more detailed explanation about how teachers' behaviors are shaped.

However, there are other variables that have not yet been considered in creating predictive model using the NCEDL data. For example, the previous studies did not examine the effect of teachers' efficacy beliefs on teacher practice even though a tremendous amount of research has revealed that teachers' efficacy beliefs are an important predictor of how they behave in the classroom. Furthermore, how teachers emotionally and instructionally respond to the children may partly depend on the level of their efficacy beliefs. Highly efficacious teachers may respond differently than less efficacious teachers when they face difficult classroom situations (e.g., when children with problematic behaviors are present or when children with special needs are present).

### *Variables Selected from the NCELD Study*

In this section, the variables selected for the current study are listed (see Tables 1 and 2) and a brief explanation for their selection is explained. Early childhood education programs (pre-kindergarten programs) are situated in a large, multilevel ecology that encompasses policy and legislation, cultural factors including family and schooling, issues related to training and workforce support, accountability frameworks at state and district levels, and curriculum frameworks, to name a few components (see Johnson, Jaeger, Randolph, Cauce, Ward, & the NICHD Early Child Care Research Network, 2003; Schonkoff & Phillips, 2000).

For example, research on the relationship between teachers' beliefs and practices about DAP has identified diverse characteristics, such as teachers' area of certification (Buchanan, Burts, Binder, White, & Charlesworth, 1998), teaching experiences (Buchanan et al., 1998; Vartuli, 1999), class size (Buchanan et al., 1998; Roupp, Travers, Glantz, Coeln, 1979), as predictors of teachers' beliefs and practices.

Moreover, Whitebook, Howes, and Phillips (1990) found that classrooms with lower adult-child ratios tended to have teachers who were more sensitive, less harsh, and less detached in their interactions with children in the classroom. Furthermore, Pianta, Howes, Burchinal, Bryant, Clifford, Early, and Barbarin (2005) found that teachers' education/credentials, teaching experience, and teachers' beliefs were significant predictors of structural and process quality of the classroom.

The purpose of the current study is to evaluate classroom quality by testing ecological models of public pre-kindergarten settings that include psychological

attributes of teachers as well as other multi-level factors. The multi-level factors of early education ecology include program and teacher characteristics.

Program characteristics consist of program-level and classroom-level variables. Program-level variables include location (i.e., in or out of a public school building), program type (i.e., Head Start or not), and length of the programs (i.e., full- or part-day). In addition, classroom-level variables consist of class size, teacher-child ratio, the number of children with special needs (IEP and LEP), and the percentage of children from low-income family in the classroom. Teacher characteristics variables include teachers' demographic variables (i.e., education level, years of teaching experience, major, and certification to teach 4-year old children) as well as teachers' psychological characteristics (i.e., depressive symptoms, attitudes toward childrearing, and efficacy beliefs), all of which have been shown to be uniquely predictive of teachers' interactions with children (Bandura, 1997; Hamre & Pianta, 2004; NICHD ECCRN, 1999).

In order to examine the effects of the various program and teacher characteristics on pre-kindergarten classroom quality, classroom-level data of pre-kindergarten in the NCEDL study was used for the current study. In addition, teachers' psychological characteristics were added to examine their mediating as well as direct effects on the variables of classroom quality.

#### Program Characteristics (Program-Level)

For program-level variables, location of the classroom (i.e., in a public school setting versus not), program type (i.e., Head Start or not), and length of the program (i.e., full- versus part-day) were used in the current study. These variables were expected to be

important predictors of classroom quality and teacher behavior in the public pre-k programs, because location of the classroom might be related to the culture of school that might affect how teachers behave and also to the teacher characteristics especially in their education and type of teacher certificate.

*Location of the classroom.* The NCEDE Multi-State Study of Pre-Kindergarten includes pre-kindergarten classrooms that are housed in public schools (53%) and in other community settings (47%). One basic question surrounding pre-k policy is whether programs operated under public schools differ from other programs (Pianta, Howes, Burchinal, Bryant, Clifford, Early, & Barbarin, 2005). It is assumed that classrooms in public school may be influenced by the academic-focused culture of public schools. Specifically, because of their physical proximity to and presumed greater interaction with elementary school teachers and administrators, pre-kindergarten classrooms located within elementary schools possibly may look more like those in an elementary school (e.g., basic skill acquisitions through large-group instruction) compared to those located in community-based settings not as directly exposed to the elementary curriculum and methods (Clifford, Barbarin, Chang, Early, Howes, Burchinal, & Pianta, 2005). In addition, school-based pre-kindergarten classes may be subjected to different regulations and more monitoring than occurs in non-government, community-based programs.

Moreover, the characteristics of teachers may differ depending on where they are teaching. Indeed, pre-kindergarten teachers in public schools have been found to be more educated, obtained higher wages, and were less likely to leave their job than pre-kindergarten teachers in non-public school settings (Bellm, Burton, Whitebook, Broatch, & Young, 2002).



*Length of the program.* In addition to location of the classroom, the wide variation in program length is likely to be related to classroom characteristics and activities. Although the field lacks research comparing full-day versus part-day preschools, the research on kindergarten finds that length of day matters (Clifford et al., 2005). Elicker and Mathur (1997) found that children in full-day kindergarten classrooms, when compared with those in part-day rooms, were more likely to experience a richer repertoire of activities including dramatic play, science, art, music, social studies, and gross motor. Longer programs may allow teachers the flexibility to individualize instruction to match the children's needs and interests. Moreover, kindergarten children who attend full-day programs were found to have higher reading and math achievement scores than children in part-day programs (Gullo, 2000). Hence, the current study included the variable of the program length to examine its relation to teachers' psychological characteristics and their classroom behavior.

*Program type.* In addition to the location of pre-kindergarten classrooms, teacher characteristics and classroom features vary depending on the type of pre-kindergarten program (i.e., either Head Start or not). Granger and Marx (1988) reported that Head Start teachers in New York City had relatively low levels of teacher certification. From the further analysis of these data, Granger (1989) found correlations between teacher training, teacher stability, and classroom quality. Henry, Gordon, and Rickman (2006) compared Head Start and state pre-kindergarten in Georgia for their quality and children's outcomes. They found that significantly more pre-kindergarten teachers had at least a Bachelor's degree than did Head Start teachers (9%). In this study, neither the Head Start nor the state pre-kindergarten sites attained an average score of five on the

ECERS-R measure. However, a national study of Head Start program reported that Head Start classrooms had higher quality than most center-based early childhood programs (Administration for Children, Youth, and Families, 2000).

Literature has demonstrated that teacher education is strongly related to child care quality. For example, In the National Child Care Staffing Study (Whitebook, Howes, & Phillips, 1990), it was found that teachers with more formal education and early childhood training at the college level showed more sensitive and appropriate caregiving behaviors in the classroom. In addition, the Cost, Quality, and Outcomes study (Helburn et al., 1995) found that the education level of the teachers was positively related to child care quality. Putting together, it is assumed that teachers in Head Start programs, who tend to have less education than teachers in public schools, may behave differently in relation to classroom quality. At the same time, however, any difference of classroom quality between Head Start program and state-funded pre-kindergarten program (i.e., not Head Start) has not been reported yet.

#### Program Characteristics (Classroom-Level)

The variables at the classroom level such as class size, teacher-child ratio, the percentage of children from low-income family, and the number of children with special needs (i.e., children with limited English proficiency and with individualized education plan) were included in the current study and are briefly discussed in this section.

*Teacher-child ratio and class size.* It has been amply demonstrated that teacher-child ratio and/or class size have a significant effect on observations of process quality and experiences of children with teachers (e.g., Burchinal, Roberts, Riggins, Zeisel,

Neebe, & Bryant, 2000; Howes, James, & Ritchie, 2003; Shonkoff & Phillips, 2000; Whitebook et al., 1990). Quality is higher and teachers are more sensitive, less harsh, and less detached in their interactions with children in the classroom when the teacher-child ratio is lower and/or class size is small.

Nevertheless, literature shows somewhat inconsistent results about teacher-child ratio and class size in relation to classroom quality. The National Day Care Study (Ruopp, Travers, Glantz, & Coelen, 1979) found that class size was the single most important predictor of preschool children's learning experience and teacher-child ratio was found to be a less important structural feature. Whitebook et al. (1990) reported that a lower teacher-child ratio was found to be associated with more sensitive and responsive childcaring. Abbott-Shim et al. (2000) found that both teacher-child ratio and class size were directly related to Head Start classroom quality. Pianta, La Paro, Payne, Cox, & Bradley (2002) found that class size was not related to classroom quality. However, these authors found weak, but significant correlations between teacher-child ratio and teacher positivity and instructional climate of classroom. Therefore, it seemed reasonable to include both teacher-child ratio and class size and to examine the relationship between these classroom structure variables and the classroom quality variables in the current study.

*The percentage of children from low-income family.* Attributes of the children in the classroom, collectively, can affect process quality and teacher behavior. In elementary schools, lower levels of quality are observed in classrooms with higher concentrations of poverty (Pianta, et al., 2002), with teachers observed to be less sensitive and instructional quality lower when a larger percentage of children in poverty are enrolled in the

classroom. In the current study, the percentage of children from low-income family (i.e., the proportion of children in classrooms below 150% poverty line) was included.

*The percentage of children with special needs.* The presence of children with special needs in classrooms may also be related to classroom quality. Buchanan et al. (1998) studied predictors for developmentally appropriate or inappropriate practices. They found that teachers of early elementary classroom (1<sup>st</sup> - 3<sup>rd</sup> grade) with fewer children with disabilities reported using more developmentally inappropriate activities than teachers who had more children with disabilities in their classrooms.

Gallagher and Lambert (2006) examined the relationships among classroom quality, the percentage of children with special needs, and child outcome measures. They did not find main effects for the classroom concentration of children with special needs for child outcomes. The percentage of children with special needs in a classroom did not influence the development of typically developing children in harmful ways. The presence of more children with special needs in the classroom did not affect the mean classroom ratings for typically developing children. Rather, for classrooms in which more than 20% of the students were children with special needs, typically developing children scored higher on print concepts.

However, these authors found interaction effects between classroom quality and the presence of children with special needs in a classroom. A high-quality classroom setting serving no children with special needs was associated with more favorable classroom mean scores on social behavior for typically developing children. On the other hand, when a high-quality classroom setting served more than 20% children with special

needs, typically developing children were rated to have more problem behaviors and scored lower scores in print concepts.

Little research has examined the relationship between classroom quality and the presence of children with special needs in a classroom. In the NCEDL study, two variables related to the presence of children with special needs in a classroom were included: the percentage of children with IEP (individualized education plan) and with LEP (limited English proficiency) and these variables were selected for the current study.

#### Teacher Characteristics (Demographic Variables)

Even though there are not consistent findings, much research shows that teachers' beliefs and practices are shaped by teachers' personal characteristics (Datnow, 2000; Huberman, 1989; O'Brien, 1992; Riseborough, 1981). For the current study, teachers' level of education, years of teaching experience, major, and state certification to teach 4-year old children were included.

*Teacher education, major, and certificate.* States vary widely in the qualification of professional development to teach pre-kindergarten. Minimum requirements range from a child development associate (CDA) certificate to an associate's degree or, in some cases, a Bachelor's degree (Bryant, Clifford, Early, Burchinal, Barbarin, Saluja, et al., 2003).

Tout, Zaslow, and Berry (2006) reviewed studies on the relationship between classroom quality and teacher qualification. They found that level of formal education was the most consistent predictor of teachers' emotional support for children (e.g., sensitivity, harshness, and detachment). Research shows that teachers with more years of

education and more specialized training in early childhood have higher quality, less authoritarian teaching practices (i.e., more elaborative, encouraging) than teachers with lower educational attainment (Arnett; 1989; Howes, 1997). In addition, process quality was higher in preschool classrooms with teachers with more education, a moderate amount of experience, and higher wages (Phillipsen, Burchinal, Howes, & Cryer, 1997).

Nevertheless, the association between teacher education and classroom quality is not entirely consistent across the research. For example, Phillipsen et al. (1997) found that the relationship between teachers' education and global quality disappeared when other structural features of the classroom (e.g., teacher-child ratio and teacher wages) were added to the model. Moreover, Hamre and Bridges (2004) noted that the association between the level of teacher education and classroom quality may result from teachers' selection effects. That is, more educated teachers may choose to work at higher quality programs.

Even though research is not consistent for the optimal level of teacher education for classroom quality, the field seems to be converging on the idea that pre-k teachers should have a Bachelor's degree (Early et al., 2006). Teachers who hold at least Bachelor's degrees were found to have stronger developmentally appropriate beliefs than those with less education (McMullen & Allat, 2002) and classrooms taught by teachers with a master's degree were observed to be more developmentally appropriate than those taught by teachers with less education (Maxwell, McWilliam, Hemmeter, Ault, & Schuster, 2001). Moreover, teachers with Bachelor's degrees certainly were found to be more effective in their responsive involvement and in being engaged with children in activities that promote

language development and emergent literacy than teachers without Bachelor's degrees (Howes, James, & Ritchie, 2003).

Maxwell, Field, and Clifford (2006) argued that there are no common definitions of professional development terms. According to these authors, the terms education, training, and credential are not defined clearly and used inconsistently across research. In the current study, different types of teachers' professional development were included: (1) the level of teacher education, (2) major (the content of training for formal education), and (3) certification. The level of teacher education consisted of four categories: (1) less than Associate's, (2) Associate's, (3) Bachelor's, and (4) greater than Bachelor's. In addition, the content of teachers' formal education (i.e., major) included three categories: (1) early childhood education or child development, (2) other education or other fields, and (3) no degree. Finally, state certification to teach 4 year old children was included in this study.

*Years of teaching experience.* Teachers' experience is continuously found to be a significant factor of teachers' efficacy beliefs (Knobloch & Whittington, 2002; Lamorey & Wilcox, 2005; Safran, 1985). It is assumed that teachers with previous experience of working with pre-kindergarten children will be more confident about how they should interact with pre-kindergarten children.

However, there is a wide range of research findings on the relationship between years of teaching experience and student outcomes. Hanushek (1986) reviewed 109 studies on the estimated effects of teacher experience on student achievement. He found that fewer than half of the studies showed that teaching experience had any statistically significant effect on student achievement and about a third of studies reported that

additional years of teaching experience had a significant positive effect. However, seven studies revealed that additional years of experience actually had a negative impact on student achievement.

The effect of teaching experience in an early childhood classroom (pre-k and k) on the quality of pre-kindergarten classroom is expected to be different from the effect of teaching experience in an elementary school classroom on the pre-k classroom quality. In the current study, two types of teaching experience variables were included in the regression models: (a) years of teaching pre-kindergarten through kindergarten children and (b) years of teaching with kids above kindergarten.

#### Teacher Characteristics (Psychological Characteristics)

In addition to teacher demographic characteristics and structural characteristics of the program, teachers' psychological characteristics and emotional states are found to be significantly associated with child care quality in terms of teachers' behavior and interactions with children (Clarke-Stewart, Vandell, Burchinal, O'Brien, & McCartney, 2002; Hamre & Pianta, 2004). For example, it has been reported that caregivers' attitudes about children and about childrearing predict more positive behavior in home-based care (Clark-Stewart et al., 2002) and in centers (NICHD ECCRN, 1999). Indeed, it is believed that attitudes about childrearing may account, in part, for why education and training are related to process quality. In addition, it has been shown that caregivers' depression is associated with more negative caregiver-child interactions, including harshness and withdrawal (Hamre & Pianta, 2004). Even though these psychological attributes of teachers of young children have received less attention in the literature on elementary



school than in child care, the child care literature, as well as the parenting literature (e.g., Campbell, Cohn, & Meyers, 1995; NICHD ECCRN, 1999), often includes them in a comprehensive analysis of the predictors of process quality.

*Teachers' self-efficacy beliefs.* Teachers' beliefs in their efficacy have been found to be related to their classroom behaviors (Bandura, 1997). Teacher efficacy beliefs affect their general orientation toward the educational process as well as their specific instructional activities. For instance, teachers with high self-efficacy beliefs are more likely to value individual differences among children (Vartuli, 2005) and build positive relationships with the children they teach through promoting children's sense of personal confidence and social competence (Bandura, 1997). On the other hand, teachers with low self-efficacy beliefs are more likely to distrust their ability to manage their classrooms, are stressed and angered by students' misbehavior, and resort to restrictive and punitive modes of discipline (Melby, 1995).

Research also revealed that the various teacher, school, and student characteristic variables explain teachers' self-efficacy beliefs. Specifically, teachers' experience is continuously found to be a significant factor in teachers' efficacy beliefs (Knobloch & Whittington, 2002; Lamorey & Wilcox, 2005; Safran, 1985). In addition, teachers' sense of support (Knobloch & Whittington, 2002), class size (Safran, 1985), and teachers' involvement in a cooperative teaching situation (Ginns & Watters, 1996) are found to be significant predictors of the teachers' self-efficacy beliefs. Teachers' self-efficacy beliefs were measured by a modified version of Bandura's Teacher Self-Efficacy Beliefs (see earlier section) and were used in the current study to test the relationships between efficacy beliefs and teachers' classroom behaviors.

*Depressive feelings.* Literature shows that depressed people who tend to withdraw from social interactions have particular difficulty negotiating close interpersonal relationships (e.g., Hammen, 2000). A great amount of research showed a strong relationship between maternal depression and parenting behavior (Cohn & Tronick, 1989; Jameson, Gelfand, Kulcsar, & Teti, 1997; Radke-Yarrow, 1998). Specifically, the relationship between depressed mothers and their toddler children was found to show less prolonged and less well-integrated interactions (Jameson et al., 1997). Depressed mother-toddler dyads were more likely to be less effective at engaging in joint attention (Goldsmith & Rogoff, 1997) and spoke less often with their toddlers (Breznitz & Sherman, 1987) when compared to well mother-toddler dyads.

Hamre and Pianta (2004) examined the relation between caregivers' self-reported depression and the quality of interactions between caregivers and young children. They found a small, but consistent association between caregivers' self-reported depression and the quality of their interactions with children. Caregivers who reported more depression were less sensitive and more withdrawn than caregivers who reported fewer depressive symptoms. Furthermore, a stronger association was found between depression and negative behavior of caregivers among those who work in family child-care settings, as well as among caregivers with less education and among those that spend more time without other adults present.

In the current study, teachers' self-reported depression was measured by the Center for Epidemiological Studies Depression Scale (CES-D) (see earlier section) and was used to examine the relationship between their depression and classroom behaviors. Based on the findings of the Hamre and Pianta (2004) study, it was hypothesized that

teachers' depression might be related to how they interact with children (e.g., create emotional climate of classroom).

*Teachers' attitudes toward childrearing.* Research on teacher-child relationships revealed some factors related to how teachers interact with children. Arnett (1989) reported that teachers with more education had less authoritarian child rearing styles and were more knowledgeable about child development. In addition, teachers with more training were less punitive and less detached with children. Moreover, teacher-child ratio, teachers' age, race, and experience with children are generally but not continuously found to be related to how teachers interact with children.

Moreover, caregivers' attitudes toward childrearing were found to be related to their positive caregiving. The National Institute of Child Health and Human Development (NICHD) Early Child Care Research Network (2000a) conducted a study about the relation between characteristics and quality of child care for toddlers and preschoolers. In this study, positive caregiving ratings were found to be significantly higher when caregivers had more child-centered beliefs. In the NCEdL study, teachers' attitudes toward childrearing were measured by the Modernity Scale and teachers' answers were coded either as child-centered (modern) or as authoritarian (traditional) views about childrearing (see earlier section).

### Summary

The literature cited in this section demonstrated that teachers' beliefs and knowledge are important factors related to how they behave in the classroom. Especially, teachers' self-efficacy beliefs were shown to be important predictors of how teacher

practices are shaped. Although teacher knowledge is not going to be directly used in the current study when testing out the model of various factors predicting teacher practice (i.e., classroom quality), the literature review on teacher knowledge did suggest important implicit information about how teachers behave in the classroom. Teachers as researchers construct knowledge through their personal teaching experience. During the construction of knowledge, teachers' experiences in the classroom, school, and even outside the school context play important roles. Therefore, the school and classroom contexts where teachers work, as well as their beliefs and their demographic characteristics are critical in the process of teachers' knowledge construction and, in turn, impact how they behave in the classroom.

The section on the NCEdL study included the detailed information such as sampling, procedures, and instruments of the NCEdL Multi-State Study of Pre-Kindergarten. Previous research using the NCEdL data primarily focused on pre-kindergarten classrooms. From this research, predictors of the classroom quality in pre-kindergarten classrooms measured by the ECERS, the CLASS, and the Snapshot were identified. However, past research has not focused on teacher practice (or behaviors) in regard to classroom quality and hence, important variables related to teachers were left out. For example, teachers' self-efficacy beliefs were not included in past analyses even though such beliefs have been found to be an important predictor of teacher practices. Moreover, the teacher interaction and teacher-child engagement items from the Snapshot, likewise, were not included in the previous research. Finally, based on the literature review on teacher beliefs and knowledge and the evaluation of the previous research,

variables were selected from the NCEDL data and detailed information concerning the variables was provided at the end.

## RESEARCH PURPOSE AND RESEARCH QUESTIONS

The primary purpose of the current study was to examine the relationship between multi-level factors and teachers' behaviors in the classroom (i.e., classroom quality) for pre-kindergarten teachers. By adding some variables missed in the previous research using the NCEDL data, one of the aims of the study was to provide a more complete model of how teachers create pre-kindergarten classroom context, how teachers emotionally and instructionally support children, how they interact with children, and how they engage in children's activities. There were two overall research questions for the current study. The first deals with main and interaction effects and the second deals with mediating effects.

Question 1: Which and to what extent do program/teacher characteristics and teachers' psychological characteristics have main and interaction effects in predicting of the 10 measures of classroom quality (three CLASS variables and seven Snapshot variables)?

Question 2: Which and to what extent is the relationship between the program/teacher characteristics and classroom quality mediated by teachers' psychological characteristics?

In addition, more specific research questions related to the overall questions were raised as follows:

Question 1-1: To what extent does school location affect classroom quality?

Question 1-2: To what extent does program type (i.e., Head Start versus not Head Start) affect classroom quality?

Question 1-3: To what extent does program length affect classroom quality?

Question 1-4: To what extent do the different structures of classroom (i.e., teacher-child ratio, the percentage of children from low-income family, and children with special needs) and the teacher demographic characteristics (i.e., teacher education, teaching experience with pre-k children, teacher certificate, and major) affect classroom quality?

Question 1-5: To what extent do teachers' psychological characteristics affect classroom quality?

Question 2-1: To what extent do teacher efficacy beliefs mediate the relationship between the program/teacher characteristics and classroom quality?

Question 2-2: To what extent do teachers' attitudes toward childrearing mediate the relationship between the program/teacher characteristics and classroom quality?

Question 2-3: To what extent do teachers' depressive feelings mediate the relationship between the program/teacher characteristics and classroom quality?

## METHODS

Information on the procedures for data collection was explained in detail in the literature review section. In this section, sample and data preparation procedures are explained. Next, the methods for creating statistical models of the factors predicting classroom quality (i.e., learning climate, teachers' emotional/instructional support, and teacher interaction/teacher-child engagement) are identified. Moreover, how these models were statistically tested and analyzed is described.

### Sample

In total, 245 pre-kindergarten teachers were included in the NCEDL Multi-State Study of Pre-Kindergarten. Among these, the CLASS scores for 18 classrooms were not available and therefore excluded for the analyses of the current study. Finally, 227 teachers comprised of the sample in the current study. These teachers were identified mostly as White and overwhelmingly females, and on average were 42 years old. Nearly 60% had at least a Bachelor's degree, about 19% had a 2-year degree, and 4% had no formal degree past high school. Among the teachers with a Bachelor's or a higher degree, almost 90% ( $n=108$ ) of the teachers had early childhood education credentials. More than 70 percent of the teachers had a state certificate to teach 4 year-olds. Descriptive statistics for the school-, classroom-, and teacher-level variables of the current sample can be found in Tables 3 and 4.



Table 3. Descriptive Statistics of School-, Classroom-, and Teacher-Level Variables

	<i>n</i>	Frequency	Percent
Location of the classroom	227		
In a public school building		124	54.6
Not in a public school building		103	45.4
Program type by location of the classroom	227		
Head Start in a public school building		41	18.1
Head Start not in a public school building		26	11.5
Not Head Start in a public school building		98	43.2
Not Head Start not in a public school building		62	27.3
Is class Full day? (>20 hrs per week)	220		
Full-day class		107	48.6
Half-day class		113	51.4
Teacher gender	227		
Female		223	98.2
Male		4	1.8
Teacher ethnicity	225		
White (non-Latina)		147	65.3
African American (non-Latina)		45	20.0
Latina		31	13.8
Other		2	0.9
	<i>n</i>	Mean	S. D.
Class size	227	18.20	3.45
Observed teacher-child ratio	219	7.99	2.24
Percentage of children in classroom below 150% poverty line	227	0.58	0.28
# of students with Limited English Proficiency	199	3.05	5.34
# of students with Individualized Education Plan	217	1.38	2.26
Class hours per week	220	24.06	12.83
Teacher age (years)	214	41.52	10.59

Table 4. Descriptive Statistics of Teacher Education, Experience, and Major

	<i>n</i>	Frequency	Percent
Teacher education level	227		
Less than Associate's		50	22.0
Associate's		42	18.5
Bachelor's		42	18.5
More than Bachelor's		93	41.0
Bachelor's versus. no Bachelor's	227		
Bachelor's		135	59.5
No Bachelor's		92	40.5
Teacher Major	227		
Early childhood education & Child development		142	62.6
Other education and other fields		65	28.6
No degree		20	8.8
State certification to teach 4 yr olds	213	152	71.4
	<i>n</i>	Mean	S. D.
Years of education	227	15.67	2.00
Teaching experience			
Years of experience with pre-k through k children	222	10.96	7.57
Years of experience with children above k	224	2.28	4.82
Total years of experience	224	13.16	9.30

## Data Preparation

Based on literature review, multi-level factors such as program and teacher characteristics were expected to affect directly as well as indirectly through teachers' psychological characteristics how teachers behave in the classroom in relation to classroom quality. Independent variables included program and teacher characteristics and teachers' psychological characteristics (see Table1).

Program characteristics variables included program-level variables such as location of the classroom, program type, and length of the program. In addition, classroom-level variables such as class size, teacher-child ratio, the percentage of children from low-income family, and children with special needs were included in the program characteristics variables. Teacher-level characteristics (demographic variables) included teachers' teaching experience, education, major, and certificate. Moreover, teachers' psychological characteristics such as efficacy beliefs, attitudes toward child-rearing, and self-reported depressive feelings were added as mediating variables.

Teacher major originally consisted of 10 categories: (1) early childhood education ( $n = 112$ ), (2) child development ( $n = 35$ ), (3) elementary education ( $n = 43$ ), (4) special education ( $n = 7$ ), (5) ESL ( $n = 1$ ), (6) other education ( $n = 9$ ), (7) psychology ( $n = 4$ ), (8) home economics ( $n = 1$ ), (9) other ( $n = 5$ ), and (10) no degree ( $n = 22$ ). For the current study, these categories were reduced to the three categories: (1) early childhood education and child development, (2) other education and other fields, and (3) no degree (see Table 4). Then, two variables were created for teacher major by using dummy

coding: (1) ECE/child development (coded as 0) versus no degree (coded as 1) and (2) ECE/child development versus other education/other fields (coded as 1).

In addition, the eight categories of teachers' education level were grouped into the four categories: (1) less than Associate's, (2) Associate's, (3) Bachelor's, and (4) greater than Bachelor's. For teachers' education level, three dummy variables were created: (1) Bachelor's (coded as 0) versus less than Associate's (coded as 1), (2) Bachelor's versus Associate's (coded as 1), and (3) Bachelor's versus greater than Bachelor's (coded as 1).

For the dependent variables, three factor variables from the CLASS were used in the current study (see Table 2). The three factors of the CLASS were learning climate, emotional support, and instructional support. Emotional support and instructional support are the variables that have been used in previous research. La Paro et al. (2004) identified these two factors by using a principal components analysis with varimax rotation and questions have been raised about both the extraction and rotation methods.

First, the goal of principal components analysis (PCA) is to reduce the information in many variables into a set of weighted linear combinations of those variables (i.e., data reduction), and this method does not differentiate between common and unique variance. Fabrigar, Wegener, MacCallum, and Strahan (1999) review literature and argue that "many researchers mistakenly believe that PCA is a type of exploratory factor analysis (EFA) when in fact these procedures are different statistical methods designed to achieve different objectives" (p. 275). These authors explain that data reduction does not attempt to model the structure of correlations among the original variables. Therefore, if the goal is to identify the latent variables which are contributing to the common variance in a set of measured variables, factor analyses should be used.

Factor analyses attempt to exclude unique variance from the analysis and the goal is to identify latent constructs underlying measured variables (i.e., explaining correlations among measured variables) (Fabrigar, Wegener, MacCallum, & Strahan, 1999; Velicer & Jackson, 1990). Putting together, EFA is the appropriate method to identify latent variables (emotional support and instructional support in the La Paro et al.'s study).

Second, varimax rotation is one of the orthogonal rotation methods that constrain factors to be uncorrelated. Theoretically, however, the two factors are more likely to be interrelated. In fact, La Paro et al. found that there is a positive relationship between the two factors ( $r = .59, p < .01$ ). According to Fabrigar et al. (1999), if the latent variables are correlated, then an oblique rotation will produce a better estimate of the true factors and a better simple structure than will an orthogonal rotation. Therefore, for the CLASS measure, an oblique rotation is a more appropriate method to be used.

For the current study, an EFA (i.e., unweighted least squares) with an oblique rotation (i.e., promax) method was used in order to see if the same factor solution would be obtained for the CLASS. Particularly, an unweighted least squares method was used because some of the CLASS variables were markedly non-normal, although others were not. Results of this analysis identified the same two factors as La Paro et al.'s analysis and these results were supported by another method (i.e., a PCA with promax rotation). Factor loadings (or component loadings) from pattern matrix are listed in Tables 5 and 6. However, the scree plot suggested that there might be only one factor (see Figure 1). Factor loadings for the one-factor solution are seen in Table 7. For the current study,

Table 5. Factor Loadings from the Pattern Matrix for Two-Factor Solution (Unweighted Least Squares with Promax Rotation)

Scale	Loadings	
	Emotional Support	Instructional Support
Negative climate	-.91	
Behavior management	.89	
Positive climate	.80	
Teacher sensitivity	.67	
Overcontrol	-.46	
Concept development		1.01
Quality of feedback		.92
Learning formats		.55
Productivity		.51

Table 6. Component Loadings from the Pattern Matrix for Two-Factor Solution (PCA with Promax Rotation)

Scale	Loadings	
	Emotional Support	Instructional Support
Negative climate	-.92	
Behavior management	.83	
Positive climate	.76	
Overcontrol	-.73	
Teacher sensitivity	.63	
Quality of feedback		1.03
Concept development		1.00
Learning formats		.62
Productivity		.60

Scree Plot

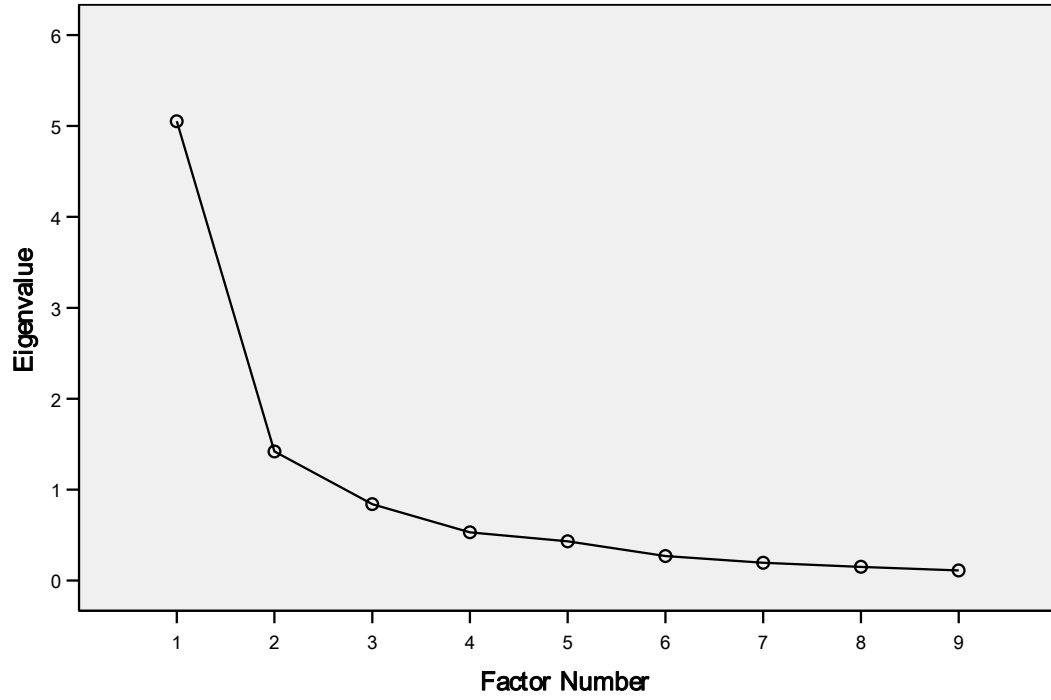


Figure 1. A Scree Plot for the CLASS Scales



Table 7. Factor Loadings from the Pattern Matrix for One-Factor Solution (Unweighted Least Square)

Scale	Loadings
Productivity	.88
Teacher sensitivity	.82
Positive climate	.81
Learning formats	.80
Behavior management	.79
Concept development	.67
Negative climate	-.66
Quality of feedback	.55
Overcontrol	-.31

therefore, all the three factors (i.e., one from the one-factor solution and two-factors from the two-factor solution) of the CLASS were used.

### Overview of Data Analysis

Relationships among various predictor variables and dependent variables were examined by using correlations. The potential range of the three factor scores of the CLASS (i.e., learning climate, emotional support, and instructional support) is between 1 and 7 and they are variables with proportional scores. Thus, they can be considered variables with continuous scores. Multiple regressions were used to examine the effects of various predictor variables on the three CLASS variables.

An examination of the distribution of the residuals for the dependent variables did not indicate problems with normality and an examination of scatter plots of the predicted values and the residuals did not indicate problems with homoscedasticity for these variables. Moreover, there were no influential outliers in the data (Cook's  $D < 1$ ). In the current study, multivariate analyses were designed to address the research questions. For question1, main effects of the program characteristics, teacher characteristics, and teachers' psychological characteristics on the classroom quality variables were examined using simultaneous regressions and hierarchical regressions. The interaction effects of these variables were examined by hierarchical regressions. For simultaneous regressions, all the predictor variables were entered at the same time. Therefore, information regarding direct effects of the variables and the unique associations between each of the predictors and the dependent variable(s) was obtained. For hierarchical regressions, predictors were entered in the order of most distal to most proximal in relation to

observed classroom quality. The predictor variables were sequentially entered into each of the four blocks in the following order: (1) program characteristics (program-level and classroom-level variables), (2) teacher demographic characteristics, (3) teachers' psychological characteristics, and (4) cross-product terms between variables.

For question 2, in order to test for the mediating effects of teachers' psychological characteristics, a series of multiple regressions were run using Baron and Kenny procedure (Baron & Kenny, 1986): (1) regressing a dependent variable on an independent variable; (2) regressing a mediator on the independent variable, and; (3) regressing the dependent variable on both the independent variable and on the mediator. In addition, the amount of mediation (i.e., indirect effects) was tested using the Sobel test (Sobel, 1982).

As the first step, the relationship between an independent variable (among the program and teacher characteristics) and a dependent variable was examined by a regression. Next, at the second step, the relationship between the independent variable from the first step and a mediating variable (teachers' self-efficacy, traditional child-rearing views, or depression) was examined. Finally, at the third step, the effect of the mediating variable (the one that was used at the second step) on the classroom quality variable (the one that was used at the first step) was examined. The independent variable as well as the mediating variable were entered in the final step. This is because the mediating variable and the dependent variable may be correlated (i.e., both caused by the independent variable). Thus, the independent variable was controlled in establishing the effect of the mediating variable on the dependent variable.

## RESULTS

### Descriptive Statistics of the Classroom Quality Variables

The mean scores of the CLASS variables were middle-range scores (see Table 8). The mean score for instructional support was lower than the mean score for emotional support. The mean scores for the Snapshot variables were less than the middle score (all the mean scores were less than .2 where the potential range is between 0 and 1). In addition, there was very limited variance in the variables. Specifically, the mean and median scores for routine practice was .01 and the mean scores of minimal, simple, elaborating, and scaffolding were smaller than .10. Therefore, these were not variables (rather constants) and we would need a huge sample size to use these variables as predictors. Given the small amount of variability, the Snapshot variables were excluded for regression analyses. Descriptive statistics of the Snapshot variables are reported in Table 8.

Table 9 shows the descriptive statistics of the classroom quality variables across the different sub-groups of the program-level variables (location, program type, and length of the program). Difference of the scores between the two locations (i.e., public school and non-public school), between the two program types (Head Start and non-Head Start), and between the two types of program based on the hours of service provided (half-day and full-day) was not noticeable (and statistically not significant).

Table 8. Descriptive Statistics of the CLASS and the Snapshot Variables

	Mean	Median	<i>SD</i>	Min	Max
<b>CLASS<sup>1</sup></b>					
Learning Climate	4.39	4.38	.75	2.44	6.47
Emotional Support	5.22	5.29	.76	2.49	6.83
Instructional Support	3.36	3.22	.95	1.31	6.20
<b>Snapshot<sup>2</sup></b>					
Routine	.01	.01	.01	.00	.09
Minimal	.04	.03	.03	.00	.13
Simple	.06	.06	.04	.00	.23
Elaborating	.06	.05	.05	.00	.38
Encouraging	.17	.17	.10	.00	.55
Scaffolding	.05	.04	.04	.00	.28
Didactic	.16	.15	.08	.01	.41

1. The potential range for the CLASS variables is between 1 and 7.
2. The potential range for the Snapshot variables is between 0.0 and 1.0

Table 9. Descriptive Statistics of the Classroom Quality Variables based on the Location, Program Type, and Length of the Program

	Not public school				Public school			
	Mean	<i>SD</i>	Min	Max	Mean	<i>SD</i>	Min	Max
Learning climate	4.37	.77	2.44	6.47	4.41	.74	2.53	6.19
Emotional support	5.23	.81	2.49	6.69	5.21	.73	3.10	6.83
Instructional support	3.39	.95	1.71	6.20	3.41	.95	1.31	5.72
Routine	.01	.01	.00	.06	.01	.01	.00	.09
Minimal	.03	.03	.00	.13	.04	.03	.00	.13
Simple	.06	.04	.01	.23	.06	.04	.00	.20
Elaborating	.06	.04	.00	.29	.06	.05	.00	.38
Encouraging	.16	.08	.00	.45	.18	.11	.00	.55
Scaffolding	.05	.04	.00	.28	.06	.05	.00	.19
Didactic	.14	.08	.01	.38	.18	.08	.01	.41

	Not Head Start				Head Start			
	Mean	<i>SD</i>	Min	Max	Mean	<i>SD</i>	Min	Max
Learning climate	4.47	.77	2.44	6.47	4.19	.69	2.68	5.72
Emotional support	5.26	.76	2.49	6.83	5.13	.77	3.46	6.63
Instructional support	3.49	.98	1.31	6.20	3.03	.78	1.71	5.15
Routine	.01	.01	.00	.09	.01	.01	.00	.06
Minimal	.04	.03	.00	.13	.03	.03	.00	.13
Simple	.06	.04	.00	.23	.06	.03	.01	.15
Elaborating	.06	.05	.00	.38	.06	.05	.00	.29
Encouraging	.18	.10	.00	.55	.17	.09	.00	.45
Scaffolding	.06	.05	.00	.28	.05	.04	.00	.16
Didactic	.17	.08	.01	.41	.14	.08	.01	.36

	Half-day				Full-day			
	Mean	<i>SD</i>	Min	Max	Mean	<i>SD</i>	Min	Max
Learning climate	4.42	.69	2.68	6.19	4.39	.83	2.44	6.47
Emotional support	5.30	.72	3.10	6.83	5.14	.81	2.49	6.69
Instructional support	3.32	.85	1.71	5.72	3.45	1.03	1.68	6.20
Routine	.01	.01	.00	.09	.01	.01	.00	.06
Minimal	.04	.03	.00	.13	.03	.03	.00	.13
Simple	.07	.04	.00	.23	.06	.03	.00	.17
Elaborating	.07	.06	.00	.38	.06	.05	.00	.29
Encouraging	.19	.11	.00	.55	.16	.08	.00	.45
Scaffolding	.06	.05	.00	.28	.05	.04	.00	.16
Didactic	.17	.09	.02	.41	.15	.08	.01	.37

## The Relationships among Various Factors and Classroom Quality Variables

### *The Relationships among the Program and Teacher Characteristics*

Location of the school was found to be positively related to teachers' education level (i.e., dummy-coded variable where Bachelor's degree was coded 0 and greater than Bachelor's was coded 1), years of their experience with pre-k/k children, and state certification to teach 4-year old children. In addition, negative relationships were found between location of the school and program type, length of the program, two dummy-coded variables of education level (Bachelor's versus less than Associate's or Associate's), and major (ECE/CD versus no degree). These relationships were all statistically significant and the strength of the relationships was weak to moderate.

Classrooms located in a public school building were found to have more children with special needs and these classrooms were more likely to be half-day program than classrooms located out of a public school building. Teachers in these classrooms were more educated, had more teaching experience with pre-k through k children, and were more likely to hold a state certification to teach 4 year-old children than teachers in classrooms located out of a public school building.

A moderate and statistically significant positive relationship was found between the program type and the percentage of children from low-income families. In addition, positive and statistically significant correlations were found between location and teacher-child ratio, education level (Bachelor's versus less than Associate's or Associate's), and major (ECE/CD versus no degree). The program type was negatively

related to class size, education level (Bachelor's versus greater than Bachelor's), and state certification to teach 4-year old children and these relationships were small.

For Head Start classrooms, class size was smaller and more numbers of children from low-income families and less numbers of children with LEP were included as compared to not Head Start classrooms. Teachers in Head Start were found to be less educated and they were less likely to have a state certification to teach 4 year-old children than teachers in not Head Start program. The correlations among the program characteristics and teacher characteristics are reported in Table 10.

*The Relationships among the Program and Teacher Characteristics and Classroom Quality Variables*

There were small, statistically significant negative relationships between learning climate or emotional support and teachers' child-rearing attitudes where teachers' traditional child-rearing attitudes were coded 0 and child-centered attitudes were coded 1. In other words, teachers with child-centered attitudes were more likely to be in classrooms with higher quality measured by the CLASS. In addition, teachers' depressive feelings were negatively related to learning climate of the classroom and their instructional support.

Moreover, the program type was negatively related to learning climate, emotional support, and instructional support. That is, Head Start classrooms were found to have lower classroom quality (measured by the CLASS). Moreover, negative relationships were found between the percentage of children from low-income families and all the



Table 10. The Relationships among the Program and Teacher Characteristics

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
1. Efficacy	--	.00	-.27***	.08	.01	-.02	-.06	.22***	.02	.15*	-.05	-.00	-.01	.10	.14*	-.10	-.12	.03	
2. Child-rearing <sup>a</sup>		--	.17**	-.09	.00	.12	.10	.14*	.09	-.24***	.14	.20*	.08	-.25***	-.09	-.05	-.00	.02	
3. Depression			--	-.10	.06	.01	-.07	.03	.05	-.11	.23	.11	.02	-.09	-.11	-.02	.15	-.01	
4. Location <sup>b</sup>				--	-.21**	-.31***	.02	-.09	.07	.20	.15	-.20**	-.18**	.36***	.13*	.01	-.19**	.29***	
5. Program type <sup>c</sup>					--	.06	-.21**	.22***	.41***	.05	-.20	.22***	.19**	-.28***	-.05	-.03	.14*	-.21**	
6. Length <sup>d</sup>						--	.19**	.25***	-.10	-.09	-.22	.00	.12	-.11	-.11	.01	-.07	-.08	
7. Class size							--	.46***	-.08	-.10	.14	-.04	.07	-.10	-.04	-.10	-.05	.01	
8. Ratio								--	-.14*	-.27***	.07	-.07	.03	-.09	-.10	-.05	-.03	.02	
9. Low-income									--	-.05	.27***	.14*	.16*	-.12	.09	-.15*	.15*	-.07	
10. IEP										--	-.17	-.09	-.05	.15*	.02	.04	-.03	-.04	
11. LEP											--	.03	-.02	.07	-.02	-.14*	-.03	.13	
12. Education level <sup>e</sup>												--	-.25***	-.44***	-.01	-.29***	.59***	-.19**	
13. Education level <sup>f</sup>													--	-.40***	-.05	-.23***	-.15*	-.09	
14. Education level <sup>g</sup>														--	.22***	.27***	-.26***	.26***	
15. Pre-k/k exp															--	-.11	-.09	.10	
16. Major <sup>h</sup>																--	-.2	-.14*	
17. Major <sup>i</sup>																	--	-.22***	
18. Certificate																			--

Child-rearing<sup>a</sup>: (0 = traditional attitudes, 1 = child-centered attitudes), Location<sup>b</sup>: (0 = non-public school, 1 = public school), Program type<sup>c</sup>: (0 = non-Head Start, 1 = Head Start), Length<sup>d</sup>: (0 = half-day, 1 = full-day), Education level<sup>e</sup>: (0 = BA, 1 = less than Associate's), Education level<sup>f</sup>: (0 = BA, 1 = Associate's), Education level<sup>g</sup>: (0 = BA, 1 = greater than BA), Major<sup>h</sup>: (0 = ECE/CD, 1 = other education), Major<sup>i</sup>: (0 = ECE/CD, 1 = no degree) \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

three factor variables of the CLASS. The classrooms with higher concentration of children from low-income family had lower scores on the classroom quality variables (i.e., learning climate, emotional support, and instructional support). The correlations among the various factor variables and classroom quality variables are reported in Table 11.

### *The Relationships among the Classroom Quality Variables*

The three variables of the CLASS had statistically significant and positive interrelationships. Learning climate was highly correlated with emotional support ( $r = .89$ ,  $p < .001$ ) and instructional support ( $r = .89$ ,  $p < .001$ ). There was also a large and positive relationship between emotional support and instructional support ( $r = .59$ ,  $p < .001$ ).

### Factor Analysis

Based on consideration of the limitations from the La Paro et al.'s (2004) analysis in identifying the CLASS factors, an EFA method (unweighted least square) with promax rotation was used in the current study. In order to compare with the two factors identified by La Paro et al., a two-factor solution was first examined in the study. As a result, the same two factors as identified by La Paro et al. (2004) were revealed (see Table 5). The first factor (i.e., emotional support) consisted of negative climate, behavior management, positive climate, teacher sensitivity, and overcontrol and accounted for 52.82% of total variance. The second factor (i.e., instructional support) consisted of concept development, quality of feedback, learning formats, and productivity and accounted for 12.08% of variance. Factor loadings of the variables based on the two-factor solution of an unweighted least square method are seen in Table 5. Furthermore, the same two

Table 11. The Relationships between the Predictor Variables and the Classroom Quality

Variables

	Learning Climate	Emotional Support	Instructional Support
Efficacy	.04	.01	.07
Child-rearing attitudes	-.13*	-.14*	-.10
Depression	-.14*	-.11	-.13*
Location <sup>a</sup>	.03	-.01	.06
Program type <sup>b</sup>	-.17*	-.08	-.23***
Length <sup>c</sup>	-.02	-.10	.07
Class size	-.07	-.05	-.07
Ratio	.03	.04	.02
Low-income children	-.30***	-.19**	-.34***
IEP	.09	.07	.14
LEP	-.02	.07	-.12
Education level <sup>a</sup>	.01	.03	-.02
Education level <sup>b</sup>	-.12	-.06	-.16
Education level <sup>c</sup>	.10	.04	.14
Pre-k/k experience	.04	.07	.00
Major <sup>d</sup>	.01	-.02	.03
Major <sup>e</sup>	-.08	-.05	-.09
State certification	.11	.13	.08

Child-rearing<sup>a</sup>: (0 = traditional attitudes, 1 = child-centered attitudes), Location<sup>b</sup>: (0 = non-public school, 1 = public school), Program type<sup>c</sup>: (0 = non-Head Start, 1 = Head Start), Length<sup>d</sup>: (0 = half-day, 1 = full-day), Education level<sup>e</sup>: (0 = BA, 1 = less than Associate's), Education level<sup>f</sup>: (0 = BA, 1 = Associate's), Education level<sup>g</sup>: (0 = BA, 1 = greater than BA), Major<sup>h</sup>: (0 = ECE/CD, 1 = other education), Major<sup>i</sup>: (0 = ECE/CD, 1 = no degree)

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

factors were revealed from a PCA with promax rotation (see Table 6).

An examination of the scree plot suggested that there might be only one factor in the CLASS measure (see Figure 1). One-factor solution from an unweighted least square accounted for 51.57% of total variance. Factor loadings for the one-factor solution are seen in Table 7. Reliabilities of the total factor (i.e., learning climate) from the one-factor solution and the two factors (i.e., emotional and instructional support) from the two-factor solution revealed that these factors are reliable. The Cronbach's alphas for learning climate, emotional support, and instructional support are .89, .84, and .88, in order. Correlations among the nine scales are in Table 12.

### Regression Analyses

The first overall question concerns main and interaction effects of various predictors. The first part of this section presents the results of simultaneous regression models and the second part of this section demonstrates the results of hierarchical regression models including cross-product terms in the final step. The last part of this section reports the findings about the effects of program-, classroom-, and teacher-level variables on the teachers' psychological characteristics. For the regression models in this study, non-directional hypotheses were tested because a result in either direction would be important and also because the direction of the relationship between some of the predictor variables and dependent variables were unclear (not tested by previous research).

Examinations of the distribution of the residuals for the three dependent variables did not indicate problems with normality. In addition, scatter plots of the predicted

Table 12. Correlation Matrix of the CLASS

	1	2	3	4	5	6	7	8	9
1 Positive climate	---	-.64*	.82*	-.31*	.70*	.64*	.46*	.53*	.34*
2 Negative climate		---	-.54*	.33*	-.76*	-.54*	-.29*	-.43*	-.17*
3 Teacher sensitivity			---	-.29*	.69*	.62*	.52*	.60*	.43*
4 overcontrol				---	-.25*	-.22*	-.06	-.34*	-.03
5 Behavior management					---	.69*	.36*	.56*	.32*
6 Productivity						---	.64*	.83*	.54*
7 Concept development							---	.65*	.76*
8 Learning formats								---	.52*
9 Quality of feedback									---

\*.  $P < .001$

values and the residuals did not indicate problems with homoscedasticity. The lowest tolerance was .36, suggesting no problem with multicollinearity. The largest value of Cook's D was .06, suggesting that there were no influential outliers.

### *Main Effects*

In order to examine the main effects of various factors on classroom quality, a simultaneous regression was run for each dependent variable. Program characteristics (program- and classroom-level variables) and teacher characteristics (teachers' demographic and psychological characteristics) were entered at the same time in the regression models. The regression statistics of the significant predictors for learning climate, emotional support, and instructional support are reported in Table 13.

There were no statistically significant relationships between program- or teacher-level variables and classroom quality. Of the classroom-level independent variables, the percentage of children from low-income families was found to be a statistically significant predictor of learning climate and emotional support, after controlling for all the other multi-level independent variables. The direction of these relationships between the proportion of children from low-income families and the two CLASS variables was negative. In addition, the number of children with LEP in the classroom was found to be a statistically significant predictor of emotional support after controlling for all the other predictor variables. Pre-k teachers from classrooms with higher number of children with LEP were found to have higher scores on their emotional support than were teachers from classrooms with lower number of children with LEP.

Table 13. The Significant Predictors Revealed from Simultaneous Regressions

Dependent Variable	Independent Variable	<i>B</i>	<i>Se. B</i>	$\beta$	<i>T</i>
Learning climate	Class size	-.04	.02	-.18	-1.86*
	Low-income children	-.63	.29	-.24	-2.18**
Emotional support	Low-income children	-.60	.29	-.22	-2.05**
	LEP	.03	.02	.23	2.35**
	Years of experience with pre-k/k	.02	.01	.15	1.71*
Instructional support	Class size	-.05	.03	-.17	-1.76*
	Low-income children	-.67	.36	-.20	-1.86*

\*  $p < .10$ , \*\*  $p < .05$

### *Interaction Effects*

Interaction effects among the predictor variables were examined by hierarchical regression models. When cross-product terms were entered in the final block of hierarchical regression models, no regression models were found to be statistically significant.

### *The Effects of the Multi-Level Factors on the Teachers' Psychological Characteristics*

The main effects of the program characteristics and teacher demographic characteristics on the teachers' psychological characteristics were examined using simultaneous regressions. Any statistically significant relationship reported in this section indicates the statistically significant effect of an independent variable after controlling for all the other independent variables in the model. The two dummy-coded variables of teachers' major were found to be statistically significant predictors for the level of their efficacy beliefs, when controlling for all the other multi-level predictor variables: teachers who majored in early childhood education or child development were more likely to be highly efficacious than teachers who had no degrees or who majored in other education or other fields.

A positive relationship was found between teachers' education level and their attitudes toward child-rearing and this relationship was statistically significant: teachers who majored in early childhood education or child development were found to have more child-centered child-rearing views than teachers who did not have a degree. Moreover, there was a negative and statistically significant relationship between teachers' major and their attitudes toward child-rearing: teachers with Bachelor's degree were more likely to



hold traditional child-rearing views than teachers with less than Associate's degrees. All the regression statistics are reported in Table 14.

### Mediating Effects

The second overall question concerns mediating effects of teachers' self-efficacy beliefs, attitudes toward child-rearing, and depression. Mediating effects were first tested by a series of regression models using Baron and Kenny procedure (Baron & Kenny, 1986): (1) regressing a dependent variable on an independent variable; (2) regressing a mediator on the independent variable, and; (3) regressing the dependent variable on both the independent variable and on the mediator. No statistically significant models were found. Therefore, Sobel test (Sobel, 1982) was not needed in order to examine the amounts of mediation (i.e., the indirect effect).

Table 14. Significant Relationships Found in Regression Analyses for Variables Predicting the Teachers' Psychological Characteristics

Independent Variable	Teachers' Psychological Characteristics	<i>B</i>	<i>Se. B</i>	$\beta$	<i>T</i>	Explanation
Major <sup>a</sup>	Self-Efficacy	-.29	.92	-.27	-3.13**	ECE/CD major related to High Self-Efficacy scores; other education/other fields related to Low Self-Efficacy scores
Major <sup>b</sup>		-5.14	1.94	-.27	-2.65**	ECE/CD major related to High Self-Efficacy scores; no degree related to Low Self-Efficacy scores
IEP	Attitudes toward Child-Rearing	-.69	.31	-.18	-2.23*	High IEP related to Traditional Child-Rearing Attitudes; Low IEP related to Child-Centered Child-Rearing Attitudes
Education Level <sup>c</sup>		9.27	2.99	.37	3.10**	BA degree related to Traditional Child-Rearing Attitudes; Less than Associate's degree related to Child-Centered Attitudes
Major <sup>b</sup>		-12.61	3.68	-.34	-3.43**	ECE/CD major related Child-Centered Attitudes; No degree related to Traditional Child-Rearing Attitudes
LEP	Depression	.56	.13	.37	4.24***	High LEP related to High Depression scores

Major<sup>a</sup> : Dummy-coding (0 = ECE/CD, 1 = Other education/other fields)

Major<sup>b</sup> : Dummy-coding (0 = ECE/CD, 1 = No degree)

Education Level<sup>c</sup> : Dummy-coding (0 = Bachelor's, 1 = Less than Associate's)

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

## DISCUSSION

### Factor Analyses

One of the instruments that measured classroom quality in this study is the CLASS (La Paro, & Pianta, 2003). The authors of the CLASS used a principal components analysis (PCA) with varimax rotation (La Paro et al., 2004) to report that the CLASS included two factors. However, both the extraction and rotation methods used by La Paro et al. were questioned by the researcher.

First, a PCA is an extraction method of which the primary goal is different from a factor analysis (Fabrigar et al., 1999). PCA seeks a linear combination of variables such that the maximum variance is extracted from the variables. PCA results in orthogonal (uncorrelated) factors and it analyzes total (common and unique) variance. On the other hand, an exploratory factor analysis (EFA) is a latent variable procedure which is used to uncover the latent structure (dimensions) of a set of variables. A latent variable is an unobserved, underlying variable that accounts for the observed or manifest variables (Velicer & Jackson, 1990). According to Fabrigar and colleagues (1999), EFA is an appropriate method if the goal is to identify latent variables.

Second, varimax rotation is an orthogonal rotation of the factor axes to maximize the variance of the squared loadings of a factor (column) on all the variables (rows) in a factor matrix, which has the effect of differentiating the original variables by extracted factor. A varimax solution yields results which make it as easy as possible to identify each variable with a single factor. However, an orthogonal rotation assumes that the factors are uncorrelated. Fabrigar et al. (1999) made a strong argument in favor of

oblique rotations rather than orthogonal solutions. They argued that if the latent variables are correlated, then an oblique rotation would produce a better estimate of the true factors and a better simple structure than would an orthogonal rotation.

Given these two questions about the methods used by La Paro and colleagues, an exploratory factor analysis (unweighted least squares) with an oblique rotation (promax) was used in this study. Unweighted least squares method was considered an appropriate method for the CLASS variables because some of the CLASS variables were markedly non-normal. In this study, all the three factor variables (two from the two-factor solution and one from the one-factor solution) were used. These factor variables were constructed by averaging the scores of all the variables that were included in each of the factor variables.

From the factor analyses, the overcontrol variable was found to have the lowest extraction communality. The communality scores of overcontrol were .10 for the one-factor solution and .15 for the two-factor solution. Small values of communalities indicate variables that do not fit well with the factor solution and probably should be dropped from the analyses. However, this variable was included in the factor variables (i.e., learning climate and emotional support) in the current study, because the reliabilities for these two factor variables were adequate even with the overcontrol variable. In addition, this decision was made in order to use the same factors reported by the authors of the CLASS (La Paro et al., 2004). Cronbach's alphas for learning climate, emotional support, and instructional support were .89, .84, and .88, respectively.

## Children from Low Income Families, LEP, and IEP

Two, statistically significant predictor variables in this study were the percentage of children from low income families and the number of children with LEP in the classroom, both specific descriptions of children who composed the classrooms (group composition). In the current study, higher percentages of children from low-income families predicted lower classroom quality measured by the two factor variables of the CLASS (learning climate and emotional support) and these relationships were statistically significant ( $p < .05$ ). In addition, there was a negative relationship between the percentage of children from low-income families in the classroom and teachers' instructional support (this relationship was significant at  $p < .10$ ). In other words, teachers working with more children from low-income families were less likely to provide a high quality learning climate (positive emotional and instructional caregiving and better classroom management).

This finding is consistent with previous research. For example, Pianta, La Paro, Payne, Cox, and Bradley (2002) found that global ratings of teachers' positive interactions with children, classroom instructional climate, and classroom child-centered climate were lower when the concentration of poverty in the school was high and the children's family income was low. In addition, Buchanan et al. (1998) found that the number of children on free or reduced lunch predicted the developmentally inappropriate practices and the inappropriate beliefs of teachers.

Buchanan et al. suggested that teachers' respect for families' preferences about how children should and need to be taught might be reflected in their practice. This may be true because research shows that families with low socioeconomic status prefer

teacher-directed methods of instruction for their children (Hyson, Hirsh-Pasek, Rescorla, Cone, & Martell-Boinske, 1991; Stipek, Milburn, Galluzzo, & Daniels, 1992). Alternatively, they explained, their finding may reflect the unique school culture often found in schools serving children from predominantly low-income families. That is, they suggest that teachers from schools where low-income families are prevalent may have low expectations of children and hence they may be less likely to offer challenges for the development of children's higher-order thinking. Or, as a third possibility, Buchanan et al. explained that their findings might be the results of teacher decision-making which might have led the teachers to conclude that the children from low-income families need skills-based instructions. The findings of this study make sense in that higher numbers of low-income children may be related to lower classroom quality and engender more instructional support from teachers. However, exactly how this instructional support is operationalized is unclear from the data in the current study.

Perhaps some clarification can be gained by looking at the impact of having larger numbers of children with limited English proficiency (LEP) in the classroom. The number of children with LEP was found to be a statistically significant predictor of classroom quality in this study. In the current study, statistically significant and positive relationships were found between the number of children with LEP in the classroom and teachers' emotional support. Teachers with a high concentration of children with LEP in their classrooms were found to provide more emotional supports in the classroom.

Thus, only two independent variables (i.e., the percentage of children from low-income families and the number of children with LEP in the classroom) predicted classroom quality (instructional support and/or emotional support). What these two

independent variables have in common is that they actually describe the kind of children (characteristics of the children) who were present in each classroom in the study. They were measures of group composition, but specific to characteristics of children. The other independent variables were not descriptors of the children, rather described such things as the program location, length of the program, program type, ratio, class size, and teacher qualifications. Whereas, the issues of family income level and limited English proficiency were the descriptors that portrayed a picture of the kind of children who were in each classroom. This point will be explained in more depth in the structure/process section of this discussion.

However, in this study, the number of children with IEP in the classroom did not predict classroom quality. Research shows that teachers from classrooms with more children with disabilities are more likely to use developmentally appropriate practice (Buchanan et al., 1998; Salisbury, Mangino, Petrigala, Rainforth, Syrcia, & Palombaro, 1994) than teachers from classrooms with fewer numbers of children with disabilities. Maxwell, McWilliam, Hemmeter, Ault, and Schuster (2001) suggest that if teachers are responsible for implementing children's individualized education plans (IEP), in order to meet the needs of individual children with disabilities, then we would expect to see more individualized and developmentally appropriate and less directive practices in classrooms with more children with disabilities. In the current study, the number of children with IEP in the classroom had a negative relationship with the number of children with LEP in the classroom (see Table 10). Moreover, the number of children with an IEP was not a statistically significant predictor of classroom quality, while the number of children with LEP was a statistically significant predictor. Although the literature on children with IEPs

indicates that we would expect to see more individualized and developmentally appropriate and less directive practices in classrooms with more children with disabilities (Buchanan et al., 1998; Maxwell, McWilliam, Hemmeter, Ault, and Schuster, 2001; Salisbury Mangino, Petrigala, Rainforth, Syrca, & Palombaro, 1994), in the current study, there were no changes in classroom quality according to the number of children with IEP in the classroom. Yet there were changes in regard to the number of children with LEP in the classroom. No research on the relationship between the number of children with LEP and classroom quality was found. What we do know is that IEP and LEP should not be equated, substantiated by the negative correlation between them that was found in this study; and the fact that IEP was not a predictor of classroom quality, though LEP was. Future studies need to examine the effect of the presence of children with LEP in the classroom on classroom quality.

## Structural and Process Quality Variables

### *Measures of Classroom Quality*

Classroom quality has been widely recognized as an important factor related to children's outcomes and assessed by many researchers in the field of early childhood education. Numerous studies have demonstrated that higher quality care is predictive of a range of positive developmental outcomes for children including language development, cognitive functioning, social competence, and emotional adjustment (NICHD ECCRN, 2000b; NICHD ECCRN, 2003). While there is consensus that quality matters, there is less consensus about what quality is or how it should be measured (Cassidy, Hestenes, Hansen, Hegde, Shim, & Hestenes, 2005; La Paro, Pianta, & Stuhlman, 2004; Sakai,



Whitebook, Wishard, & Howes, 2003). Historically, the assessment of classroom quality has partly focused on the physical settings of the classroom such as adequacy of materials for children, space for play, and safety. Or, it relied on more distal factors such as teacher-child ratio and credentialing. These latter two distal factors were included in this study.

Extant observation measures used in early childhood education research use global ratings. They vary substantially in the aspects of the classroom environment rated and the degree of inference made in the ratings. Measures of global or overall quality of the classroom environment include the Early Childhood Environment Rating Scale (ECERS; Harms & Clifford, 1980), the Infant-Toddler Environment Rating Scale (ITERS; Harms, Cryer, & Clifford, 1990), and the assessment profile for early childhood programs (Abbot-Shim & Sibley, 1987). Such observational instruments measure quality of the physical setting, curriculum, caregiver-child interactions, health, safety, scheduling of time, indoor and outdoor play spaces, teacher qualifications, play materials, center administration, and meeting staff needs. These measures primarily focus on the structural quality of early childhood programs but they do not measure classroom processes such as instructional practices or the quality of classroom interactions in context.

The focus of the study was to examine the relationship between various program and teacher characteristics and classroom quality. In the current study, classroom quality was conceptualized as what is constructed through teachers' classroom practice. The CLASS and the Snapshot were expected to measure process quality of classroom and hence intended to be included for regression analyses in the current study. In the current study, none of the structural independent variables (except for IEP and low-income)

predicted classroom process variables as measured by the CLASS. Going back to the previous discussion, this begins to raise the question of whether the structural variables of program and teacher characteristics are the appropriate predictors for studies about classroom process quality.

### *The Classroom Assessment Scoring System (CLASS)*

There is a recent movement centered on accountability in the field of early childhood education. Most states are increasingly investing state and federal funds to provide quality education for young children through the creation and support of public pre-k programs for larger numbers of children (especially from the low-income, minority children). Federal legislation such as the No Child Left Behind Act highlights the importance of quality in early education and emphasizes accountability, particularly that schools and classrooms should be held more responsible for student achievement. However, the mechanisms for ensuring accountability rest entirely on assessment of children (La Paro et al., 2004).

This tendency to view child assessment as the only means for ensuring accountability of classrooms and schools may be limited, because children's educational experiences in classrooms are related to the quality of education that can play an important role in children's achievement. This is where the recognition and measurement of process classroom quality variables becomes important. For example, teacher-child relationships are found to influence many school-related outcomes (Birch & Ladd, 1996; Howes, Matheson, Hamilton, 1994; Pianta, 1992; Wentzel, 1996). According to Pianta (1999), teacher-child relationships contribute to children's social and academic

competence. Teachers who engage in sensitive and responsive interactions with children are more likely to develop nurturing relationships, which are essential to children's security (Elicker & Fortner-Wood, 1995). Children who have a more secure relationship with their teacher are, in turn, more likely to explore their environment and, therefore, have more opportunities to learn. A number of studies have reported that children who have less directive, less harsh, and less detached teachers, experience more positive interactions, are more considerate and sociable (Phillips, McCartney, & Scarr, 1987), display higher levels of language development (Whitebook, Howes, & Phillips, 1990), and are observed to be more competent in cognitive activities (Howes & Stewart, 1987).

As such, interactions between children and their teachers provide a powerful context for early learning and development. Much of the research investigating relationships between teacher-child interactions and child outcomes has primarily focused on the warmth and sensitivity of interactions. However, there is a missing story in explaining teacher-child relationships. Even though a tremendous amount of research using various measures of teacher-child relationship has shown the effects of the affective aspect of the teacher-child relationship on children's outcomes, such research generally ignored another aspect, one that is probably more directly related to children's outcomes: instructional quality of the teacher-child relationships. In the current study, the CLASS was thought to assess emotional support, instructional support, and learning climate, a step toward understanding the instructional quality of the teacher-child relationships as process variables.

Most of the existing measures of classroom quality heavily focus on the structural quality of the classroom such as physical settings of the classroom (e.g., space,

furnishings, and materials), personal care routines, program structure, and teacher-child ratio or on the process quality such as positive, warm emotional climates of the classroom and teachers' responsiveness and sensitivity. On the other hand, the CLASS includes scales to assess the degree to which teachers promote high-order thinking and problem solving (i.e., concept development scale), how teachers engage children in activities and facilitate activities so that learning opportunities are maximized (i.e., instructional learning formats), and how teachers extend children's learning through their responses about children's learning and understanding (i.e., quality of feedback scale). Therefore, the CLASS is a measure that may allow us to assess the ignored construct in classroom quality measures (i.e., children's instructional experiences in the classroom).

Structural aspects of quality are often described as group composition and staff qualifications (Phillips & Howes, 1987) and process quality as actual experiences that occur in child care settings such as children's interactions with teachers, peers, and materials and their participation in activities (Vandell & Wolfe, 2000). The structural quality of the classroom is an important factor in children's quality education, however, the tendency to view this component of the classroom quality as the only means for ensuring accountability of classrooms and schools may be limited. In fact, structural dimensions of quality are typically considered to be more distal indicators of classroom quality and these dimensions do not directly impact child outcomes (Cassidy et al., 2005; NICHD, 2006). On the other hand, process features of classroom are considered to provide more direct information about the children's actual classroom experience.

It has been long assumed by policy analysts and state regulatory personnel that structural dimension of classroom quality are strongly related to process features of

classroom quality and are valid and reliable indicators of child care quality (Cassidy et al., 2005). However, it is still arguable whether or not structural indices can be readily substituted for process quality measures (Scarr, Eisenberg, & Deater-Deckard, 1994). Rather, it has been posited that structural indicators provide the foundation for process indicators but are not direct influences on the quality of care and education that children receive (Cassidy et al., 2005).

### Teacher Training and Quality

Contrary to the bulk of the literature that uses teacher preparation variables to predict classroom quality, no significant findings were found in this study. Tout and colleagues (2006) argue that research in this area suffers from imprecise measurement. For instance, education level, major, and training in the form of continuing education is often not uniformly well-defined nor measured well.

The argument for consistent and specific measurement of teachers' continued training is reinforced by Maxwell and colleagues (2006) when they pointed out that only a few studies that they reviewed contained a measure of pure training. Tout and colleagues (2006) discussed the importance of documenting the nature of teacher's continuing education (the content of the training and how often the training occurs). These authors argued that the role of training in professional development and its links to program quality have not been extensively examined. They indicated that the studies focusing on pure training might be hindered by imprecise measure. Often, research only measured training by assessing whether teachers had ever attended training or how often they attended training.

The NCEDL data did include a question concerning training. However, the question about continuing education (training) on the NCDEL teacher survey was not interpretable in terms of the quality and quantity of training (in other words, the training variables in the NCDEL study fell prey to the criticisms just discussed). The teachers who participated in the NCEDL study were asked to report where they received specialized training in early childhood education (e.g., in-service workshops in my center, workshops at professional meetings, courses in high school, courses for credit at a four year college or university) and this measure of training was not enough to tell us either the quantity or quality (content) of this continuing education and so this variables was not included in the data analyses. Hence, in the current study, the effects of teacher training was not examined and statistically controlled when the relationship between classroom quality and various predictor variables was examined.

Research generally has shown that teacher qualifications were positively related to classroom quality. However, there were also studies that did not reveal positive effects of teacher qualification variables on classroom quality, or at least not directly. Abbott-Shim et al. (2000) proposed a structural model of Head Start classroom quality. In this model, teachers' education level did not have direct effects on classroom quality but had indirect effects through their instructional activities. The National Day Care Study (Ruopp et al., 1979) found that child-related education and training but not formal education, was related to preschool classroom quality. Pianta and colleagues (2002) found that teachers' attitudes and beliefs about children were more important factors in predicting quality than were teacher education or credentials.

In this study, teachers' education level, their major (the content of teacher education), and state certificate were not found to be statistically significant predictors of process quality measured by the CLASS. Given the inconsistency of the findings across the studies, it is hard to compare the findings of this study to previous studies. Possible reasons for this inconsistency may be because neither the definition of teacher qualifications (Doherty, 1991; Maxwell et al., 2006) nor the strength of the relationship with quality are consistent (Tout et al., 2006) across the studies. Maxwell et al. identified three components of professional development: education, training, and credential. They indicated that the three components were often intermixed in the measures, and the terminology was not used consistently. Similarly, future studies should control for teacher characteristics variables and avoid drawing conclusions from simplistic research designs and statistical analyses. In this study, the effects of teachers' education level and state certification on classroom quality disappeared when other variables were controlled for.

Alternatively, inconsistent findings about the relationship between structural features of classroom quality (e.g., teacher education) and process quality may be because the classroom quality measures that are used in research assess different features of process quality in the classroom. For example, Burchinal and colleagues (2002) examined the associations between caregiver education and caregiver sensitivity measured by the Caregiver Interaction Scale (Arnett, 1989) and ECERS-R (Harms, Clifford, & Cryer, 1998). They found that classrooms with teachers with a Bachelor's degree had higher scores on these measures than classrooms with teachers with less education. In the Abbott-Shim et al. (2000)'s study on the model of Head Start classroom

quality, classroom quality was measured by the Assessment Profile for Early Childhood Programs: Research Version (Abbott-Shim, & Sibley, 1992). In this study, teachers' education level did not have direct effects on classroom quality but had indirect effects through their instructional activities.

As pointed out by La Paro et al. (2004), the CLASS is a new measure of process quality in the classroom that assesses a different aspect of classroom quality. It is designed to measure teachers' instructional supports for children's higher-order thinking as well as their emotional supports. Therefore, the predictors for other aspects of process quality (e.g., sensitivity, detachment, and harshness) that were measured in previous studies may not be the predictors for the CLASS variables.

In the current study, structural features of quality (teacher-child ratio, class size, and teacher education) did not significantly predict classroom quality. The two independent variables were found to be statistically significant predictors of emotional support and learning climate measured by the CLASS: the percentage of children from low-income families and the number of children with LEP. Although these are classroom-level variables, they do not indicate structural quality of the classroom. Rather, they describe the children in the classroom. So, regardless of teacher education and other structural features of teacher and classroom, process quality seemed to be impacted in this study by variables that are descriptive of the kind of children in the classroom.

Likewise, future research might consider teacher process variables as possible predictors of classroom quality such as teachers' personal practical knowledge (Connelly & Clandinin, 1986, 1995a, 1995b) and local knowledge (Cochran-Smith & Lytle, 1993). There is a wealth of literature emerging in this area that may be tapped for innovative



thinking in designing future research. In the current study, it was not possible to freely consider the role of teachers' personal practical knowledge or local knowledge. As discussed by the scholars, teachers actively construct their knowledge through their daily interactions with children, other teachers, administrators, and parents and this knowledge affects their classroom behaviors. Therefore, the characteristics of their teaching environment and the relationship of the teachers to significant others in the school with whom they interact are important in explaining teachers' classroom behaviors.

No statistically significant predictors were found for the variable of instructional support from the CLASS. However, marginal and negative relationships were found between class size or the percentage of children from low-income families and instructional support. In other words, classrooms with a higher concentration of children from low-income families had lower process quality in the classroom (lower scores on emotional support and instructional support). In addition, pre-k teachers from classrooms with higher class sizes were found to provide instructional support for children's higher order-thinking development less often than were teachers from classrooms with lower class sizes.

In sum, the percentage of children from low-income families seems to be a strong indicator of classroom process quality. The relationship between class size or the percentage of children from low-income families and instructional support was only significant at  $p < .10$ . More research is needed to figure out the predictors for the instructional quality of the classroom.

## Methodological Considerations in the Assessment of Process Quality

As reported, for five of the seven Snapshot measures, the mean scores were so low and the variance was so small that the Snapshot was not considered to be a viable measure for this study. Given these low scores and limited variances, other issues with the Snapshot bear mentioning. Higher scores on the three variables of the CLASS were considered to be indicators of high classroom quality, however, higher scores of the seven variables from the Snapshot did not seem necessarily to represent high classroom quality, as explained below.

All of the individual scores on the Snapshot variables had limited variances and the maximum scores only reached to the middle range of the possible scores. For example, the highest maximum score of all of the Snapshot variables was .55 for encouraging (see Table 8), where the possible range was between 0.0 and 1.0. However, if the range of scores on the Snapshot were wider, would we know more about the process quality of the classroom? For example, does knowing that there are more didactic interactions tell us very much about classroom quality?

In fact, the Snapshot may be an instrument that measures only a small part of process quality in the classroom. The Snapshot seems to provide information about the level of teacher interaction with children, not the quality of their interaction.

Methodologically, some of this may be explained in that the items of the Snapshot were not mutually exclusive and these items were coded as absent (coded as 0) or present (coded as 1). Observers coded teacher practice based on teachers' behaviors with a study child (four study children per classroom) rather than coding what happened in the setting at large as they did on the CLASS. For the mean score at the classroom-level on the

Snapshot, the scores were obtained by the equation of the total amount of time any of the observed children were engaged in the designated interaction divided by the total number of times children in that room were observed, for each time point. Hence, an observation of teachers' interaction with an individual child may not tell us what is going on in the classroom at any specific moment. Likewise, the method of data collection may not have lent itself to recording what was happening generally in the classroom. In future studies, mixed methods may be needed to figure out the process quality of the classroom (e.g., the quality of teacher-child interaction).

Perhaps the Snapshot measures the amount of particular teacher interaction preferences rather than the process quality of the classroom; or perhaps the Snapshot measures only one small part of process quality and other contingent data (mixed methods research designs) might help to build a more complete picture of process quality.

## SUMMARY OF FINDINGS

The purpose of this study was to examine the direct and indirect effects of various program, classroom, and teacher characteristics on classroom quality. The data of the NCEDL Multi-State Study of Pre-Kindergarten was used for the purpose of the study.

The main findings of this study are summarized as follows:

1. There were statistically significant and negative relationships between the percentage of children from low-income families in the classroom and learning climate and emotional support (significant at  $p < .05$ ) and instructional support (significant at  $p < .10$ ); there was a statistically significant and positive relationship between the number of children with LEP in the classroom and emotional support. The statistically significant relationships between independent and dependent variables that were identified by correlational analyses were washed out when the effects of other independent variables were controlled in multiple regressions.
2. No indirect effects were found in this study. Teachers' attitudes toward child-rearing, their level of self-efficacy beliefs, and depression were not significant mediators.
3. In addition to the fact that the Snapshot variables were proportional, they had extremely low means and limited variances. So, these variables were not used for regression analyses.
4. Teacher qualification variables were not statistically significant predictors of classroom process quality in this study.

## LIMITATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

The limitations of the current study were identified. First, the Snapshot variables had very limited variance so they were not used in regression analyses. In addition, even if the means and variances had been adequate for analyses, the Snapshot variables did not include the information about the contexts of where teachers' specific behaviors (i.e., routine, minimal, simple, elaborating, encouraging, scaffolding, and didactic practices) were observed. Contextual information could have made it possible to more accurately explain some findings of this study.

Second, teacher training variables could not be included in this study. The teacher training variables from the NCEDL study did not include the information on the quantity, quality, and content of the trainings that teachers had received, so were not selected for the current study. However, as suggested by Tout et al. (2006), teacher training may be a significant predictor of how teachers provide classroom practices and hence, this could not be thoroughly explained in this study.

Third, the findings of this study may not be generalized for the state-funded pre-kindergarten classrooms across the States. The sample in the NCEDL study consisted of pre-k teachers in state-funded classrooms in six states. These states were not randomly chosen. Out of 41 states that invested state funds in pre-kindergarten initiatives in 1999, the 19 states that had significant pre-kindergarten initiatives (i.e., states that served 15% of their state's 4-year-olds or served at least, 15,000 4-year-olds) were selected first. From the 19 selected states, 13 states were chosen to maximize diversity with regard to geography, location of the program, length of the program, and teacher credentialing

requirements. Finally, six states were invited to participate in the study and five states agreed. So, the sixth state was replaced so that the study has six participating states. Hence, these pre-k teachers may not be representative for all the pre-k teachers in state-funded pre-k classrooms. Moreover, the pre-k programs in these six states may not represent the pre-k programs in all the states.

Fourth, the current study used the NCEDL data that is accessible to public. This data did not contain information on the characteristics of the state in which each classroom was located (the restricted version of the NCEDL data set contains the information on the characteristics of the six states). Therefore, it is not possible to know whether the findings of this study are due to the characteristics of the six states or to the characteristics of classroom and/or teachers.

These limitations are inherent in the nature of secondary data analyses and are not meant as criticism of the NCEDL data. Rather they are factors that simply limited the scope of the interpretations of the current findings.

More research is needed in order to examine the relationship between teacher qualification variables (education, training, credentials) and teachers' classroom behaviors. In future studies, teacher qualification variables should be clearly defined and measured.

In addition, as discussed previously, more research is needed to examine the relationship between various predictor variables and process quality of the classroom measured by the CLASS (or a classroom quality measure that assesses similar aspects of the process quality of the classroom). Furthermore, in future studies, the contexts where teachers construct their knowledge ("personal practical knowledge" or "local

knowledge”) and how they use it in their teaching practices should be considered. This information may provide a better understanding of how various predictors are related to teachers’ appropriate or less appropriate behaviors in the classrooms. In this regard, mixed methods research designs may be helpful.

Finally, future studies need to use representative sample of pre-k teachers in state-funded programs. The number of state-funded pre-k programs is increasing across the states and state policy concerning teacher qualification and/or classroom characteristics (e.g., teacher-child ratio and class size) in state-funded pre-k programs is different across the states. Therefore, future studies need to consider the relationships between classroom quality and the state where each classroom is located.

## CONCLUSIONS

1. Teacher- and program-level, structural variables were not statistically significant predictors of classroom process quality in this study with the exception of two unique variables such as: (1) the percentage of children from low-income families and (2) the number of children with LEP in the classroom. These two predictors share a commonality in that they describe group composition (classroom-level variables) in terms of specific child characteristics and this commonality may be important to consider in choosing variables for measuring and predicting classroom process quality.
2. In order to identify the predictors of process quality, it may be necessary to reconsider the relative importance of structural variables compared to variables that are descriptive of children's actual characteristics, and may therefore be more closely related to the quality of teacher-child interaction for both instructional and emotional support.
3. Teacher qualification variables were not statistically significant predictors in this study. One reason might be that, like much of the previous research, the data on teacher qualifications in this study did not address the issues surrounding how to measure the quality of training.
4. The Snapshot is not a definitive measure of classroom process quality, though it may provide information about the level or amount of teacher interactions in the classroom. Thus it may be a valuable tool to support the measurement of process quality, but it is not a comprehensive measure of classroom process quality.



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## APPENDIXES

## APPENDIX A: FINDINGS ABOUT THE SNAPSHOT VARIABLES

### Regression Analyses

The first overall question concerns main and interaction effects of various predictors. The first part of this section presents the results of simultaneous regression models and the second part of this section demonstrates the results of hierarchical regression models including cross-product terms in the final step. The last part of this section reports the findings about the effects of program-, classroom-, and teacher-level variables on the teachers' psychological characteristics. For the regression models in this study, non-directional hypotheses were tested because a result in either direction would be important and also because the direction of the relationship between some of the predictor variables and dependent variables were unclear (not tested by previous research).

Examinations of the distribution of the residuals for the 10 dependent variables (i.e., the three factor variables of the CLASS and the seven variables of the Snapshot) did not indicate problems with normality. In addition, scatter plots of the predicted values and the residuals did not indicate problems with homoscedasticity. The lowest tolerance was above .20, suggesting no problem with multicollinearity. The largest value of Cook's D was .81, suggesting that there were no influential outliers.

### *Main Effects*

In order to examine the main effects of various factors on classroom quality, a simultaneous regression was run for each dependent variable. When program characteristics (program- and classroom-level variables) and teacher characteristics (teachers' demographic and psychological characteristics) were entered at the same time, the models were found to be significant for the three dependent variables: encouraging ( $F = 2.06, R^2 = .22, p = .009$ ), scaffolding ( $F = 2.85, R^2 = .28, p = .000$ ), and didactic ( $F = 1.86, R^2 = .20, p = .022$ ).

#### Program Characteristics (Program-Level)

Location of the program, program type, and length of the program were not found to be statistically significant predictors of classroom quality in the study. Multiple regressions revealed that these three program-level variables did not have statistically significant main effects on any of the classroom quality variables.

#### Program Characteristics (Classroom-Level)

Every classroom-level variable except one (the number of children with IEP in the classroom) was found to be statistically significant predictors of classroom quality. There were negative and statistically significant relationships between class size and two classroom quality variables (i.e., simple and scaffolding) of the Snapshot, when controlling for all the other multi-level variables (i.e., program-, classroom-, and teacher-level variables). In addition, the proportion of children from low-income families was found to be a statistically significant predictor of learning climate and emotional support, after controlling for all the other multi-level variables. The direction of these

relationships between the proportion of children from low-income families and the two CLASS variables was negative. Furthermore, positive and statistically significant relationships were found between the number of children with LEP and emotional support and encouraging behaviors of the teachers. The regression statistics are reported in Table B1.

#### Teacher Characteristics (Demographic Variables)

Teachers' education level and state certification were not statistically significant predictors of the classroom quality variables in the study. There were negative and statistically significant relationships between: (1) years of teaching experience with pre-k through k children and teachers' didactic practice and (2) teachers' major (ECE/CD versus no degree) and encouraging practice (see Table B2).

#### Teacher Characteristics (Psychological Characteristics)

Teachers' self-efficacy beliefs and their attitudes toward child-rearing were found to be statistically significant predictors of classroom quality. There were positive relationships between (1) self-efficacy beliefs and encouraging and; (2) attitudes toward child-rearing and didactic. However, teachers' depression was not a statistically significant predictor of classroom quality (see Table B2).

#### *Interaction Effects*

Interaction effects among the predictor variables were examined by hierarchical regression models. The model with interaction effects was only statistically significant for the classroom quality variable, didactic practice from the Snapshot. When the cross-

product terms among the predictors were entered in the final step of the hierarchical regression, 29% of additional variance was accounted for. Statistically significant interaction effects on didactic practice were found between location and the number of children with LEP, program type and class size, and teachers' self-efficacy beliefs and their major.

For pre-kindergarten teachers in a public school, teachers from classrooms with lower numbers of LEP children had higher scores on didactic practice than did teachers from classrooms with higher number of LEP children. On the other hand, for pre-kindergarten teachers not in a public school, teachers from classrooms with lower numbers of LEP children had lower scores on didactic practice than did teachers from classrooms with higher numbers of LEP children (see Figure C1).

For Head Start teachers, teachers from classrooms with lower class size had lower scores on didactic practice than teachers from classrooms with higher class size. For teachers not in Head Start, teachers from classrooms with lower class size had higher scores on didactic practice than teachers from classrooms with higher class size (see Figure C2).

For teachers who had their degrees in early childhood education or child development, the level of their self-efficacy beliefs did not appear to make a big difference on their scores on didactic practice. However, for teachers who did not have a degree, teachers with lower level of their self-efficacy beliefs had lower scores on didactic practice than did teachers with higher level of their self-efficacy beliefs and this difference was noticeable when the interaction was graphed (see Figure C3).

## Mediating Effects

The second overall question concerns mediating effects of teachers' self-efficacy beliefs, attitudes toward child-rearing, and depression. Mediating effects were tested by a series of regression models and the amounts of mediation (i.e., the indirect effect) were examined using Sobel tests (Sobel, 1982). In this section, the results of regressions and the Sobel tests are presented.

### *The Results of Regression Models*

Using Baron and Kenny procedure (Barron & Kenny, 1986) a series of regressions were run: (1) regressing a dependent variable on an independent variable; (2) regressing a mediator on the independent variable, and; (3) regressing the dependent variable on both the independent variable and on the mediator. Two models were found to be statistically significant. In the first model, teachers' education level (Bachelor's versus less than Associate's) predicted their attitudes toward child-rearing that, in turn, predicted their didactic practice after controlling for the effect of the education level (see Table B3). In the second model, teachers' education level (Bachelor's versus greater than Bachelor's) predicted their attitudes toward child-rearing that, in turn, significantly predicted their didactic practice after controlling for the effect of education level (see Table B4).

### *The Results of Sobel Tests*

In order to examine if the two dummy coded variables of teachers' education level indirectly affect the scores on teachers' didactic practice through teachers' attitudes toward child-rearing and whether the indirect effect is statistically significant, the Sobel

test (Sobel, 1982) was used. The Sobel tests showed that the mediating effects of the two dummy-coded variables were not statistically significant. For the model including the dummy variable of Bachelor's versus less than Associate's, the Sobel test statistics was 0.95 ( $p = .34$ ). For the model including the dummy variable of Bachelor's versus greater than Bachelor's, the Sobel test statistics was -0.97 ( $p = .33$ ).



APPENDIX B. TABLES

Table B 1. Significant Relationships Found in the Regression Analyses for Classroom-Level Variables Predicting Classroom Quality (N = 227)

Independent Variable	Dependent Variable (Classroom Quality)	<i>B</i>	<i>Se B</i>	$\beta$	<i>t</i>	Explanation
Class Size	Simple	-.002	.001	-.214	-2.22*	Low Class Size related to High Simple (i.e., not elaborating) scores
	Scaffolding	-.004	.001	-.308	-3.42**	Low Class Size related to High Scaffolding scores
T-C Ratio	Routine	-.002	.001	-.283	-2.79**	Low T-C Ratio related to High Routine scores
% of Children from Low-Income Family	Learning Climate	-.628	.290	-.236	-2.18*	Low % of Children from Low-Income Family related to High Learning Climate scores
	Emotional Support	-.596	.290	-.222	-2.05*	Low % of Children from Low-Income Family related to High Emotional Support scores
LEP	Emotional Support	.034	.015	.226	2.35*	Low LEP related to Low Emotional Support scores
	Encouraging	.004	.002	.211	2.31*	Low LEP related to Low Encouraging scores

\*  $p < .05$ , \*\*  $p < .01$

Table B 2. Significant Relationships Found in the Regression Analyses for Teacher-Level Variables Predicting Classroom Quality (N = 227)

Independent Variable	Dependent Variable (Classroom Quality)	<i>B</i>	<i>Se B</i>	$\beta$	<i>t</i>	Explanation
Years of Teaching with Pre-K/K	Didactic	-.002	.001	-.183	-2.11*	Less Teaching Experience with Pre-K/K related to High Didactic scores
Major <sup>a</sup>	Encouraging	-.107	.043	-.265	-2.45*	ECE/CD major related to High Encouraging scores; No degree related to Low Encouraging scores
Self-Efficacy	Encouraging	.004	.002	.180	2.05*	Low Self-Efficacy related to Low Encouraging scores
Attitudes toward Child-Rearing <sup>b</sup>	Didactic	.001	.001	.179	2.08*	Traditional (authoritarian) views related to Low Didactic scores; Modern (child-centered) views related to High Didactic scores

\*  $p < .05$

Major<sup>a</sup>: (Dummy coding: 0 = ECE/Child Development, 1 = no degree)

Attitudes toward Child-Rearing<sup>b</sup>: (Dummy coding: 0 = traditional (authoritarian) views, 1 = modern (child-centered) views)

Table B 3. Summary of a Series of Regression Analyses for Testing the Mediating Effects of Teachers' Education Level (Bachelor's versus Less than Associate's) on Didactic through Teachers' Attitudes toward Child-Rearing

Baron and Kenny Procedure	<i>B</i>	<i>Se B</i>	$\beta$	<i>t</i>	$R^2$	<i>F</i>
Step 1: Regressing "Didactic" on "Education Level" <sup>a</sup>	-.06	.01	-.27	-4.28***	.08	18.28***
Step 2: Regressing "Attitudes toward Child-Rearing" on "Education Level" <sup>a</sup>	4.68	1.57	.20	2.98**	.04	8.85**
Step 3: Regressing "Didactic" on "Attitudes toward Child-Rearing" after controlling for "Education Level" <sup>a</sup>	.001	.001	.15	2.22*	.10	12.60***

Education Level<sup>a</sup>: (Dummy coding: 0 = Bachelor's, 1 = Less than Associate's)

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

Table B 4. Summary of a Series of Regression Analyses for Testing Mediating Effects of Teachers' Education Level (Bachelor's versus Greater than Bachelor's) on Didactic through Teachers' Attitudes toward Child-Rearing

Baron and Kenny Procedure	<i>B</i>	<i>Se B</i>	$\beta$	<i>t</i>	<i>R</i> <sup>2</sup>	<i>F</i>
Step 1: Regressing "Didactic" on "Education Level" <sup>a</sup>	.05	.01	.27	4.27***	.08	18.23***
Step 2: Regressing "Attitudes toward Child-Rearing" on "Education Level" <sup>a</sup>	-4.88	1.30	-.25	-3.76***	.06	14.16***
Step 3: Regressing "Didactic" on "Attitudes toward Child-Rearing" after controlling for "Education Level" <sup>a</sup>	.001	.001	.16	2.40*	.10	11.80***

Education Level<sup>a</sup>: Dummy-coding (0 = Bachelor's, 1 = Greater than Bachelor's)

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

APPENDIX C: FIGURES

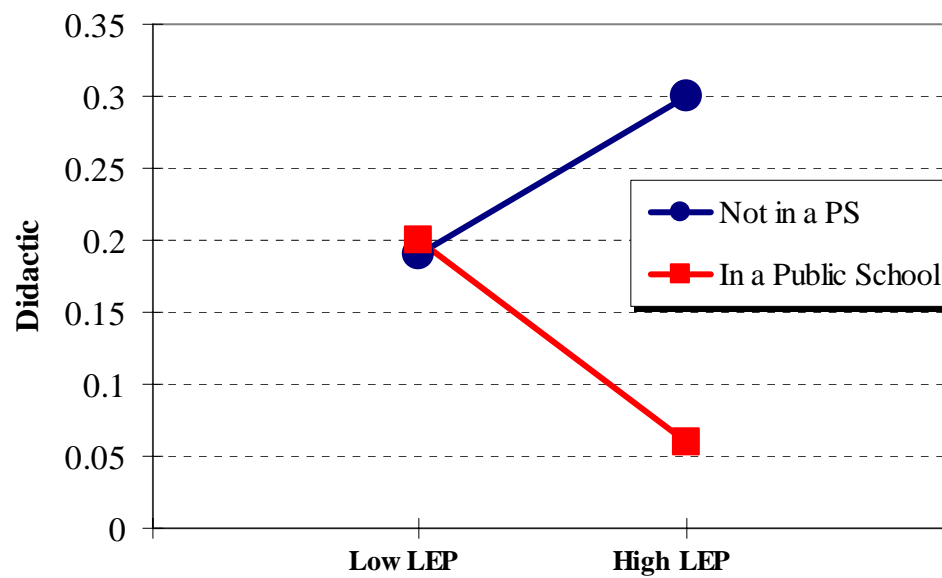


Figure C 1. Interaction Effect between Location and the Number of Children with LEP in the Classroom

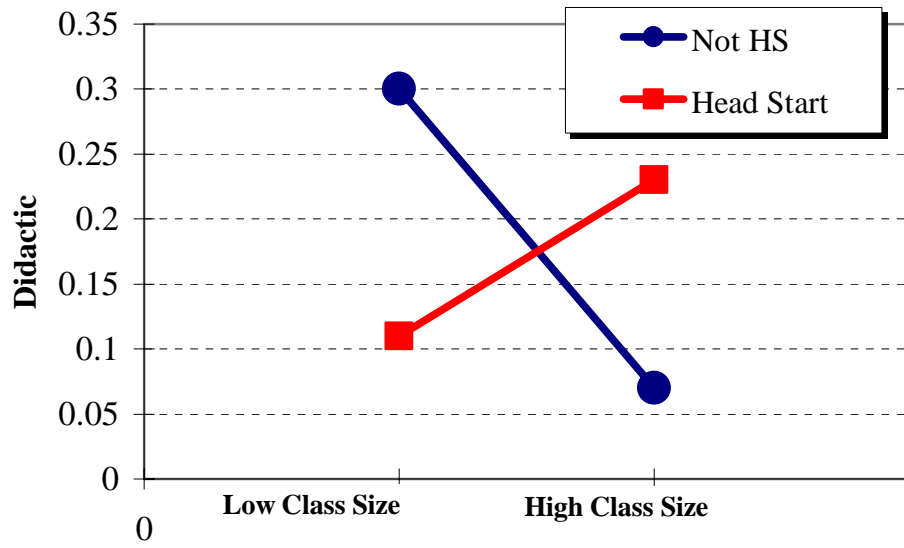


Figure C 2. Interaction Effect between Program Type and Class Size

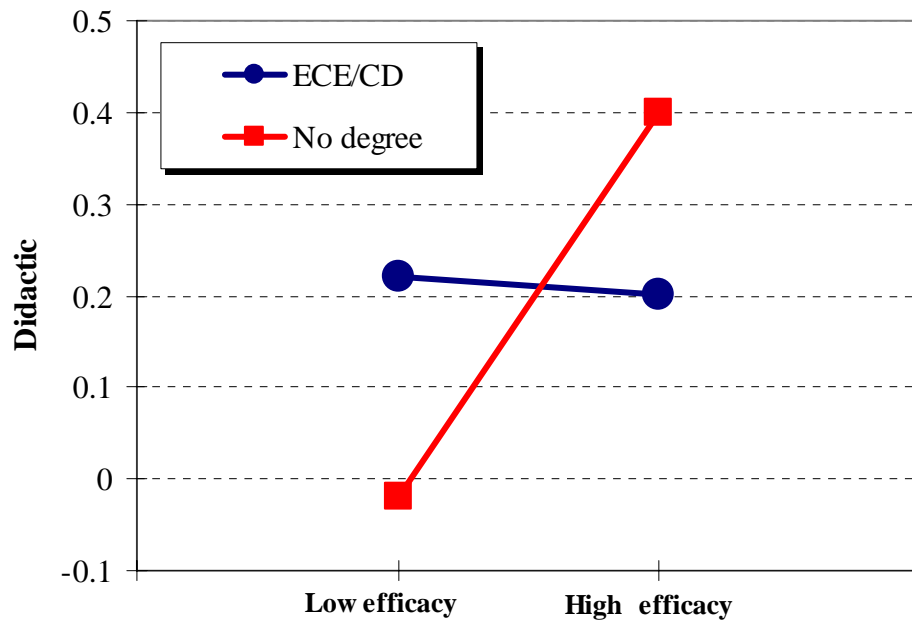


Figure C 3. Interaction Effect between Teachers' Major and Their Level of Self-Efficacy Beliefs

## APPENDIX D: DISCUSSION OF THE FINDINGS ABOUT THE SNAPSHOT VARIABLES

### Main and Interaction Effects

#### *The Effects of the Classroom-Level Variables*

Class size, teacher-child ratio, the percentage of children from low-income families, and the number of children with LEP were found to be statistically significant predictors for the classroom quality variables (main effects). A smaller class size and lower teacher-child ratio were related to higher engagement of pre-k teachers. Specifically, teachers with lower class sizes were more likely to have higher scores on simple and scaffolding practice. In addition, teachers with lower teacher-child ratios tended to have higher scores on routine practice. Buchanan et al. (1998) found that class size was a significant predictor for developmentally appropriate or inappropriate practices where lower class sizes demonstrated more developmentally appropriate practices. In addition, Abbott-Shim et al. (2000) presented a structural model of Head Start classroom where class structure variables (class size and teacher-child ratio) had direct, negative relationships with classroom quality measured by the *Assessment Profile for Early Childhood Programs: Research version* (a different measure of classroom quality than the ones used in the NCEDL study).

#### *The Effects of the Teacher-Level Variables*

The teacher demographic characteristics variables used in this study were teachers' education level, major (the content of their formal education), years of



experience with pre-k/k children, and state certification to teach 4-year old. These variables are teacher qualifications variables. Child care research and policy generally indicate the importance of the positive relationship between teacher qualifications and preschool classroom quality, and yet investigations of teacher qualifications and classroom quality continue to be generally conducted without consistency (e.g., even the definitions of the variables are inconsistent) across research studies (Maxwell et al., 2006; Tout et al., 2006).

In this study, simultaneous regression analyses revealed that teachers who majored in early childhood education or child development were more likely to provide encouragement than teachers who did not have a degree (see Table 15). This result was consistent with previous research. Past research showed that teachers with more years of education and more specialized training in early childhood provide more elaborative and encouraging practices than teachers with lower educational attainment (Arnett, 1989; Howes, 1997; Whitebook et al., 1989). Tout and colleagues' (2006) review also indicated that more education, particularly with specialization in early childhood development, was related to a higher quality of programs and interactions between teachers and children.

In addition to teachers' major, their teaching experience with pre-k/k children was found to be a statistically significant predictor for their didactic practice in the current study. Teachers with less teaching experience with pre-k/k children were found to use didactic practices (middle of the road) more often than teachers with more teaching experience with pre-k/k children. However, teachers' education level and state certification to teach 4-year old children were found to have no significant relationships

with any of the classroom quality variables when the effects of all the program and teacher characteristics were controlled for (main effects).

This result raises questions about the findings of previous studies concerning the relationship between teacher professional qualification variables and classroom quality (or teacher practice). Why did teacher's education level not significantly predict classroom quality in the current study, although teachers' major (the content of their formal education) did? Are the results of previous studies valid if the research designs did not measure or control for the effects of "other" variables? Or, were there methodological problems concerning the observation of teacher practices?

The findings in this study regarding the inconsistent effects of teacher qualification variables on classroom quality may be also due to methodological errors with regards to research design and/or measuring classroom quality. For example, the variables of the Snapshot have limited variance and the highest scores only reach mid-range scores. It is possible that the pre-k teachers in this study do not use much of any teacher practices (i.e., routine, minimal, simple, elaborating, encouraging, scaffolding, and didactic) in their classrooms. It is also possible that these teachers did not simply use much of these behaviors when the observers were present in the classrooms. The observers visited each classroom two times and in the morning during each visit.

The findings of the current study may also be because the observers did not have enough knowledge in early childhood education or child development and/or in the measure itself. Interrater reliability seemed to be adequate: for the CLASS a mean of weighted kappa was .67; for the Snapshot, mean scores of the data collectors' rating for the overall kappa across the four training sessions were higher than .60. However,

according to La Paro et al.'s report (2004), some of the data collectors failed several reliability tests during the training. Hence, using the CLASS seems to require intensive training to gain familiarity with the measure and to ensure inter-rater reliability.

Future research needs to clarify the roles of each type of teacher qualification variables (i.e., education, training, credential, and teaching experiences). Teachers' formal education, both the information about the degrees obtained and about the content of education (major) are important components for teachers' professional development that may possibly influence teachers' classroom behaviors. Through their formal education, teachers obtain knowledge (formal knowledge). These teachers may be more highly efficacious about their teaching practice (the relationship between teachers' major and their efficacy beliefs is explained in the following section). However, the effect of their training should not be ignored. Training provides an opportunity for continuing education and this may also influence teachers' practices.

At the same time, future research also needs to examine more intensively the role of teachers' experience. In the current study, teachers were asked only to report the years of teaching experiences. However, this does not tell us about the nature of teaching experiences or the continuing educational experiences. If the premise of Cochran-Smith, Lytle, Clandinin, and Connelly is true, then, teachers' everyday experience may have strong effects on their teaching practice. Therefore, information about the teaching context where teachers interact with people and environment itself may allow for our continued understanding of how teachers construct local knowledge or personal practical knowledge.

### *The Effects of the Teachers' Psychological Characteristics*

Two statistically significant models of the main effects were found for the teachers' psychological characteristics. Simultaneous regressions showed that teachers' attitudes toward childrearing were a statistically significant predictor of teachers' didactic behaviors and teachers' self-efficacy beliefs were a statistically significant predictor of their encouraging behaviors after controlling for all the program and teacher characteristics. However, teachers' depression was not a statistically significant predictor for their classroom behaviors.

#### Teachers' Attitudes toward Child-Rearing

In the current study, teachers' traditional (authoritarian) views were related to lower didactic scores and their modern (child-centered) views were related to higher didactic scores. Again, high scores on didactic in the current study may be interpreted as the middle-of-the road because the maximum score of the didactic practice was a middle-range score (the maximum score for didactic was .41). So, teachers with traditional attitudes were less directive and teachers with child-centered attitudes were more directive, though not high directive.

If higher scores on didactic meant their middle-of-the road practice (engaging in children's activities but in a moderately directive way), then this result would be somewhat consistent with the findings from a NICHD study (NICHD ECCRN, 2000a). The NICHD research showed that teachers' child-centered attitudes toward child-rearing significantly predicted their positive caregiving (e.g., positive attitudes and physical contact and response to vocalization) measured by the ORCE. If child-centered teachers

in the current study had been less directive, it might mean that they were less attentive to children in their classrooms. However, the child-centered teachers in this study were attentive in a moderately directive way. Though not totally consistent with the NICHD study, these results are in the same vein of child-center child-rearing views being associated with teacher engagement.

Another interesting finding was that teachers with a Bachelor's degree were more likely to have more traditional child-rearing views, while all teachers with early childhood education or child development major had more child-centered views. These mixed findings raise questions about the influence of continuing educations and training as variables that should be measured and controlled.

There are few existing studies that link teachers' childrearing attitudes to their classroom behaviors and so, at best, this finding can be loosely interpreted. More research to explain teachers' childrearing attitudes in relation to their classroom behaviors is needed.

#### Teachers' Self-Efficacy Beliefs

In this study, one dimension of teachers' sense of efficacy was used for analyses: sense of personal teaching efficacy. This dimension of teacher efficacy refers to individuals' assessment of their own teaching competence. Teachers' perceptions of their own teaching abilities influence their choice of classroom management and instructional strategies (Ashton & Webb, 1986). Teachers' efficacy beliefs also affect the efforts they put into teaching, the goals they set, and their level of aspiration (Tschannen-Moran, Woolfolk Hoy, & Hoy, 1998). Teachers with a strong sense of efficacy are open to new

ideas and more willing to experiment with new methods to better meet the needs of their students (Guskey, 1988; Stein & Wang, 1988); they also tend to exhibit greater levels of planning and organization (Allinder, 1994). According to Bandura (1997), teachers who believe strongly in their instructional efficacy (teachers with high personal teaching efficacy) tend to rely on persuasory means rather than authoritarian control and to support development of their students' intrinsic interests and academic self-directedness. In this study, teachers' efficacy beliefs were found to be a statistically significant predictor of their encouraging practice (see Table B2). Highly efficacious teachers in this study were found to provide encouragement more than were less efficacious teachers. This finding was consistent with previous studies.

Taken together, the literature on teachers' level of self-efficacy beliefs indicates that the level of teachers' self-efficacy beliefs are related to class- or student-level variables (e.g., a particular group of students they work with) (Raudenbush, Rowen, & Cheong, 1992; Ross, Cousins, & Gadalla, 1996) and a number of school-level variables as well (e.g., climate of the school, behavior of the principal, sense of school community, and decision making structures) (Hoy & Woolfolg, 1993; Lee, Dedick, & Smith, 1991). For example, Raudenbush et al. (1992) found that teachers' higher efficacy was related to classes that contained students who were highly engaged. When student disorder was kept to a minimum in the school, the teachers tended to feel a greater sense of efficacy (Lee et al., 1991). Though not directly applicable to the current study's findings, this does support the idea that efficacious teachers are more likely to be encouraging.

In addition, a few studies showed that teachers' level of self-efficacy beliefs were related to teacher-level variables (e.g., experience and education). Teachers' efficacy

beliefs increased with experience (Dembo & Gibson, 1985; Hoy & Woolfolk, 1993), particularly during the preservice year(s) (Housego, 1990; Hoy & Woolfolk, 1990). Teachers with a graduate degree were more likely to have higher efficacy beliefs than those who did not (Hoover-Dempsey, Bassler, & Brissie, 1987; Hoy & Woolfolk, 1993). In the current study, teachers' major (education with early childhood education or child development degree) was the only statistically significant predictor of the teachers' level of self-efficacy beliefs. Teachers who had formal training in early childhood education or child development were more highly efficacious than teachers who had formal training in other education or other field or who did not have formal education.

In addition, a statistically significant model of interaction effects between teachers' self-efficacy beliefs and their major was revealed from a hierarchical regression. For teachers who majored in early childhood education or child development, the level of their self-efficacy beliefs did not make a big difference on their didactic practice (difference of the conditional means between high and low level of self-efficacy beliefs was .02). However, for teachers who did not have a degree, the level of their self-efficacy beliefs made a noticeable difference on their didactic practice (difference of the conditional means was .42). For the teachers with no degrees, lower level of self-efficacy beliefs were related to lower scores on didactic practice and higher level of self-efficacy beliefs were related to higher scores on didactic practice (see Figure C3).

Putting the findings of this study together, if pre-k teachers had degrees in early childhood education or child development, they were more likely to be efficacious about their teaching practices (personal teaching efficacy). Even if pre-k teachers with ECE/CD major had lower efficacy beliefs, their efficacy beliefs did not affect their didactic

practice. Whereas, if pre-k teachers lacked formal training in early childhood education or child development, they were more likely to be less efficacious teachers. The level of the efficacy beliefs for these teachers did have impact their didactic practice: lower efficacy beliefs were related to less didactic practice (less engagement or possible laissez-faire approaches) and high efficacy beliefs were related to more didactic (more engagement or middle-of-the road approaches) practice.

If teachers had formal education and training in early childhood education or child development, teachers' formal knowledge ("outside-in" -knowledge attained from their formal training) may have helped the teachers be more confident of teaching practice for pre-k children. Hence, even less efficacious teachers could be more likely to interact with children. However, if teachers did not have formal education, their lack of knowledge could have had negative effects on their teaching practice. A negative self-image held by these teachers (i.e., low scores on personal teaching efficacy) could possible have had an even more negative effect on their teaching practice.

#### Interaction Effects between Location and Number of Children with LEP (for Didactic Dependent Variable)

It is possible that the more academic-focused culture of public schools might influence the teaching practices of pre-k teachers whose classrooms are located in public schools and where typical teaching practice of elementary teachers might include basic skills acquisitions and/or large-group instruction. Specifically, because teachers often construct knowledge about teaching by interacting with other teachers, staffs, parents, and children (i.e., personal practical knowledge or local knowledge) (Cochran-Smith, &



Lytle, 1993; Connelly & Clandinin, 1995a, 1995b) and they are often influenced by the culture of their schools, pre-k classrooms in public schools may differ from those located in community-based settings (Clifford, Barbarin, Chang, Early, Howes, Burchinal, & Pianta, 2005). However, the current study did not reveal that pre-k classrooms in public schools were different from those in non-public schools (no main effects), though there was one interaction effect between location and the number of children with LEP for didactic practice.

The mean score of didactic practice was higher (more directive teaching practice) for classrooms in public schools than those not in public schools (see Table 9). However, the mean difference was not statistically significant and the simultaneous regressions did not show that location of the classrooms significantly influenced pre-k teachers' practices. Rather, location of the classroom had different effects on the teachers' didactic practice according to high and low concentration of children with language problems.

For pre-kindergarten teachers in public schools, teachers from classrooms with lower numbers of LEP children had higher scores (middle of the road) on didactic practice than did teachers from classrooms with higher numbers of LEP children (see Figure C1). Conditional means for these two public school groups were .20 (lower numbers of LEP) and .06 (higher numbers of LEP) and means for the two non-public school groups were .19 (lower numbers of LEP) and .30 (higher numbers of LEP). So, pre-k teachers working in classrooms including smaller numbers of children with LEP in public school buildings were more likely to use middle-of-the road didactic practice; pre-k teachers working in classrooms including greater numbers of children with LEP in public school buildings were more likely to use less didactic practice. On the other hand,

for pre-kindergarten teachers not in a public school, teachers from classrooms with lower numbers of LEP children had lower scores on didactic practice than did teachers from classrooms with higher numbers of LEP children.

To reiterate, by looking at the conditional means of these teachers, there was a small, .01 difference (.20 compared to .19) between public school teachers and non-public school teachers when their classrooms do not have many children with LEP. Nevertheless, there was a more noticeable, .24 difference (.06 compared to .30) between the public school teachers and non-public school teachers when their classrooms have greater number of children with LEP. Why did the classroom location matter only when the concentration of children with language problem was higher?

Research shows that teachers from classrooms with more children with disabilities are more likely to use developmentally appropriate practice (Buchanan et al., 1998; Salisbury, Mangino, Petrigala, Rainforth, Syrcia, & Palombaro, 1994) than teachers from classrooms with fewer numbers of children with disabilities. Maxwell, McWilliam, Hemmeter, Ault, and Schuster (2001) suggest that if teachers are responsible for implementing children's individualized education plans (IEP), in order to meet the needs of individual children with disabilities, then we would expect to see more individualized and developmentally appropriate and less directive practices in classrooms with more children with disabilities. This seems to fit much the findings of more emotional supports and encouraging behaviors with higher number of LEP children in the classroom.

Nevertheless, it is difficult to attach meaning to the didactic dependent variable that is described in this study. Although there is a noticeable difference in the two conditional means between public and non-public school classrooms with high LEP, what

does didactic mean in each of these conditions? For the public school with high LEP, it means that there were virtually no observations of didactic teaching behavior with the four target children. For the non-public school with high LEP, it means that teachers used relatively more didactic behaviors with the four target children in their classrooms. This data does not provide enough information to tell us if teachers in high LEP classrooms used more individualized and more developmentally appropriate practices (as suggested by Maxwell et al.) or if they simply were less directive but not necessarily developmentally appropriate (e.g., not providing structure and/or not telling children what to do). Classrooms with higher numbers of LEP children are assumed to be classrooms where teachers have more issues with which to deal (e.g., classroom management, communication, more planning time for individual needs, and/or less time to address individual needs of non-LEP children). In other words, higher number of LEP children in a classroom could mean more “pressure” on the teacher.

Given this classroom description of high LEP, what are the possible differences between public and non-public school pre-k classrooms and how might these impact didactic teaching behaviors? Might teachers in public schools have local knowledge and support systems that are different from teachers in non-public schools and how might this impact didactic teaching?

One conjecture is that pre-k teachers in public schools may have a more consistent exposure to such things as: (1) multidisciplinary educational specialists (language, learning disabilities, and content specialists), (2) elementary school basic skills teaching methods, (3) pressure associated with accountability, (4) a broad range of professional colleagues (pre-k – grade 5), to name a few.

In addition, there were significant demographic differences between the public and non-public school teachers that may demonstrate that public school pre-k teachers have different formal knowledge (more years of education and more certified teachers) and also possibly different local knowledge (because of more children with IEP and LEP in their classrooms) (see Table 10). These elements can be considered as a kind of the local knowledge discussed by Cochran-Smith and Lytle (1993) and also as personal practical knowledge discussed by Connelly and Clandinin (e.g., 1995a, 1995b). These scholars remind us of how the complex nature and interrelationships of these aspects of teaching might influence many teaching behaviors (i.e., in this study, didactic practice).

Because this study is secondary data analysis and the researcher was not involved in the creation or definition of the variables on the Snapshot (nor any variable in this study), it is difficult to accurately explain how the didactic variable of the Snapshot might be meaningfully interpreted. That is, the information about the Snapshot variables (as defined in the NCDEL code book, and without any specific contextual information) does not help to explain why the public school pre-k teachers respond with less didactic behaviors in a more “pressured” classroom situation (high LEP) than do non-public school pre-k teachers, beyond the conjecture that is offered here.

Gallagher and Lambert’s (2006) study showed that a high concentration of children with special needs in the classroom had negative influences on the development of typically developing children only when the classroom quality is low (e.g., negative learning environment, less individualizing teaching practice, and less interactions). Hence, future research needs to focus on the contexts where pre-k teachers in public schools and non-public schools use didactic practices. With more information on the context of

difference for teachers' didactic practices, we can possibly sort out the meanings of low didactic scores in various classroom situations: (1) if teachers use more individualized and more developmentally appropriate practices, (2) if teachers use less direction and structure, and/or (3) if teachers simply do not interact with children in meaningful ways. Moreover, more research is needed to figure out how pre-k teachers in public schools and in non-public schools construct their local knowledge or personal practical knowledge through daily interactions with children, other teachers, parents, and administrators in the schools and how this knowledge may affect how they behave in their classrooms.

#### Interaction Effects between Program Type and Class Size (for Didactic Dependent Variable)

For Head Start teachers, teachers from classrooms with lower class size had lower scores on didactic practice than teachers from classrooms with higher class size. Stated in reverse, for teachers not in Head Start, teachers from classrooms with lower class size had higher scores on didactic practice than teachers from classrooms with higher class size. The conditional means for the scores of high didactic practice were .30 (not Head Start) and .23 (Head Start) and these were considered middle-range scores (middle-of-the-road approaches) (see Figure C2).

Class size is a variable that often discussed in the early childhood literature. Simultaneous regressions showed that there were statistically significant and negative relationships between class size and two other dependent variables, simple and scaffolding practice (see Table B1). Teachers with smaller class sizes were more likely to engage children with simple responses and to scaffold children than teachers with larger class sizes.

However, the effects of class size on teachers' didactic practice were different across the program types. Why do pre-k teachers in Head Start and in non-Head Start classrooms with different class size use didactic practices differently? There are documented differences between Head Start and non Head Start teachers and classrooms.

In congruence with previous studies (e.g., Granger & Marx, 1988; Henry, Gordon, & Rickman, 2006), teachers were less educated and there were fewer certified teachers in Head Start than in non-Head Start in the current study. Head Start classrooms had higher proportions of children from low-income families, lower class sizes, and smaller numbers of children with LEP than non-Head Start classrooms. On the other hand, non-Head Start teachers were more likely to have Bachelor's or greater than Bachelor's degree, majored in early childhood education or child development, and held state certifications to teach 4-year old children (see Table 10). Given these documented differences, it is still difficult to explain why Head Start teachers with higher class sizes are more didactic (or middle of the road). Again, with limited information on the context for teachers' didactic practice, we can not definitely interpret the conditions of less teacher-direction and structure in the classroom as appropriate or not.

#### Analysis of Mediating Effects

In order to examine indirect effects between the independent variables (program and teacher characteristics) and dependent variables (classroom quality), a series of regressions were run following the Barron and Kenny procedure (Barron & Kenny, 1986). In addition, the amount of mediation (i.e., indirect effects) was tested using the Sobel test (Sobel, 1982).

Regressions showed that teachers' attitudes toward child-rearing could be a significant mediator for the relationship between the two dummy-coded variables of teachers' education level (Bachelors' versus less than Associate's; Bachelor's versus greater than Bachelor's) and didactic practice (see Tables 17 and 18). Limitations of the Baron and Kenny method have been identified by researchers. This method is more likely to have (1) low power, (2) Type I error, (3) not being able to address suppression effects, and (4) not addressing the central question of whether the indirect effect is significantly different from zero and in the expected direction (Preacher, & Hayes, 2004).

Given the limitations of the Baron and Kenny method, the Sobel test was also used in this study. The Sobel test determines the significance of the indirect effect of the mediator by testing the hypothesis of no difference between the total effect (path  $c$ ) and the direct effect (path  $c'$ ) (see figure D1). The indirect effect of the mediator is the product of path  $ab$  (where  $a$  indicates the relationship between independent and mediating variables and  $b$  indicates the relationship between mediating and dependent variables) which is equivalent to  $(c - c')$ . In the current study, the Sobel tests showed that the amounts of mediation of child-rearing were not significant.

In the current study, no mediating effects were found. Even though regressions following the Barron and Kenny procedure suggested the two possible significant indirect effects, the Sobel test showed these indirect effects were not statistically significant (not different from zero).

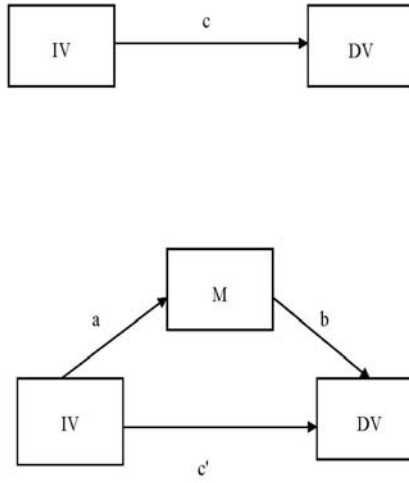


Figure D 1. A Diagram of Total and Direct Effects



## VITA

Mi-Hyang Ryu was born in Busan, Korea on November 11, 1971. She has stayed in her hometown until she graduated from Sung Mo Woman's high school in 1990. In the same year, she went to Hankuk University of Foreign Studies in Seoul, Korea and received a B.A. in French and English in 1995. After her graduation, she first started her career as a management consultant in NonNo inc. between 1995 and 1996. In 1996, she started her part time work as a Korean language teacher at American Embassy in Seoul, Korea and she also taught Korean language to American soldiers during the same period. From 2000, she continued her education at the graduate school in the University of Tennessee, Knoxville and earned a Master's degree in Child and Family Studies in the year of 2003. In November, 2003, she had a presentation at the play round session in the annual meeting of the National Association for Educating Young Children (NAEYC) (Chicago, IL), titled, "Early Childhood Teachers' Self-Reported Beliefs and Practices about Play (Ryu & Tegano). In April 2005, she presented at a poster session of the annual meeting of the American Educational Research Association (AERA), in Montreal, Canada. The title of her presentation was "Early Childhood Teachers' Beliefs and Practices about Play: Comparisons across Program Types and Levels (Ryu, Tegano, & Moran). On November in the same year, she presented at the play round session in the annual meeting of the NAEYC (Washington, DC). The title of her presentation was "Early Childhood Teachers' Beliefs and Practices about Play: A Comparison of Program Level and Type (Ryu, Tegano, & Moran). Mi-Hyang is currently a Ph.D. student in the department of Child and Family Studies at the University of Tennessee, Knoxville.