

An eco-behavioral analysis of children's engagement in urban public school preschool classrooms

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Abstract

The primary aim of this study was to identify particular group configurations and teacher behaviors that co-occurred with children's active engagement in public school early childhood classrooms for 4-year-olds. Children ($N = 138$, 52% boys) were observed using a time sampling method in 12 classrooms in 12 urban schools serving students from predominantly lower-income, minority families. Children were involved in whole group settings for 52% of observations. The most common teacher behavior in any setting was providing direction/instruction. Logistic regression analyses indicated that, during academic activities, children were more likely to be actively engaged when involved in a peer group and when teachers were providing affirmations or were monitoring, and least likely to be actively engaged in a whole group and when teachers were providing directions. During play activities, children were more likely to be actively engaged when they were alone and least likely to be engaged in a whole group and in a child–teacher setting. © 2007 Elsevier Inc. All rights reserved.

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Widespread interest in preschool programs as preparation for early success in school has led to questions about how to maximize program experiences that contribute to children's cognitive and social competence. Increasingly there are renewed calls for early childhood program research to rigorously examine program characteristics that produce beneficial outcomes for all children (e.g., Bowman, Donovan, & Burns, 2001). There is considerable interest in identifying what works in classrooms, particularly pedagogical practices that promote gains in learning and development (e.g., Shonkoff & Phillips, 2000).

Children's engagement in classroom activities is a promising target of research on preschool program pathways to improved learning outcomes. Studies suggest that children's positive engagement in classroom activities and routines contributes to school achievement (for recent reviews, see Fredricks, Blumenfeld, & Paris, 2004; Greenwood, Horton, & Utley, 2002). For example, the quality of children's participation (e.g., cooperative, self-directed) in kindergarten (Buhs & Ladd, 2001; Ladd, Birch, & Buhs, 1999) and in first grade (Alexander, Entwisle, & Dauber, 1993) classrooms has been found to be a strong predictor of school performance and of subsequent decisions to drop out of school

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(Alexander, Entwisle, & Horsey, 1997). Enhancing children's classroom engagement is a long-standing interest of preschool teachers. A dominant perspective in early childhood education is that young children are intently curious about their worlds (Bowman et al., 2001) and that good early childhood classrooms build on this "eager to learn" orientation by promoting hands-on and "minds on" involvement in activities that encourage children to figure out how things work (Copple & Bredekamp, 2006, p. 15). Because researchers generally view children's classroom engagement as amenable to change (Fredricks et al., 2004), an important step in designing improvements in the quality of children's participation in learning activities is the identification of classroom contexts associated with active child engagement.

The study reported in this article examined children's engagement in pre-kindergarten classrooms in relation to two different domains of pedagogical practices: type of group setting (e.g., small, large, whole group) and teacher behaviors. These domains are among the major decision areas teachers consider in planning and implementing a daily classroom schedule (e.g., what types of configurations and teacher practices should be used for academic activities?). The intent of the study was to identify classroom contexts that co-occur with active child engagement in academic activities and in play activities. The research was conducted in urban public school early childhood classrooms serving 4-year-old children primarily from lower-income, ethnic minority families.

1. Types and contexts of engagement

Studies of young children's participation in classrooms generally have focused on behavioral engagement, particularly indicators of active involvement (i.e., talking, doing), attention (i.e., listening, watching), and nonengagement (i.e., wandering, staring; McWilliam, Scarborough, & Kim, 2003). Research on older students' classroom and school participation also has examined emotional (e.g., identification with school; Finn, 1989) and cognitive (e.g., psychological investment in learning; Neumann, Wehlage, & Lamborn, 1992) engagement. Observational (versus teacher report) methods are essential for research on classroom factors that co-occur with different levels of children's engagement, and have been used productively in a number of studies across different grade levels (Fredricks et al., 2004), including preschool classrooms (e.g., deKruif, McWilliam, Ridley, & Wakely, 2000).

Researchers view engagement as a function of a student's interaction with the immediate context (Finn and Rock, 1997), including instructional practices (Marks, 2000). For example, a study of whole group book reading time in preschool classrooms found that teachers' use of talk related to the story was associated with increases in the attention (i.e., eye gaze) of children, even for children who were previously inattentive (Gianvecchio & French, 2002).

Academic activities (e.g., shared book reading during group time) and play activities (e.g., child-initiated pursuits during free choice or center time) together constitute a significant portion of the daily schedule in early childhood classrooms (e.g., Layzer, Goodson, & Moss, 1993). These two broadly defined types of activities may provide a different range of options for child engagement as well as groupings and teacher behaviors. Free play activities, for instance, are generally intended to support active child engagement while offering maximum latitude to teachers in their physical location and the extent to which they interact with children (Kontos, 1999). Studies of teacher interaction with children during free play that focus on the child (versus the teacher) as the target of observation often find a large percentage of observation intervals in which the child has no contact with the teacher (e.g., 67%; File, 1994). Academic activities may support more frequent use of a narrower set of configurations (e.g., whole group) and teacher behaviors (e.g., verbally instructing), with obvious implications for type of child engagement (e.g., watch and listen).

The group setting may be viewed as an opportunity structure that supports different types of teacher behaviors and child engagement. Early education experts submit that children learn best when they are exposed to a variety of classroom structures – including whole group, large group, small group, and individual time with a teacher – and to discourse patterns and thought processes that move children beyond their existing knowledge and skills (Bowman et al., 2001). Preschool children's behaviors in different types of groupings have received limited attention in research on early childhood programs. Several recent studies have examined children's outcomes in relation to group configuration, however. A longitudinal, cross-national study of preprimary programs of education and care found that the amount of whole group activities was negatively related to children's cognitive performance at age 7 years, and that children in preprimary settings in which free choice activities predominated had significantly better language performance at age 7 than in settings dominated by personal care and group social activities (Montie, Xiang, & Schweinhart, 2006). Also, an observational study of preschoolers' classroom language and literacy experiences found that instructional strategies carried out in small group and individual settings were related to greater growth in children's

alphabet and letter-word skills in comparison to whole-class activities, whereas whole-class instruction but not small group/individual instruction was associated with preschoolers' vocabulary growth (Connor, Morrison, & Slominski, 2006).

Based largely on theoretical and practical grounds, whole and large group configurations are commonly viewed as difficult settings for providing language and cognitive experiences that build on children's existing or emerging understandings and accommodate individual differences. For example, prevailing practice guidelines consider extensive use of whole group time to be developmentally inappropriate (Bredekamp & Copple, 1997), and the widely used Early Childhood Environment Rating Scale, Revised Edition (ECERS-R; Harms, Clifford, & Cryer, 1998) gives a higher score to frequent opportunities for children to pursue free choice activities that inherently result in smaller groupings of children. Small groupings maximize a teacher's opportunity to provide individualized attention to a child, a process considered particularly important in programs serving at-risk children (Frede, 1998). Accordingly, some effective preschool curriculum interventions in early reading (Whitehurst et al., 1994) and mathematics (Starkey, Klein, & Wakeley, 2004) are carried out in small groups of children. One-on-one settings involving a child and teacher(s) represent the smallest group configuration involving an adult. Observational studies of free play time in preschool classrooms have found teachers more likely to initiate interaction with a child when he/she was alone versus engaged in interaction with peers (Harper & McCluskey, 2003) and to interact with less socially competent children (Kontos & Wilcox-Herzog, 1997), thereby creating a one-on-one configuration. In general, there is a tendency in the early childhood literature to consider group configuration in a dichotomous manner (large versus small) even though there is a potentially important mid-point between whole (e.g., 20 children) and small (e.g., four children) group. Research is needed on level of child engagement in relation to a more refined set of group configurations.

There also is limited research on children's behaviors in the context of specific teacher behaviors. More studies of teacher and child behaviors have been conducted during free play time than during academic activities, perhaps because there are unanswered questions in the early childhood literature about how teachers can appropriately promote children's learning during play activity without interfering with positive interactions with peers. Studies have found that the amount of time children interact with adults is negatively correlated with the amount of time they interact with peers during free play (e.g., Harper & McCluskey, 2003). A series of investigations by Kontos and colleagues found that children's complex interactions with peers (Kontos & Keyes, 1999) and with both peers and objects (Kontos & Wilcox-Herzog, 1997; Kontos, Burchinal, Howes, Wisse, & Galinsky, 2002) were more probable when adults were not part of the children's social context. However, McWilliam et al. (2003) found that teacher presence (not interacting) was as predictive of child engagement as teacher questions and responsive comments (e.g., praising a child or repeating what a child said), although teacher presence was associated with both higher (e.g., active involvement) and lower (e.g., wandering) forms of child engagement. It is not known whether teacher presence is linked to children's engagement in academic activities, where typically teachers specify the focus of desired child actions and teacher presence may serve a monitoring function.

In addition to presence or absence in a child's immediate context, teachers offer different types of talk that may be associated with level of child engagement. Directives, questions, and praise/affirmations are among the teacher verbal behaviors that have received research attention. Directives (e.g., verbally instructing, demonstrating, requesting, redirecting) provide children with guidance on particular ways to engage in the activity at hand (e.g., watch, listen) and often are viewed as especially appropriate for promoting the engagement of at-risk children in learning activities. Empirical support for this perspective is limited, however, with some evidence indicating that teacher directiveness is negatively related to the initiations of children with special learning needs (e.g., Mahoney & Wheeden, 1999). Compared to directives, teacher questions and teacher praise or affirmative statements may offer children greater latitude in their behaviors. Whether these types of teacher behaviors are sufficiently potent to promote or sustain active child engagement is unclear (McWilliam et al., 2003).

The question of how to strengthen children's early childhood experiences is especially salient for policymakers and practitioners responsible for preschool classrooms in public schools. Public school preschool programs are growing rapidly, largely as a part of the expansion of state-supported preschool programs (Barnett, Hustedt, Robin, & Schulman, 2004; Gilliam & Zigler, 2000). There are long-standing concerns about the developmental appropriateness of public school classrooms, including the potential downward extension of an elementary school curriculum that emphasizes whole group instruction and gives minimal attention to free play (e.g., Elkind, 1981; Zigler, 1987). A study of Title 1-funded public school preschool classrooms in North Carolina found regular free play opportunities (Farran & Son-Yarborough, 2001; Farran, Son-Yarborough, Silveri, & Culp, 1993), but a more recent six-state study of state-funded

preschool programs found that classrooms located in school buildings offered less time in free choice activities and more time in whole group settings than preschool classrooms located in community settings (Pianta et al., 2005).

2. Eco-behavioral approach

Eco-behavioral analysis is well suited for identifying specific classroom practices that appear to “set the stage” for children’s engagement. The goal of this approach is to determine the association between aspects of a classroom (e.g., types of groupings and teacher behaviors) and children’s actions (e.g., engagement) that are linked to concurrent or later developmental status (e.g., literacy and language abilities). Eco-behavioral analysis initially proved to be useful in early intervention research (Carta, Atwater, Schwartz, & Miller, 1990; Carta & Greenwood, 1985; Greenwood, 1991; Greenwood & Carta, 1987) and more recently has been used in child care research to identify classroom processes associated with children’s simple versus complex interactions with peers and with objects (Kontos & Keyes, 1999; Kontos et al., 2002). The approach focuses on the likelihood of children’s behaviors of interest co-occurring with particular classroom conditions, including concurrent classroom factors (e.g., academic activity and whole group setting), thereby yielding a more finely tuned portrait of what happens in classrooms. The emphasis on co-occurrence is an advance over the more common research practice of assuming the existence of co-occurrence when associations are found between observed frequencies of children’s behaviors and observed rates of classroom conditions. It also moves toward greater recognition of the complexities of teaching by considering nested configurations of classroom factors. Accordingly, this research strategy has the potential to improve the specificity of guidance to practitioners regarding pedagogical decisions in the design and implementation of educational experiences for young children.

Eco-behavioral analysis complements and extends the field’s more predominant lines of investigation focused on structural features and global quality of early childhood programs as predictors of children’s outcomes. Since the late 1970s, researchers have examined staff education and training, group size, staff-child ratios, and other regulable variables in a search for mechanisms to ensure program quality (e.g., Burchinal, Cryer, Clifford, & Howes, 2002; NICHD Early Child Care Research Network, 2005; Ruopp, Travers, Glantz, & Coelen, 1979). Although this important area of inquiry has influenced early childhood program policies, an empirical understanding of the association between structural features and children’s outcomes does not readily lead to concrete guidance on what teachers should do with young children in a classroom without a systematic understanding of classroom processes (e.g., Phillipsen, Burchinal, Howes, & Cryer, 1997).

Eco-behavioral analysis also is complementary to curriculum comparison studies aimed at identifying what works in preschool education. This area of investigation is characterized by between-classroom comparisons of curriculum models (e.g., Marcon, 1999; Miller & Bizzell, 1983; Schweinhart, Weikart, & Larner, 1986) that in essence are intervention packages comprised of complex arrangements of content and pedagogical components (Campbell, 1986). Eco-behavioral analysis can extend and refine curriculum research through a within-classroom examination of the co-occurrence of children’s target behaviors and specific curriculum components. In this manner, researchers can begin to disentangle the elements of a curriculum as a first step toward identifying the most important components of a curriculum model.

The current study employed an eco-behavioral approach to examine the co-occurrence of active child engagement with different types of groupings and teacher behaviors in public school pre-kindergarten classrooms. Academic activities and play activities were considered separately. This correlational study was viewed as requisite to subsequent investigation of the causal role of classroom factors in promoting appropriate levels of children’s engagement in preschool classrooms. The study pursued a child’s perspective on classrooms by observing individual children’s behaviors and their classroom contexts. Our observational focus on children’s experiences meant, for example, that teacher involvement was pertinent only if a teacher was within close physical proximity to a target child. A secondary aim of the study was to provide recent descriptive data on the nature of state-funded preschool classrooms in urban public schools.

The study included four covariates that previous research has linked to children’s pre-kindergarten classroom behaviors, program outcomes, or teacher practices. The child-level covariates included child gender (e.g., Fabes, Martin, & Hanish, 2003); children’s vocabulary skills (e.g., Connor et al., 2006); and child age (e.g., McWayne, Fantuzzo, & McDermott, 2004). Global classroom quality was included as a covariate because prior research has found global classroom quality to be associated with children’s outcomes (e.g., Peisner-Feinberg & Burchinal, 1997) but not with teacher and child behaviors in classrooms (e.g., Kontos et al., 2002).

3. Method

3.1. Participants

3.1.1. Classrooms and teachers

Teacher recruitment for the study proceeded as follows. All elementary schools that offered a general curriculum (i.e., not a particular curriculum, such as Montessori at each grade level) and included a pre-kindergarten classroom were identified in a large urban school district in the Midwest. The identified schools were stratified into three categories defined in relation to the school district's overall student racial/ethnic characteristics: (a) schools with an equal or over-representation of African American students; (b) schools with an over-representation of Hispanic students; and (c) schools with an over-representation of European American students or a generally mixed racial/ethnic enrollment pattern. This stratification was considered important because of the segregated living patterns (and thus school enrollment patterns) in the urban area served by the school district. Schools in each of the three categories were then placed in random order. Recruitment was focused on securing two-thirds of the sample from the first category and the remaining third from the latter two categories. The intent of this strategy was for the study sample to approximate the racial/ethnic characteristics of students in the school district (i.e., approximately 60% African American at the time of the study). Per school district policy, school principals were first approached to request permission for the pre-kindergarten classroom in their building to participate in the study. Once a principal granted permission, pre-kindergarten teachers were presented information about the study orally and in writing. Recruitment continued until teachers representing the desired number of classrooms (12) consented to participate in the study.

The 12 pre-kindergarten classrooms were located in 12 different elementary schools. The classrooms enrolled an average of 25 children each (range: 24–27) for a 6 h session 5 days per week. There was a lead teacher and a part- or full-time aide in each classroom. The classrooms were partially funded with state monies and were targeted for children expected to enter kindergarten the following year. The school district did not mandate a particular preschool curriculum or benchmark learning targets. This provided teachers flexibility to develop their own pedagogical approaches within the culture of their particular schools and as approved by their principals. The teachers largely reported using thematic units. All had some curricular resources available, most often *Doors to Discovery*TM, a thematic unit curriculum focused on literacy published by the Wright Group (www.wrightgroup.com).

All 12 teachers held a bachelor's degree and two also had earned a master's degree. Nine of the 12 teachers held certification in early childhood (three with an early childhood certification combined with elementary school certification). The remaining three teachers held certification in an area other than teaching children in a regular preschool classroom (e.g., elementary education). Thus, one-half of the teachers held an early childhood teaching certificate resulting from baccalaureate-level preparation in early childhood education exclusively. Seven of the teachers had 3 or fewer years as a lead teacher in a public school classroom. Three teachers had 5–10 years of experience and two teachers had 11 or more years of lead teaching in a public school classroom. One teacher was African American; all others were European American. Eleven of the 12 teachers were female.

3.1.2. Children

The 138 children (52% boys) who participated in the study had an average age of 5.29 years (S.D. = .29; range: 4.65–6.12) when observations were conducted near the end of the spring semester. Per school system requirements for entry to the preschool classroom, children were to have been 4 years of age by September 1. The children's demographic characteristics reflected the student populations served by their respective school. Across the 12 elementary schools, an average of 82 percent of the students were from racial and ethnic minority backgrounds (range: 40–99%) including African American (69%), Hispanic (9%), Asian American (3%), and Native American (1%). Other students were European Americans. Three percent of the students were English language learners, all enrolled in five of the 12 schools. Seventy-nine percent of the students overall were eligible for a free or reduced lunch.

3.2. Measures

3.2.1. Child observations

Observations of children's behaviors in the classroom were conducted using an instrument developed by Kontos (Kontos et al., 2002; Kontos & Wilcox-Herzog, 1997). Data in the following four categories were used for the current

study: the child's behavior (dependent measure); the type of activity in which the child was engaged or expected to be engaged; the grouping in which the child was located; and the behavior of the teacher. Codes in each of these categories are defined in Table 1.

The teacher's behavior was coded (a) when the child was located in a whole group, regardless of physical proximity to the target child, and (b) in other settings when the target child was within three feet of the teacher(s). The rationale for the 3 ft criterion, used in other observational studies (e.g., Kontos, 1999), is that this configuration affords clear opportunity for the teacher and child(ren) to engage in a verbal exchange. The lead teacher's behavior was coded in instances where more than one teacher met one of these conditions (e.g., both lead and assistant teacher within three feet of target child in a small group). The behavior of the assistant teacher (aide) was coded if she was the only adult who met one of these conditions; this occurred infrequently.

Observations were conducted on 3 different days for each child. There was an attempt to capture the stream of activities across the school day, although morning observations were deemed more important because of typical classroom schedules. In some classrooms, it was difficult to garner much useful observation time during the afternoons as naptime, followed by the transitions necessary to end the day and prepare children for multiple bus lines, preceded a departure time as early as 2:30 p.m. in some schools.

Each of the 3 observation days began at a different point in time during the school day. One observation began at the start of the school day. The second beginning time was determined by working backwards from the assigned lunch hour, in order that the entire morning would be represented in the data. The third beginning time was after the nap. In sum, data were collected across the day, except during the noontime routines of lunch, recess, and nap. However, the data points predominate across the mid-morning hours, those regarded by the teachers as highly important to their work.

Children were observed in sequential order, with a 10 s interval for observation and a 20 s interval for coding. After completing observations for each child, the sequence was repeated until up to 20 data points were collected for each child. There was an average of 50 data points per child across the 3 days of observations. On average, 20 data points were recorded during each of the two morning observations and 10 data points were recorded during the afternoon. The number of children observed in each of the 12 classrooms involved in the study ranged from 9 to 17. Differences in the number of observed children across classroom were a function of the number of parents providing informed consent for their child's participation in the study. In classrooms with larger numbers of children involved in the study, the group of participating children was randomly split in half by classroom. Observers collected data according to the 3-day plan separately for each of the two subgroups. Thus, observers were in classrooms with larger numbers of study children for a total of 6 days (3 days for the first half, 3 days for the second half).

Each observation period in a classroom lasted approximately 90–120 min, depending on the number of children in the rotation. Each child was observed approximately every 5–8 min. Each observer wore a wristwatch that provided a slightly audible beep at 10 and 20 s intervals (i.e., 10 s to observe the target child, followed by 20 s to code and then locate the next child to be observed). If multiple behaviors and/or settings were observed during the 10 s observation interval, the behavior/setting that occurred for the majority of the interval was coded.

In the current study, inter-observer reliability established through training prior to data collection was as follows: 82% for engagement, 90% for activity, 85% for group setting, and 85% for teacher behavior. Reliability was established through observations conducted in a pre-kindergarten classroom not associated with the study. Observers followed procedures described above regarding sequential observation of children using the same time intervals. Live coding of ongoing behavior was conducted until each observer met the criterion of 80% or higher agreement in each category for a minimum of 3 of 4 consecutive observation days.

For data analyses, the pre-academic, book/story, and music/dance activity codes were collapsed to form "academic activity." The "play activity" variable was comprised of fantasy play plus fine motor/manipulative activities that had no clear academic purpose. Active and passive transition codes were combined to form "transition." The "routine activity" variable was comprised of clean-up, snack/meal, rest, and personal care. Time-out, which was rarely observed, was combined with "other activity." In the group setting category, the "child-teacher" variable was comprised of codes where one or two teachers were in close proximity to the target child only. With regard to teacher behaviors, the "praise/acknowledge" and "social" codes were combined to form "affirm," and the "gesture/demonstration" and "verbal direction" codes were combined to form "direct." Teacher disengagement, rarely observed, was combined with teacher "out of range" codes to form "out of range/disengaged."

Table 1
Observation coding categories and definitions

Code categories	Definition
Child behavior	
Actively engaged	Child has focused attention and is actively talking and manipulating or using materials relevant to the task at hand 50% or more of the 10 s interval. The behavior must include active, task-related movement and may or may not be in response to adult prompts. In general, manipulation of materials is required during any activity that includes materials (e.g., fine motor) or when no activity has been specified. When materials are not involved, non-manipulative motor behavior that is relevant to the activity is included (e.g., movement during music). If the child's behavior is contrary to teacher instruction, active engagement would not be recorded.
Attentive	Child has focused attention, listening and/or watching 50% or more of the interval. Child is talking to or answering questions directed to him/her by a peer or teacher. The child is not actively engaged while talking. The child must be observing an activity, not just looking around the room or at persons or things that are not involved in a designated activity.
Disorganized	Child demonstrates some active engagement but not for more than a few seconds at a time. His/her attention "flits" or changes during the interval.
Off task	Child is engaged in an activity that does not have the approval of the teacher or is not related to the designated activity (e.g., talking out loud when children have been asked to sit and listen).
Disengaged	Child's attention is wandering or he/she appears to be daydreaming or unoccupied.
Type of activity	
Pre-academic	Activities devoted to teaching/learning skills related to reading, mathematics, handwriting, science, social sciences, health/safety (e.g., reciting the alphabet).
Fine motor	Use of small muscles to move fingers, wrists, and hands, usually involving the grasp (e.g., putting puzzles together, stacking cubes, placing pegs in a pegboard). Code as "pre-academic" if fine motor actions occur as part of a pre-academic activity (e.g., gluing pictures of a story in a correct sequence).
Book/story	Involves reading or telling of a tale, often involving a book, puppets, flannel board or other media. Includes looking at a book independently or with a teacher or peers, and listening to a recorded story.
Fantasy play	Child is engaged in make believe through transformations of self (e.g., mother) or objects (e.g., block is a cookie) that are not directed by the teacher.
Gross motor	Use of large muscles in arms, legs, feet for running, jumping, hopping, skipping, catching, etc.
Music/dance	Child is singing, dancing, listening to music, clapping and/or moving to music, doing fingerplays or reciting poems to music.
Clean-up	Child is putting away toys, instructional materials, furniture, food (e.g., putting away blocks at end of free play).
Snack/meal	Child is eating a meal or snack. May be conversing with teacher(s) or peers while eating.
Rest time	Child is involved in teacher-initiated rest time for 50% or more of the observation interval.
Personal care	Child is involved in toileting, washing hands, dressing, grooming (e.g., putting on coat prior to outside play).
Time out	Child has been removed from group or from participation in an activity as a disciplinary action.
Active transition	Child is moving from one activity to another.
Passive transition	Child is waiting to move to another activity.
Group setting	
Solitary	Child is involved alone in an activity; no peers or teacher within 2 child arm lengths.
One teacher/target child	Child is involved in an activity by him/herself with one adult; no peers within 2 child arm lengths from target child.
Two + teachers/target child	Two or more teachers are within 2 child arm lengths of target child. One teacher might be assisting the child while another teacher is monitoring the activity.
Small group	Target child is with two or three other children and a teacher(s) (total of between two and four children, including target child).
Large group	Child is with between four and 11 other children and a teacher(s) (total of between five and 12 children, including target child).
Whole group	Child is with all other children in the classroom and a teacher(s).
Peers only	Child is with a group of peers and no adult is within 2 child arm lengths.
Teacher behaviors	
Praise/acknowledge	Teacher uses verbal praise with target child (e.g., "good job") or acknowledges target child's action (e.g., "thank you").
Social	Teacher talks to target child about personal or home topics (e.g., clothing being worn, siblings, parents).

Table 1 (Continued)

Code categories	Definition
Verbal direction	Teacher gives child verbal instruction(s) to perform a particular behavior(s) in the immediate setting without accompanying gestural prompts or physical direction. Teacher comment must specify the behavior the child is expected to perform or not perform and must contain a verb describing the behavior. The instruction may be directed to the target child or to a group of children (including the target child) (e.g., “Let me see you clap your hands”; “Show me how you build a tower”).
Gesture/demonstration	The teacher either (a) uses gestural prompts to attract the child’s attention to a task (e.g., pointing) or (b) demonstrates how to do a task. Simply holding up an object is not a gestural prompt. The demonstration must be directed toward the target child (e.g., visual orientation toward target child) or to a group of children (including target child) who are expected to perform the same actions simultaneously. The adult also may be giving verbal directions but this code (gesture/demonstration) would take priority over verbal direction.
Question	The teacher asks an activity-related question without accompanying gestural prompts or physical direction. The phrasing of the question may suggest that the teacher is (a) asking the child to supply specific activity-related information (e.g., “What color is the ball?”) or (b) prompting the child to perform a behavior without an explicit instruction for the desired behavior (e.g., “Where do you put that one?”). Questions that are explicit instructions for a specific behavior (e.g., “Would you sit down, please?”) are coded as verbal direction. The question must be directed to the target child.
Monitor	The teacher is close (within 2 child arm lengths) to the child and/or the teacher is in the same area as the target child (i.e., in the gross motor area). The teacher is visually attending to the target child or presenting stimuli for the target child (e.g., holding a busy box). The teacher does not use any of the forms of direction described above.
Disengaged	The teacher(s) is not engaged in behavior related to children or the classroom activity(ies) (e.g., not attending to or interacting with children; involved in a conversation with another adult that is not related to the classroom; talking on the telephone).

3.2.2. Global classroom quality

The Early Childhood Environment Rating Scale-Revised edition (ECERS-R; Harms et al., 1998) was used to measure global classroom quality. This frequently used measure consists of 37 items that address personal care routines, furnishings and display, language/reasoning, fine/gross motor, creative activities, social development and adult needs. Each item is rated on a one–seven scale based on the presence of attributes listed in the item descriptors. A score of one is described as “inadequate,” a score of three is “minimal,” a score of five is “good,” and a score of seven is “excellent.” For the current study, item scores were summed and divided by the total number of items resulting in an average item score that could range from one to seven. The ECERS-R has been shown to be both reliable and valid as an indicator of quality (Harms et al., 1998). For the current study, observers achieved 90% inter-observer reliability (i.e., agreement within one point on each scale) through training prior to data collection.

3.2.3. Children’s receptive language ability

The Peabody Picture Vocabulary Test – III (Dunn & Dunn, 1997) was used to assess children’s receptive vocabulary skills. This individually administered, norm-referenced test is designed for children as young as 2.5 years of age, and has repeatedly been shown to be both a reliable and valid measure of receptive language skills. Raw scores can be converted to age-referenced standard scores, age-equivalent scores, and percentiles. The test, originally developed in 1959, has been used extensively in child development research as a measure of early childhood program outcomes as well as a predictor of academic achievement.

3.3. Procedure

Child observations were conducted in late spring of 2002. ECERS-R observations were completed approximately 5 months prior to conducting the child observations. The total period of child observations spanned approximately 1 month. Attempts were made to observe on 3 consecutive days in each classroom but this plan was difficult to consistently implement because observations were not conducted on days involving field trips, special programs, and significant time devoted to physical education or art (conducted by specialty teachers). The PPVT-III was administered approximately 4 months prior to conducting child observations.

3.4. Analyses

To preserve the co-occurrence of child behavior and contextual factors (i.e., grouping, teacher behavior), data were analyzed at the behavior or event level by examining the multiple time-sampled data points for each child. Accordingly, the data were not collapsed within-child because the co-occurrence of child behaviors and contextual factors may vary across observations. Analyses were conducted using logistic regression based on a generalized estimating equations (GEE) approach (Liang & Zeger, 1986). This analytic approach is widely used in biostatistics, in part because it easily accommodates repeated assessments in categorical outcomes. GEE provides parameter estimates, standard errors, and asymptotic test statistics for a wide variety of statistical models and can take into account dependencies in the outcome measure due to repeated assessments. Models account for variation due to nested factors (i.e., within models that describe individual patterns of behavior) and variation due to factors that may influence all individuals similarly (i.e., between models that predict individual differences in behavior patterns from selected child and classroom factors). GEE methods can account for variations in the number of observations per child and can accommodate change across observations in predictor variables, such as group setting and teacher behaviors. For the analyses reported herein, we fit GEE logistic models assuming equal correlations among observations nested within-child.

For the regression analyses, we used active engagement as an indicator of the highest level of appropriate child involvement. We modeled the log odds of active engagement (versus all other child behaviors) in academic activities and in play activities as a function of group setting and teacher behaviors in separate logistic regression models. A total of 5621 observations and 138 children were available for the regression analysis. The model included the four covariates noted earlier in this report: child language skill (total PPVT standard score), child gender, child age, and global classroom quality (total ECERS-R score). A simultaneous regression approach was used to build the GEE logistic regression models, with independent variables entered together. Because GEE does not allow for higher order nesting, in follow-up analyses we added classroom as a fixed effect to the GEE analyses to test whether results changed when accounting for the nesting of children in classrooms.

4. Results

Descriptive statistics are reported in Table 2. Note that in most of the observations, children were actively engaged (47%) or attentive (40%). Academic and play activities were the focus of children's behaviors in about two-thirds of all observations (67%). The breakdown of academic activities (47%) is as follows: pre-academic pursuits (27%), such as reciting the alphabet; listening to or looking at a book (12%); gross motor (5%); and music or dance (2%). With regard to play activities (21%), children were more likely to be observed in fine motor or manipulative activities (15%) than in fantasy play (5%).

In most observations, children were involved in whole group settings (52%) or in a group of peers in which an adult rarely was involved (29%). Children were infrequently observed to be in smaller configurations, as reported in Table 2. In most observations, teachers were out of range or disengaged (54%) or providing direction or instruction (32%). In nearly one quarter of all observations, the teacher was providing direction in a whole group setting (24%). The percentage of observations in which teachers were affirming, questioning, or monitoring was relatively low (see Table 2).

Table 3 reports the percentage of group setting observations by teacher behavior. Note that teacher direction was the most common type of teacher behavior in each of the groupings where a teacher potentially could be involved.

Descriptive statistics for the covariate measures used in the regression analyses were as follows: the mean of the PPVT-III total standard score was 92.8 (S.D. = 15.9) and the mean total ECERS-R score across the 12 classrooms was 3.35 (S.D. = .86; range: 2.2–4.8), which indicates low (1–3) to moderate (3–5) global quality.

Table 4 reports the distribution of children's observed participation in academic activities and in play activities across different types of groupings and teacher behaviors. A majority of observations involving academic activities occurred in whole group settings whereas a majority of observations where children were focused on play activities occurred in peer settings. Overall children were observed in academic activities in a whole group setting 25% of all observations, and they were observed in play activities in a whole group setting 11% of all observations. When children were observed in academic activities, they were interacting with peers only 25% of the time. In both academic and play activities, children were involved in a child–teacher configuration or in a small group in less than 5% of the observations. Teachers were out of range or disengaged in most observations where children were pursuing play

Table 2
Descriptive statistics

Variable	Overall percent		Proportion of child behavior	
	<i>n</i>	%	Actively engaged	Attentive
Child behavior				
Actively engaged	2699	47		
Attentively engaged	2334	40		
Disorganized	229	4		
Not engaged	197	3		
Off task	294	5		
Activity				
Academic	2862	46	.39	.47
Play	1265	21	.75	.15
Transitions	874	14	.33	.54
Routines	760	12	.84	.08
Other	395	7	.11	.76
Grouping				
Solitary	310	5	.67	.23
Child–teacher	96	2	.25	.51
Small group	186	3	.65	.28
Large group	542	9	.55	.36
Whole group	3101	52	.27	.59
Peers only	1717	29	.73	.15
Teacher behavior				
Affirm	193	3	.50	.44
Direct	1818	32	.26	.58
Question	132	2	.07	.84
Monitor	488	8	.51	.42
Out of range/disengaged	3122	54	.60	.28

activities (76%) and in about one-half of observations where children were involved in academic activities. Providing direction or instruction was the most common way for teachers within close physical proximity to the target child to be involved in academic activities (36%) and play activities (15%).

The proportion of observations in which children were observed as actively engaged (talking, doing) or attentive (listening, watching) during each activity, grouping, and teacher behavior is listed in the final two columns of Table 2. Children were more likely to be observed as actively engaged when pursuing play or routine activities, when in solitary, small group or peer groupings, and when teachers affirmed, monitored, or were out of range or disengaged. Children were more likely to be attentive when involved in transitions and other activities, when in one-on-one or whole group settings, and when teachers offered directions or questions.

The results of logistic regression analyses of active child engagement in academic activities and in play activities as a function of group setting and teacher behavior are reported in Table 5. The model in these analyses is a reference

Table 3
Percentage of group setting observations by teacher behaviors

	Child–teacher	Small	Large	Whole
Teacher behaviors				
<i>n</i> (observations)	96	186	542	3101
Affirm	27%	13%	7%	3%
Direct	59%	40%	40%	47%
Question	4%	2%	6%	2%
Monitor	3%	18%	19%	11%
Out of range/disengaged	6%	26%	27%	36%

Note. Solitary and peer settings were omitted because there is no teacher involvement.

Table 4

Percentage of children's academic and play activities by group settings and teacher behaviors

	Academic	Play
Group setting		
<i>n</i> (observations)	2815	1272
Solitary	3%	6%
Child–teacher	1%	<1%
Small group	4%	3%
Large group	14%	4%
Whole group	53%	26%
Peers only	25%	59%
Teacher behavior		
<i>n</i> (observations)	2849	1278
Affirm	3%	3%
Direct	36%	15%
Question	4%	<1%
Monitor	5%	6%
Out of range/disengaged	51%	76%

cell model wherein the parameter estimates test whether there is an increase in the likelihood of observing active engagement associated with that variable. The reference cell for grouping is peers only, and the reference cell for teacher behaviors is teacher out of range or disengaged. For example, the parameter estimate $B = -2.94$ for large group indicates that children were significantly less likely to be engaged when observed in academic activities in large group settings than when observed interacting with peers only. The odds ratio indicates the extent to which a predictor differentially increases the probability of active engagement occurring in one condition over the reference condition. An odds ratio of greater than 1 denotes there is increased likelihood of active child engagement co-occurring with the

Table 5

Longitudinal logistic regressions: predicting child engagement in academic activities and play activities from group setting and teacher behavior

	Academic activities			Play activities		
	β	(S.E.)	Odds ratio	β	(S.E.)	Odds ratio
Intercept	1.82***	(.50)	6.17	2.70***	(.68)	14.88
ECERS total	.08	(.09)	1.08	-.05	(.12)	.95
PPVT – fall	-.01	(.004)	.99	-.00	(.01)	1.00
Age – fall	-.02	(.02)	.98	-.05*	(.02)	.95
Gender	.10	(.13)	1.11	-.43*	(.19)	.65
Group setting						
Solitary	-1.32***	(.34)	.27	1.02*	(.42)	2.77
Teacher–child	-1.92***	(.39)	.15	-1.88**	(.62)	.15
Small group	-.81**	(.26)	2.25	-.01	(.41)	.99
Large group	-.91**	(.21)	2.48	-.55	(.15)	.58
Whole group	-2.94***	(.20)	.05	-1.00***	(.21)	.37
Teacher behavior						
Affirm	.63*	(.25)	1.88	.15	(.55)	1.16
Direct	-.37*	(.15)	.69	-.31	(.26)	.73
Question	–	–	–	–	–	–
Monitor	.89***	(.23)	2.44	.14	(.41)	1.15

Note. Reference cells are as follows: group setting = peers only; teacher behavior = out of range/disengaged. Parameter estimates for classroom condition is the log of the ratio of the odds of being actively engaged during the condition listed in that row compared with the odds of being actively engaged during the reference cell.

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

classroom factor of interest than with the reference condition; conversely, an odds ratio of less than 1 indicates there is decreased likelihood of active child engagement co-occurring with the classroom factor of interest. For example, in the analysis of children observed in academic activities, an odds ratio of .05 (exponent of the log odds, the parameter estimate) for large group indicates that children were .05 times more likely to be observed as engaged overall in large groups than when interacting with peers only (reference cell). Stated the other way, children were 20 times more likely to be actively engaged in academic activities when in a peer group than in a whole group configuration. Similarly, a parameter estimate of $-.55$ (odds ratio of .58) for large group in analyses of active engagement when children were in play activities indicates that the odds of being actively engaged while in play activities in a large group were about 60 percent of the odds of being actively engaged while in play activities in the peer setting—that is, were 1.67 times more likely to be actively engaged in play activities when in a peer setting than when in a whole group.

During academic activities, children were more likely to be actively engaged when involved in a peer group (reference cell) and least likely to be actively engaged in a whole group configuration. For academic activities, significantly higher levels of active engagement were observed when children were in peer settings than when they were in solitary or child–teacher settings or were in small, large, or whole groups. With regard to teacher behaviors during academic activities, children were more likely to be actively engaged when teachers were providing affirmations (praise, acknowledgement) or monitoring, and least likely to be actively engaged when teachers were providing directions (see Table 5).

During play activities, children were more likely to be actively engaged when they were alone (solitary), and least likely to be engaged in a whole group and in a child–teacher setting. Teacher behaviors were not related to active engagement during play activities. Two covariate variables – child gender and age – were significantly related to active engagement during play activities. As reported in Table 5, younger children and girls were more likely to be actively engaged during play activities than older children and boys.

As noted earlier, in follow-up analyses we added classroom as a fixed effect to the GEE analyses to test whether results changed when accounting for the nesting of children in classrooms. They did not.

5. Discussion

Results of this eco-behavioral analysis add to a growing scientific literature aimed at identifying preschool classroom factors associated with children's engagement in learning activities. The findings also contribute to a fledgling line of research on state-funded preschool programs by providing a snapshot of life in urban public school pre-kindergarten classrooms from a child's eye view. Children's behaviors were the unit of observation and analysis, with the context (group configuration and teacher behavior) of children's actions coded from the perspective of the target child. The findings pertain most directly to state-funded preschool classrooms located in urban public schools serving substantial numbers of students from racial and minority backgrounds.

The classrooms observed in this study exhibited characteristics found in other research on public school preschool classrooms (e.g., Pianta et al., 2005): frequent use of whole group settings, more time in academic than play activities, and teacher behaviors that emphasized verbal instructions and demonstrations. The low-to-moderate overall global quality of classrooms in the current study, as measured by the ECERS-R ($M = 3.35$; $S.D. = .86$), was generally consistent with the global quality of classrooms examined in a recent six-state study of state-funded preschool programs (e.g., $M = 3.86$; $S.D. = .77$; Clifford et al., 2005).

Our results support long-standing concerns of early education experts that whole group settings promote passive modes of child participation in learning activities. In whole groups, which provided the context of child behavior in 52% of our observations, children were twice as likely to be listening and/or watching (attentive) than talking and/or acting (actively engaged). Children exhibited higher proportions of active engagement in nearly all other configurations, but most of these settings – small group, large group, and solitary settings – occurred infrequently and none surpassed the peer group as the most likely setting of active child engagement in academic activities. The “out of range” status of teachers in nearly all peer settings may have fostered active engagement. Moreover, perhaps teachers' propensity to offer directions/instructions in any configuration in which they were present accounts for our finding that smaller groups, including child–teacher settings, did not predict active child engagement. From a child's perspective, receiving instruction and direction appeared to be the common experience in any setting involving a teacher.

The extensive use of whole group settings is not surprising in view of the large class size and high teacher–child ratios found in the classrooms, factors which no doubt contributed to low-to-moderate global quality ratings. These are

challenging circumstances for initiating and sustaining smaller groupings and individualized interactions with children. Nonetheless, teachers did not appear to use smaller groupings as an opportunity to initiate conversations or facilitate other forms of active child engagement. Teachers rarely asked questions in any type of grouping, for example, although affirmative talk (praise) was somewhat more frequent in smaller than in larger groupings. One-on-one configurations potentially offer an ideal setting for child–teacher verbal exchanges, yet in our study this was not a context of active child engagement in academic and play activities. An interpretation of this finding is that teachers may have approached individual children who were not engaged or who were not appropriately pursuing a designated task. This interpretation is consistent with the findings of Harper and McCluskey (2003). In the current study, teachers were providing direction in more than one-half of the child–teacher observation intervals.

Whether children's attentive behavior represented meaningful learning experiences for a sizable portion of the preschool day is an open question. Listening and watching can be a useful way to learn, especially when substantively and sequentially linked to more active modes of engaging the subject matter. The benefits of large doses of this passive form of participation in learning activities are unclear, however. Results of prior research with at-risk preschool and kindergarten students (Carta et al., 1990) and with elementary school students (Greenwood, 1991) suggest that attentiveness may be an insufficient approach to learning compared to active engagement. One of the problems of frequent attentive behavior in learning contexts is the limited feedback it provides teachers. Specifically, the prevalence of attentive behavior patterns in our study seemed to be largely a function of teachers' strong dependence on instructional strategies that do not provide an immediate check on children's information processing and learning. Did children understand what was being presented? Could they internalize and use the concepts themselves? Teachers can readily answer these types of questions through pedagogical approaches that support children's talking about and acting on new knowledge and skills, yet active engagement was not the primary means of child participation in the academic activities offered in the classrooms we observed.

The separate treatment of academic and play activities in our analyses of predictors of active child engagement is an important contribution to a literature that has examined teacher and child behaviors mostly during free play or in particular academic contexts, notably group book reading. In academic activities, active child engagement was more likely to occur in peer group settings (reference cell) than any other of the five configurations we considered, especially whole group, as discussed earlier. In play activities, active child engagement was more likely to co-occur with solitary settings and least likely to co-occur with child–teacher configurations and with a whole group than with a peer group. Compared to peer-only settings, children were more likely to be actively engaged in solitary settings during play activities and less likely to be actively engaged in solitary settings during academic activities. This pattern suggests that the nature of the activities rather than the solitary setting itself may have been a factor in children's active engagement.

With regard to teacher behaviors, children's active engagement was more likely to occur in academic activities when teachers offered affirmations (praise, social talk) or monitored children's behaviors than when teachers were not present. Monitoring and affirming may be viewed as forms of responsiveness to a child, and the current findings may be a reminder that children respond favorably to a teacher's supportive acknowledgment. The teacher monitoring results are consistent with findings of McWilliam et al. (2003). Monitoring often serves an observation function that helps teachers better understand a child's interests and developmental status for purposes of individualizing experiences and communicating child progress information to parents and others. For children, teacher monitoring may also function as a nonverbal acknowledgment of their actions that fosters active engagement. Talk may not be the only way for teachers to demonstrate their interest in children. The salience of teacher affirmations and monitoring may have been enhanced for children by the relative infrequency and therefore novelty of these behaviors in a teacher involvement pattern that emphasized giving directions or being out of range.

Teachers were out of range or disengaged to a greater extent in play activities (76%) than in academic activities (51%). This overall rate of teacher "absence" is generally consistent with results of other studies that examined life in preschool classrooms from the child's view (e.g., File, 1994). Studies in which the teacher is the target of observation yield significantly higher percentages of teacher interactions with children (e.g., Kontos, 1999). The relatively small percentage of observation intervals in which a teacher was "present" may account for the lack of significant relations between teacher behavior and active child engagement in play activities.

Child age and gender, two of the covariates included in our regression analyses, were related to active child engagement in play but not academic activities. We wonder if older children found it challenging to remain actively engaged in the limited range and complexity of play materials typically available to children (e.g., table toys). The

higher rate of active engagement of girls during play may be related to preschool girls' tendency to exhibit more verbal interaction during their play than boys (e.g., Charlesworth & Dzur, 1987). In the current study, talking was one of the criteria for being coded as actively engaged.

The quality of play activities in the classrooms observed in this study is noteworthy. In addition to the lower rate of teacher presence compared to academic activities, the relatively small amount of time that children were observed in play entailed fine motor/manipulative activities to a greater extent than fantasy play. Moreover, about one-fourth of observed play activities occurred in whole group (e.g., all children sitting at tables working independently with a puzzle, pegboard, or other table toy). Although manipulative activities enable children to strengthen their fine motor and cognitive skills, it appears that children had few opportunities to improve their representational competence, language use, and social development through pretend actions and role enactments in constructive activities that other studies have found to be "high yield" activities regarding the cognitive complexity of child actions (e.g., Kontos & Wilcox-Herzog, 1997).

Our observations were conducted near the end of the school year when presumably students were familiar with classroom routines and expectations. Different patterns of behavior may have been found at earlier points of the school year (e.g., higher rate of child wandering or disengagement). Also, teachers may have increased their use of whole group instruction toward the end of the year as a means of preparing students for the transition to kindergarten. A needed direction in eco-behavioral research is the use of longitudinal designs that permit careful investigation of change over time in patterns of child engagement and classroom factors. In addition, increasing the number of observations per child (average of 50 across 3 days in the current study) in future research would help provide assurances that observations are representative of child behaviors and settings.

5.1. *Implications*

Our findings support early childhood program curriculum and practice guidelines that discourage frequent use of whole group settings. At the same time, the results provide only partial support for the corollary assumption that smaller groupings promote active engagement of children in learning activities. Active child engagement may not have flourished in smaller group settings because teachers did not substantially alter their dominant pattern of giving directions and instructions. In addition to recommending the use of small groups, then, practice standards and professional development efforts may need to provide concrete guidance on how teachers can take full advantage of smaller group settings for fostering active child engagement. One obvious starting point is teachers' use of questions, a strikingly infrequent occurrence in the current study.

Successful implementation of practice standards and professional development initiatives focused on appropriate teacher behaviors in small group settings may benefit from an understanding of influences on teachers' decisions regarding their own behaviors and uses of different group configurations to promote children's learning. One possible contribution to teachers' pedagogical practices is the elementary school building context of the preschool classroom, as suggested in the aforementioned Pianta et al. (2005) finding. Time and resources for children's free play, for example, may be difficult for pre-kindergarten teacher to justify to other teachers and administrators who view key attributes of attentive behavior – listening and watching – as the best indicators of engagement in learning. The school's context also may be influential. Parents and other members of communities comprised primarily of families from minority backgrounds living in poverty may consider listening, watching, and responding upon teacher request to be a particularly appropriate and needed approach to learning (e.g., Stipek, Milburn, Clements, & Daniels, 1992).

A valuable purpose of correlational research conducted in early childhood programs is the identification of variables that warrant further consideration in research-based program development work. Teachers' monitoring and affirming behaviors as well as the use of peer groups are worthy of attention in systematic efforts to promote active child engagement in learning. Monitoring and affirming behaviors are conducive to intentional embedding in teaching strategies employed in both academic and play activities. The coordination of peer-managed settings with other configurations (e.g., as a follow-up to whole or large group instruction) may prove to be a beneficial method of strengthening targeted knowledge or skill areas (e.g., by extending activities into a setting known to support active child engagement). Planned variation in the frequency, duration, and/or sequencing of a particular practice(s) could be examined in relation to level of child engagement and children's outcomes, thereby contributing to our empirical understanding of dosage as well as causal relations. This level of detailed investigation of classroom contexts is integral to advances in the search for ways to improve the outcomes of pre-kindergarten education, and begins with a promising set of classroom

features and teacher behaviors identified through research, such as the eco-behavioral approach employed in the current study.

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