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# Topics in Early Childhood Special Education

## Characteristics and consequences of everyday natural learning opportunities

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An ecological perspective of human development and learning views child functioning as multiply determined, where the processes influencing behavior and development emanate from different settings, and relations between the settings, in which children are participating members (Bronfenbrenner, 1979, 1999). According to Bronfenbrenner (1992), the aim of an ecological science of human development is the "systematic understanding of the processes and outcomes of human development" (p. 188) where "variations in developmental processes and outcomes are [considered] a joint function of the characteristics of the environment and of a [developing] person" (p. 197).

The study described in this article examined the influences of a number of person and environment (setting) factors on children's everyday learning opportunities and how children performed and functioned in several different behavioral domains. Our main interest was the influence of the development-instigating and development-enhancing characteristics of everyday family and community activity settings (Bronfenbrenner, 1979; Gallimore, Goldberg, & Weisner, 1993; O'Donnell, Tharp, & Wilson, 1993; Wertsch, 1985), although we examined the influence of other person and environment factors both to test the effects on child behavior and development and to ascertain the relative importance of activity setting characteristics as determinants of child performance and functioning. The importance of both classes of developmental processes was stated in the following way by Bronfenbrenner (1993):

> Among the personal characteristics likely to be most potent in affecting the cause ... of development ... are those that set in motion, sustain, and encourage processes of interaction between the [developing] person and two aspects of the proximal environment: first, the people present in the setting; and second, the physical and symbolic features of the setting that invite, permit, or inhibit engagement in sustained, progressively more complex interaction with an activity in the immediate environment. (p. 11)

The intervention we designed, implemented, and evaluated attempted to mirror this set of process conditions.

Two person and three activity-setting variables were investigated. The person variables included child developmental standing and caregiver responsiveness to child behavior. Child disability is at least one child (person) factor that would be expected to influence learning and development. Research has consistently demonstrated that children with developmental delays initiate interactions with objects and people less frequently than do their typically developing peers (Mahoney & Robenalt, 1986; Marfo, 1988). One of the most important socio-environmental factors associated with children's learning and development is adult sensitivity and responsiveness to child behavior (Mahoney, Robinson, & Powell, 1992; NICHD Early Child Care Research Network, 1999). Bronfenbrenner (1995) noted that caregivers, and their interactional styles, are a potent environmental influence on children's learning and development. Research now clearly indicates that children's learning is enhanced, and development is facilitated when competence production is responded to contingently and when caregivers support and encourage the production of new competencies (Shonkoff & Phillips, 2000).

Both the quantitative and qualitative characteristics of child participation in everyday family and community activity were investigated. According to Bronfenbrenner (1995), the influences of environment on human development are likely to be maximal when children's participation in everyday activity "occurs on a regular basis over extended periods of time" (p. 620). In the present study, both the frequency of participation in activity settings and the variety of activity settings experienced by the children were examined as factors that influence learning and development. Additionally, we investigated the development-instigating properties of activity settings that operate to produce variations in children's behavior and performance. According to Bronfenbrenner (1992), activities that make up the fabric of everyday life can have either development-enhancing or development-impeding influences and effects depending on the characteristics and features of the activities. As has been well documented, not all life experiences have similar features nor do they all have similar effects on learning and development (see especially Wachs, 2000). Everyday activities that invite and encourage child participation would be expected to produce positive developmental consequences, whereas everyday activities that hinder and discourage child participation would be expected to have negative developmental consequences. The rationale for the primacy of our interest in the development-instigating characteristics of naturally occurring everyday learning activities is explained next.

## ACTIVITY SETTINGS AS SOURCES OF LEARNING OPPORTUNITIES

The study described in this article was conducted as part of an early childhood research institute that is investigating ways of increasing young children's participation in everyday naturally occurring learning opportunities as one approach to promoting children's learning and development (Dunst & Bruder, 1999b; Dunst, Bruder, Trivette, Raab, & McLean, 1998). Descriptive studies of children's everyday experiences that were

conducted as part of this institute found that any one physical location (e.g., neighborhood playground) is the source of many different kinds of activity settings (sandbox, teeter-totter, swings, slide, etc.) and that any one activity setting is the source of many different kinds of learning opportunities (filling and dumping a bucket with sand, building a sand castle, burying toys in the sand, etc.; Dunst & Bruder, 1999a). Research now indicates that everyday family and community life provides young children with many different kinds of learning opportunities and experiences (Dunst, Hamby, Trivette, Raab, & Bruder, 2000; Goncu, 1999). Natural learning opportunities are afforded as part of daily living, child and family routines, family rituals, family and community celebrations and traditions, and other everyday activities that are either planned or happen serendipitously, and which across time and in their aggregate constitute the life experiences of a developing child (Bronfenbrenner, 1979, 1992). These include, but are not limited to, meal times, bath times, caring for pets, dressing and undressing, taking walks or strolls, playing in a puddle of water, picnics, planting flowers, bedtime stories, car or bus rides, bookstore story hours, amusement rides, play groups, grocery shopping, and the like. As noted by Gallimore and Goldenberg (1993), "Children's activity settings are the architecture of their everyday life and the context of their development" (p. 315).

Farver (1999) described in detail the different ways in which activity settings have been conceptualized and investigated from a child-in-context perspective of learning and development. This term has its roots in Vygotsky's (1978) model of socially mediated learning and Soviet activity theory (Leont'ev, 1981; Wertsch, 1985). The term has more recently been used by a number of writers (e.g., Tharp & Gallimore, 1988; Weisner, Matheson, & Bernheimer, 1995) for describing and studying the "contexts in which collaborative interaction, inter-subjectivity, assisted performance, and learning occurs" (Tharp & Gallimore, 1988, p. 72). Farver (1999) noted, "Activity settings are made up of everyday experiences rather than a deliberate curriculum, and they contain ordinary settings in which children's social interaction and behavior occurs. They are the who, what, where, when, and why of daily life" (p. 102).

The term activity setting was adopted as the unit of analysis for our early childhood research institute and this study because it best captures the rich array of naturally occurring everyday experiences that provide young children equally rich arrays of learning opportunities (see Dunst & Bruder, 1999a; Dunst, Hamby, et al., 2000). An activity setting is defined as a situation-specific experience, opportunity, or event that involves a child's interaction with people, the physical environment, or both, and provides a context for a child to learn about his or her own abilities and capabilities as well as the propensities and proclivities of others. The learning opportunities that take place in activity settings can be either planned or unplanned, intentional or incidental (Dunst & Bruder, 1999a). The kind of situated learning that takes place in the context of everyday experiences has been found to promote acquisition of competence that is culturally rooted, functional and adaptive, and makes possible increased child participation in everyday family and community activity settings, both social and nonsocial (e.g., Cole,

1996; Cole, Engestrom, & Vasquez, 1997; Fogel, 1997; Goncu, 1999; Hart & Risley, 1995; Rogoff, Mistry, Goncu, & Mosier, 1991, 1993).

Both practical experience (Dunst, 2001) and research (Wachs, 2000) tell us that there are differential characteristics and consequences of the learning opportunities experienced by and afforded to young children as part of everyday life. More than 30 years of child learning and development research highlight the environmental conditions associated with the positive behavioral effects of everyday learning opportunities (Wachs, 2000). Figure 1 shows a framework we have found useful for capturing selected features of natural learning environments that mirror what we know from child learning and development research. This way of portraying the influences of activity setting-based learning opportunities has been especially instructive as an organizing scheme to help practitioners determine the likelihood that natural learning opportunities will have development-instigating and development-enhancing features (Dunst, Herter, & Shields, 2000). The framework was used in the study described in this article to assess the characteristics and consequences of natural learning environment interventions for infants, toddlers, and preschoolers with delays or disabilities. The foundation of the model is interest-based learning opportunities. Research has demonstrated that children's learning is enhanced when their interests engage them in social and nonsocial interactions that provide opportunities to practice existing skills, explore their environments, and learn and master new abilities (Chen, Krechevsky, Viens, & Isberg, 1998; Gelman, Massey, & McManus, 1991; Guberman, 1999; Mandler, 2000; Nelson, 1999). Nelson (1999), for example, found that variations in the development of children's competence were "related easily to the child's life activities and interests" (p. 2). Similarly, Guberman noted, "Children's own interests and sense-making processes [are] a central formulation of supportive [learning] environments" (p. 207).

[FIGURE 1 OMITTED]

The way in which children's interests function as a factor (Bronfenbrenner, 1993; Wachs, 2000) that influences learning and development can be explained as follows. People, objects, and events that are interesting to children are what captures and maintains their attention (Fogel, 1997), encourages them to interact with people and objects (Rusher, Cross, & Ware, 1995), and promotes participation in social and nonsocial activities (Goncu, Tuermer, Jain, & Johnson, 1999). Interest-based playing, interaction, and exploration provide the foundation for child engagement (McWilliam & Ware, 1994). When children are engaged in everyday activities, they have the opportunity to practice existing abilities, perfect emerging skills, and acquire new competence (Farver, 1999). Contexts that afford children opportunities to express competence are ones that are more likely to encourage and support exploration (Wachs, 1979). Through exploration, children come to learn the relationship between their behavior and its consequences, thereby enhancing and strengthening their sense of mastery (MacTurk & Morgan, 1995). A sense of mastery, in turn, reinforces existing and promotes new interests.

## RESEARCH QUESTIONS

The investigation reported in this article constituted a modest attempt to ascertain the relative importance of different person and environment (activity setting) variables in terms of their influences on children's learning opportunities and changes in children's behavior and performance. We implemented procedures for increasing young children's participation in everyday natural learning environments, measured different person and environment characteristics, and related variations in these factors both to differences and changes in learning opportunities and to child behavior and performance. In each of the analyses we performed, the separate influences of one person variable (child functioning), one socio-environmental variable (caregiver responsiveness), and two kinds of proximal activity setting variables (number/ frequency and development-instigating characteristics) were ascertained in terms of changes that occur over time and group differences in the outcomes we considered. This tactic permitted us both to discern the relative importance of the different person and environmental influences on child behavior and performance and to establish the extent to which the person and environment factors were differentially related to the child outcome measures we investigated.

The specific research questions answered by our analyses were the following:

- What was the relative importance of different person and environment factors in explaining variations in different kinds of children's learning opportunities?

- What was the relative importance of different person and environment factors in explaining variations in different domains of child behavior and performance?

- What were the differential effects of the person and environment factors in explaining domain-specific variations in different developmental outcomes?

We hypothesized that children's learning opportunities and children's behavior and performance would be related to variations in the person and environment factors that we studied but that the development-instigating and development-enhancing characteristics of everyday learning activities would prove most important (Bronfenbrenner, 1999; Wachs, 1990). We further hypothesized that the influences of activity setting characteristics would show the strongest relationship to outcomes that were used as performance measures and that the influences of caregiver responsiveness would show the strongest relationship to outcomes that were more socially interactive in nature. On the basis of Bronfenbrenner's (1999) contention that the quantity of experiences needed to produce development change is important, we hypothesized that frequency and number of activity settings would be positively related to differences in children's learning opportunities and children's behavior and performance.

## METHOD

### Participants

The study participants were 63 children and their parents (92%) or relatives (8%) raising the children. The children were involved in Part C early intervention programs or Part B (619) early childhood education programs in six states (California IN = 8], Connecticut IN = 14], Hawaii [N = 7], New Mexico [N = 12], North Carolina IN = 17], and Wisconsin IN = 5]). Most of the children (60%) were served in center-based programs only, 29% were served in their homes, and 11% were served through a combination of center- and home-based programs. Participants were recruited primarily though their early intervention or preschool programs.

A purposive sampling procedure was used to ensure that study participants represented as diverse a sample as possible. Two child and two family characteristics were used for sample recruitment. Children were recruited so that they differed according to age and diagnosis or disability, and parents were recruited so that they differed according to their socioeconomic status and both cultural and ethnic backgrounds.

Table 1 shows the characteristics of the participants and their children and families. The children's ages covered the entire preschool period, with at least 10% of the children represented at each of six age levels. The children were quite diverse in their diagnoses, with the following conditions as their etiologies and reasons they were eligible for early childhood intervention: Down syndrome, Prader-Willi syndrome, cerebral palsy, hearing or vision impairments, prematurity, epilepsy, autism, microcephaly or macrocephaly, cleft palate, speech delays, and developmental delays. The children were nearly equally divided among four levels of developmental status (severity).

Family socioeconomic status (Hollingshead, 1975) was normally distributed among five classes. The extent to which families had chronic difficulties meeting financial obligations (i.e., were economically marginal) or had acute difficulties meeting financial obligations (i.e., were borderline economically marginal) was determined using financial adequacy measures developed by Bowman (1993) and McLoyd, Jayaratne, Ceballo, and Borquez (1994). Five items that measured the adequacy of financial resources for rent, food, clothing, and monthly bills, as well as difficulty in meeting other routine financial obligations, were each rated by the respondents on 4-point scales. Respondents who indicated that financial resources were "not-at-all adequate" and that they have "extreme difficulty" meeting financial obligations were considered economically marginal, whereas respondents who indicated that financial resources were "just a little adequate" and they had "some difficulty" meeting financial obligations were considered borderline marginal. On the basis of these criteria, nearly one fifth (18%) of the families had extreme difficulties meeting financial obligations, and nearly two fifths (38%) had some difficulty meeting financial obligations.

The diversity we sought in terms of family ethnic and cultural backgrounds was also achieved. The percentage of participants in each ethnic group varied from 10% to 22%, with no one group constituting a majority of study participants.

Although not targeted as selection criteria, the parents' background characteristics were diverse as well. Ages of the participants varied from 17 to 54, and they completed as few as 2 years to as much as 20 years of formal education. About half the participants were employed full or part time, and just over 75% of the participants were married or living with a partner.

**Procedure**

The study comprised 18 sessions and consisted of 2 weeks of preintervention interviews, observations, and measurements, and 16 weeks of intervention and ongoing data collection. The exact number of weeks it took to complete the study varied from 19 to 26 because of child illnesses, family vacations, and other life circumstances that occasionally prevented child participation in the everyday activities used as sources of learning opportunities and the collection of process (intervention) and outcome data.

Preintervention. Participants were interviewed using an investigator-developed interview protocol to identify the activity settings making up the fabric of family or community life, as well as the activity settings participants considered potentially important for their children but that were not used regularly as sources of learning opportunities. The protocol included an explanation of everyday family and community activities and how these activities could be used to provide or increase children's learning opportunities. We also explained that the purpose of the interview was to generate as complete a list as possible of everyday activities that would be used to select activities as sources of learning opportunities for the child.

The protocol was made up of 10 main questions (e.g., What kinds of things do you and your family do in and around your home or community every day or almost every day?) and follow-up probes for each question (e.g., What happens on a daily basis? Certain times of the day? Certain days of the week?). Observations during the preintervention visits, physical evidence (e.g., photographs, artifacts), and other sources of information (e.g., verbal descriptions) were also used to ask about and generate a compilation of each family's activity settings.

The 10 questions and probes were organized into two categories according to the type of activity setting. We first identified the daily routines, nondaily routines, family and community rituals and celebrations, and other child, parent, and family events and activities that constituted the life experiences of the participants. These included various activities, such as bath times, meal times, laundry, neighborhood walks, parent/child games, visiting friends or neighbors, grocery shopping, sandbox play, tricycle riding, hiking, swimming, watching Sesame Street, going to basketball or baseball games, praying, family conversations, eating out, Sunday school, and so forth. Second, we

asked participants to identify activity settings that were not a regular part of family or community life but that the participants thought might be appropriate sources of learning opportunities for their children. Participants were provided a list of examples of activity settings that other families used as sources of learning opportunities (Dunst et al., 1998) to see if there was anything else the respondent had not thought about that might be an activity that the child would find fun and enjoyable. The kinds of activities identified as potential sources of learning opportunities included planting flowers or vegetables, attending library story times, feeding ducks at a community pond, riding horseback, dancing and singing, playing with pots and pans, going to the zoo or pet store, attending community gatherings, and playing musical instruments.

The lists of activity settings that might serve as sources of everyday learning opportunities were used by the participants to select 10 to 12 activity settings that constituted the focus of intervention. Participants were asked to consider each activity and to pick those that they thought would be fun and enjoyable for their child. Research staff engaged participants in conversation about the appropriateness of the activity settings as sources of learning opportunities to be sure that those selected would be "good candidates" as sources of learning opportunities, and to consider activities that happened or could be made to happen easily and on a regular basis as part of participation in the study. Participants were asked to choose at least three activity settings that were not currently sources of learning opportunities and to pick activity settings that would or could occur three to four times per week. The average number of activity settings selected by the participants was 10.37 (SD = 0.77, range = 10 to 13). Figure 2 includes examples of the kinds of activities selected as sources of learning opportunities.

After the target activity settings were selected, participants were asked to identify the behavior or behaviors they wanted their children to produce in each activity setting, with the caveat that the behaviors were to be interesting and enjoyable to the children. Participants were asked to consider each activity setting one at a time and to describe the behavior or behaviors they wanted their children to do or learn in the activity. Research staff engaged participants in conversation about the behaviors to be sure they had a high probability of occurring in the activity settings and to ascertain whether they could be produced often. Notwithstanding these suggestions, the final decision about children's behavior (as well as activity settings) was left to the participants. The variability that resulted from this tactic allowed us to capture differences in the development-enhancing characteristics of the activity settings that constituted the focus of this study (see Measures section below). Figure 3 gives examples of the kinds of behaviors selected by participants.

Intervention. Participants were visited every other week for 16 weeks during the intervention phase of the study, a total of 8 visits. At the end of the preintervention period and during the first week of intervention, the participants and research staff together developed and implemented procedures to increase children's participation in activity settings as sources of learning opportunities. Two approaches were used to increase

children's participation: an activity schedule and an activity setting by child behavior matrix (Dunst et al., 1987). One type of instructional practice (responsive teaching--see below) was used to encourage participants to reinforce and facilitate their children's behavior in the context of activity settings.

The activity schedule was used to remind participants to increase their children's involvement in the activity settings that were selected as sources of learning opportunities. Participants were told that the purpose of the schedule was to assist them in providing their children more learning opportunities by increasing the number of times the children participated in the activities. Either a daily or weekly schedule was used by the parents as a prompt to remember to involve their children in the activity settings. Figure 2 shows an example of a weekly schedule used to increase child participation in activity settings. The way in which the schedules were used by participants was highly individualized, although each participant was asked to identify and follow 3 or 4 steps to be sure the schedule was used as a way to increase participation in the activity settings. In the largest majority of cases, the schedules were used like a "shopping list" to remind the participants to involve their children in the activities during the days of the week indicated.

Figure 3 shows an example of the matrix employed in the study. The activities included on the activity schedule were first listed across the top of the matrix, and the behaviors identified by the participants during the preintervention phase (see above) were listed down the left-hand side of the recording form. Respondents were then asked to consider each behavior one at a time and to indicate which activities would provide their children opportunities to produce the behavior by placing an X in the appropriate cells. The matrix was used to focus attention on desired behavior in the activity settings that were selected as sources of learning opportunities, to illustrate that different activity settings provided contexts for expressing various child behaviors, and to focus parents' attention on their children's competence in the activity settings. The same procedure implemented to promote participants' use of the activity schedule was employed to encourage the participants to use the matrix as an intervention strategy.

Contingent responsiveness and/or incidental teaching (see Wolery & Sainato, 1996) were the instructional strategies used to reinforce and support children's production of competence in the context of the activity settings. The procedures were described to the participants as "responsive teaching." Participants were shown how to respond contingently to their children's behavior to maintain engagement, provide support and guidance as needed, and evoke variations and elaborations in children's behavior. The instructional practice was taught by explaining and demonstrating how children's use of different behaviors in activity settings could be maintained or increased by ensuring that the behaviors produced something interesting and positive (e.g., a roly-poly making a sound each time a child moved it, or a participant smiling or talking to the child each time the child vocalized to an adult). Response elaboration was explained and demonstrated in terms of ways of getting the child to produce variation in his or her behavior as part of participation in the activity settings.

After explaining and demonstrating the use of the teaching methods (contingent responsiveness and/or incidental teaching), participants themselves were asked to implement the procedures, and feedback was provided using the activity setting by child behavior matrix as the framework for embedding responsive teaching into everyday learning opportunities. The responsive teaching procedures were reviewed and discussed during each visit with the families, and necessary modifications were made on the basis of investigator observations and participant comments or feedback. The ongoing observations, conversations, and feedback were used to ensure that the procedures were consistently used as an instructional practice.

**Independent Variables**

During the 2-week preintervention period and throughout the course of intervention, we assessed the number and frequency of participation in activity settings, obtained measures of the development-enhancing characteristics of the activity settings, and collected information about participants' use of responsive teaching. In addition, we obtained measures of children's developmental standing to determine each child's developmental quotients. Table 2 lists the person and setting variables that constituted the focus of investigation and the indices used as independent measures in the analyses we performed.

Activity Settings. Participants maintained daily logs of whether their children participated in the activity settings selected as sources of learning opportunities. The logs listed the activity settings down the left-hand side of a recording form and the days of the week across the top of the form. Participants simply circled the days of the week on which an activity setting occurred and that their children participated in the activity settings. The average occurrence of activity settings per week was determined for each child and was used as the measure of frequency of participation in the activity settings. Children participated in an average of 33.37 (SD = 13.84) of the targeted activity settings per week during the course of the study.

In addition to information about participation in everyday activity settings that was obtained from the daily logs, every other week, beginning on the first week of intervention, we administered an activity setting scale that included an assessment of whether the children participated in the activity settings that were selected as sources of learning opportunities. Participants were asked to indicate for the 10 to 13 activities used as sources of learning opportunities whether the children participated in the activity during the past week. The mean number of activity settings that the children experienced per week was used as the measure of number of activity settings occurring for each child. Of the 10 to 13 activity settings selected as sources of learning opportunities, the average number of different activity settings in which children participated each week was 8.65 (SD = 1.44).

Repeated measures analyses of both sets of learning opportunities data produced significant differences in the number and frequency of participation in activity settings

during the course of the study. Follow-up tests showed that the number of different activity settings used as sources of learning opportunities and the frequency of participation in the activities increased significantly from the preintervention to the end of the first two weeks of intervention. Thereafter, number and frequency remained stable throughout the study, as evidenced by nonsignificant within intervention phase comparisons.

Activity Setting Characteristics. The development-enhancing characteristics of activity setting-based learning opportunities were assessed using both an investigator-administered parent interview protocol (activity setting rating scale) and investigator observations and rating of children's participation in everyday activity settings. The Activity Setting Rating Scale was used to obtain parents' judgments of the characteristics of both the activity settings and children's participation in the activity settings, and the investigator ratings were used to ascertain the reliability of the parents' judgments.

The Activity Setting Rating Scale was administered every other week during intervention and included participants' judgments of six characteristics of children's learning for activities that occurred during the week prior to completing the scale. For each activity that occurred during the week prior to the interview, participants were asked six questions using family-friendly language and terminology (e.g., How much was the activity something [child's name] enjoyed or was interested in doing?) to obtain information about the characteristics of the learning opportunities. For each activity setting in which the child was a participant, we assessed the extent to which (a) the activity setting was interesting to the child, (b) the child was engaged in the activity setting, (c) the child manifested targeted behavior, (d) the child displayed new or emerging competence, (e) the activity setting afforded opportunities for exploration, and (f) the child displayed variety in his/her behavior repertoire. Each characteristic was rated on a 5-point scale ranging from not at all true to a great deal true for the child's behavior and responses.

An average of 74 activity settings per child (SD = 16) was assessed over the course of the study to judge the extent to which learning opportunities were characterized by development-enhancing features. A factor analysis of the six activity setting characteristics obtained during the study produced a single-factor solution. A composite score was computed for each child and used as a measure of the development-enhancing characteristics of the activity settings that served as the contexts for everyday learning opportunities.

Researchers' observations of children's participation in activity settings occurred on five occasions and were used to assess the same characteristics of learning opportunities as were rated by the participants. An average of 15.45 activity settings per child (SD = 4.16) was observed and rated over the course of the study. The same activities that were rated by the participants and observed by the research staff were used to establish interrater reliability of the six ratings. Median interrater agreement for the six activity setting

characteristics was 89% across all observation sessions, and ranged from 81% to 95% for the individual characteristics.

Responsive Teaching. Participants completed a 10-item ([alpha] = .95) investigator-developed scale to assess the degree of adoption and usefulness of the responsive teaching method. The scale was completed 4 weeks after the responsive teaching procedures had been implemented by the participants. Respondents assessed the extent to which the procedure focused their attention on their children's abilities, was useful for maintaining their children's engagement, provided them a tool to reinforce their children's competence, and helped them provide their children a variety of opportunities to learn new behavior. Individual scale items were rated on a 4-point scale ranging from not at all true to very true with regard to adoption and usefulness.

Development Quotients. Assessment information that was obtained about each child's age-equivalent level of development was used to calculate developmental quotients (DQs) as a measure of developmental standing. DQs were calculated using the following formula: DQ equals developmental age divided by chronological age multiplied by 100.

**Outcome Measures**

Several different parent self-report and investigator-administered observation and rating scales were used as dependent measures to assess changes in both learning opportunities and children's behavior and performance. The instruments used as outcome measures, and selected characteristics of each scale, are listed in Table 3. (The appendix includes sample items from each of the scales.) The largest majority of outcome measures (64%) was investigator-administered observation rating scales, whereas 36% were parent self-report scales. Four of the measures assessed different kinds of children's learning opportunities, and seven scales measured different aspects of children's behavior and performance. The instruments were administered five or eight times over the course of the study and were used as repeated measures in the analyses we performed to relate person and environment characteristics to their consequences. The scales were specifically selected or constructed to assess learning opportunities and children's behavior and performance beyond that measured or observed in the activity settings that constituted the focus of intervention. Additionally, the scales and measurement procedures were carefully selected to assess different but converging aspects of learning opportunities and children's performance.

The Child and Parent Experiences Scale (Dunst, 1998) and Parent and Child Play Scale (Dunst, 1986) were used to measure different aspects of children's behavior and children's learning opportunities. Both are self-report measures and were completed by the participants on five occasions during the study (once during preintervention and four times during the intervention phase).

The Child and Parent Experiences Scale includes three child-related subscales (Everyday Child Performance, Child Progress, and Child Learning Activities). The

Everyday Performance subscale includes six items ([alpha] = .70) that measure a child's social affective behaviors (e.g., smiles or laughs), social interaction (e.g., enjoys being around other people), communication (e.g., knows how to get others' attention), and volitional behaviors (e.g., tries hard to do things he or she likes). Respondents indicated on a 5-point scale how often their children manifested the behaviors on a typical day. A factor analysis of the subscale items produced a single-factor solution. The subscale therefore constituted a unidimensional measure of children's everyday behavioral competence.

The Child Progress subscale includes six items ([alpha] = .79) that measure respondent judgments about whether their children made less, more, or about the amount of progress expected at the time the scale was completed. Judgments about children's progress were made in terms of ambulation (e.g., getting around on his/her own), social-adaptive abilities (e.g., participating in family activities), communication (e.g., getting people to understand wants), and socialization abilities (e.g., getting along with other children), with each item rated on a 5-point scale. The subscale was developed to assess parents' perceptions of the degree of their children's behavior change. A factor analysis of the subscale items produced a unidimensional solution.

The Child Learning Activities subscale includes five items ([alpha] = .84) that ask respondents to indicate the extent to which the participants were able to provide their children different kinds of learning opportunities (e.g., when and where a child gets to experience learning activities) and the extent to which their children participated in the activities (e.g., how often the child gets to play with other people). Each item was rated on a 5-point scale ranging from not at all to always. A factor analysis of the subscale items produced a single-factor solution measuring parent-mediated child learning opportunities.

The Play Scale includes 24 items ([alpha] = .89) organized equally into six types of play opportunities: responsive parent/child games (e.g., blowing raspberries), lap games (e.g., peek-a-boo), mastery play (e.g., finger games), pretend play (e.g., phone conversations), verbal play (e.g., singing songs), and discovery play (e.g., drawing with crayons). The scale specifically measures how often a parent and child participate in everyday informal learning opportunities. Respondents indicated on a 4-point scale the number of days per week the parent and child played each game. A second-order factor analysis of the 24 scale items produced a single-factor solution that indicated the appropriateness of summing scale responses to obtain a total scale score. This score (sum of the 24 item ratings) was used as a measure of parent/child play opportunities.

The Child Behavior Rating Scale, based on the Carolina Record of Individual Behavior (Simeonsson, Huntington, Short, & Ware, 1982), was used to measure different aspects of children's behavioral characteristics. The particular subscales used as outcome measures assessed both the quality and quantity of children's performance in different behavioral domains. The scale was administered by the research staff on five occasions during the study (once during preintervention and four times during intervention). The

scale includes four sets of five items that measure child social responsiveness ([alpha] = .85), cognitive style ([alpha] = .84), positive affect ([alpha] = .84), and negative affect ([alpha] = .79). Ratings were made based on observations of the child during the every-other-week visits to the family's home. Each scale item had different 5-point rating scales. Factor analyses of each set of items produced unidimensional scales. The social responsiveness subscale measures the nature of children's interactions with adults, child social involvement, responsiveness, orientation, and social engagement with adults. The cognitive style subscale measures children's attention span, activity level, goal directedness, endurance, and motivation. The affect subscales measure different types of children's positive (smiling, laughter, animated expression, etc.) and negative (crying, fussing, apprehensiveness, etc.) affective behaviors.

The Child/Parent Rating Scale was used as a global measure of child behavioral style and child/child and adult/ child interactions. The scale is an investigator-developed instrument, and was administered on eight occasions (once during preintervention and seven times during intervention). The scale includes a child performance subscale, with five items ([alpha] = .74) that measure different aspects of children's everyday behavioral style (affective responsiveness, vocal and verbal behavior, excitement, persistence, etc.). Each item was rated on a 4-point scale ranging from not at all to a lot. The scale also includes two sets of items that measure socialization opportunities with other children (siblings, friends, or cousins) and with adults (parents, relatives, or other adults). The frequency of opportunities to interact with children and adults was calculated on the basis of observations of the children participating in the study.

**Methods of Analysis**

Repeated measures ANOVAs and linear growth curve analyses were used to assess the relationships between activity settings, child and participant characteristics, and differences and changes in both learning opportunities and children's behavior and development. Both were performed using the BMDP statistical software program 5V (Dixon, 1992). BMDP5V uses an analytical approach, in which time-varying differences in dependent (outcome) measures are explained by a set of regression parameters for one or more independent variables. Stated differently, within-subject time period differences (5 or 8 in the present study; see Table 2) in learning opportunities and children's behavior and performance were related to between-subject group differences by means of regression methods for repeated measures data.

In the repeated measures ANOVAs, dummy variable coding (Hardy, 1993) was used to generate time period contrasts, and to estimate the regression parameters that were calculated for the main effects for time periods, main effects for group differences, and the interactions between time periods and groups. In the growth curve analyses, rates of change (regression slopes) were calculated for each child's data by fitting a model in which the regression of the dependent variables on time was assumed to be linear. Two sets of growth curve analyses were performed: one for the time period scores and one for a linear transformation of these scores (see below). The regression parameters for

the linear growth curves, group differences, and the interactions between growth curves and group differences were used to determine the effects of the independent variables on differences in the slopes of the regression lines. Growth curve analysis is "born out of a ... statistical tradition in modeling of individual growth over time" (Willett, 1988, p. 347).

The between-factor independent variables in the analyses were frequency of participation in activity settings, number of activity settings serving as sources of learning opportunities, development-enhancing characteristics of the activity settings, responsive teaching, and severity of child disability (functioning). A median split of each independent measure was used to constitute groups for testing the effects of variations in each factor on the outcomes considered (see Table 2). This strategy involved dichotomizing the scores for each independent variable into the lowest 50% and the highest 50% in order to constitute contrasting groups of children. For each independent variable, assignment to groups above the median constituted the presence of more favorable person or environment characteristics.

The dependent variables were the measures of learning opportunities and children's behavior and performance obtained throughout the study (see Table 3). Four different kinds of learning opportunities were considered in each analysis: child learning activities, child/child interaction opportunities, child/adult interaction opportunities, and parent/child play opportunities. The seven child behavior and performance measures that were considered in each analysis were everyday child performance, respondent judgments about child progress, child social responsiveness to adults, child cognitive style, child positive affect, child negative affect, and child behavioral style.

Three different sets of dependent measures were calculated and subjected to both repeated measures ANOVAs and growth curve analyses. Each provided a different way to conceptualize and measure change (Menard, 1991) and were intended to provide different solutions for measuring growth and ascertaining factors associated with changes or differences in time-series data (see especially, Willett, 1988, 1989). The first set of measures was the individual time period scores, calculated as the sum of the individual ratings making up the different learning opportunities and child performance scales or subscales. These scores provide direct indices that ascertain mean differences between groups, but are only indirect measures of intra-individual change (Applebaum & McCall, 1983). The second set of measures was the growth curve slopes of the individual time period scores. These are direct measures for ascertaining intra-individual change and therefore constitute child-specific indices of growth patterns (Burchinal & Appelbaum, 1991; Willett, 1988). The third set of measures was the growth curve slopes of the cumulative totals of the individual time period scores. This simple transformation of the dependent measures produced intrinsically linear outcomes (Devore, 2000) and made possible direct tests of the influences of the independent variables on variations in linear trends. The transformed time period scores are best conceptualized as measures of the cumulative consequences of variations in person and environment factors (see e.g., Hart & Risley, 1995).

Probability statistics and effect sizes were calculated in the three sets of analyses. BMDP5V computes for both ANOVAs and growth curve analyses Wald-type chi-square statistics that test the null hypothesis that there are no between- or within-subject group differences, or interactions between research factors. Significant chi-squares indicate that the effects of an independent variable, or its interaction with time period or linear growth curve estimates, are reliably different. Effect sizes were calculated using procedures described in Rosenthal (1994) for between-group comparisons and Rosenthal and Rosnow (1991) for within-group (time period) differences. An effect size is a measure of the "size of the relationship between any two variables" (Rosenthal, 1994, p. 232) and is an index of how much one group of subjects differs from another group of subjects on a dependent measure. These were calculated from Z-scores produced by BMDP5V, in which main effects for groups, main effects for time period differences or growth curves, and the interactions between research factors are decomposed into single degrees of freedom regression terms. According to Lipsey (1998), an effect size of .20 "is a reasonable minimal effect size level to ask [intervention] research to detect--it is large enough to potentially represent an effect of practical significance, but not so small to represent an extreme outcome for intervention research" (p. 45).

## RESULTS

Recent guidelines for reporting intervention research findings were used as a framework for presenting and interpreting results (Lipsey, 1998; Snyder, 2000). In presenting the findings, the chi-squares (and their probability levels) and the effect sizes (ES) for the main effects of the five person and environment factors, and the interactions between time series and these factors, provide the basis for substantive interpretation of the results. Following convention, the ESs for the main effects analyses were "computed so that positive values indicate a 'better' outcome" for the group of subjects characterized as having more favorable person or environment features (Lipsey, 1998, p. 42). The larger the ES for the interaction terms, the more the person or environment factor moderates time period (or linear trend) differences in the dependent measures (Hall, Rosenthal, Tickle-Degnen, & Mosteller, 1994). Findings were considered substantively important when both the p values and effect sizes for a main or interaction term were of sufficient magnitude to consider the analyses sensitive in detecting a mean group difference or differential pattern of time-series change in the data (Lipsey, 1998).

### Learning Opportunities

Time Period Scores. The main effects results for the time period data, and interactions between time period and group membership on each research factor, are presented in Table 4. Differences in three of the four learning opportunities measures were related to variations in one or more person and environment factors as well as interactions between these factors and time periods. In almost every case, the presence of more favorable features was associated with overall group differences in numbers of learning opportunities (main effects) and differences in the numbers of learning opportunities afforded the children at one or more time period (interaction effects).

The main effects analyses of the time period scores produced the following results. First, the presence of more favorable development-enhancing activity setting characteristics was associated with involvement in significantly more child learning activities and more parent/ child play opportunities. In other words, children who experienced activity settings (as part of the intervention) characterized by different development-instigating features (see Figure 1) tended to be the same children whose parents reported engaging their offspring in more learning and play activities. Second, participation in a larger variety (number) of activity settings was related to parents reporting that they engaged their children in more learning activities compared to children who experienced less varied numbers of activity settings. Third, greater adoption and use of the responsive teaching methods were associated with observed differences in child/adult interactions; the greater the adoption and use of the instructional practices, the more the children were observed interacting with adults.

[FIGURE 1 OMITTED]

The main effect for number of activity settings and differences on child learning activities was qualified by a Research Factor x Time Period interaction. Post hoc analysis of this interaction indicated that children participating in a larger number of activity settings experienced more learning activities at 3 out of 5 of the time periods, $Fs(1, 61) = 3.33$ to 9.70, $ps < .05$ to .001. The influences of number of activity settings on the pattern of differences, however, did not show any time period trend as evidenced by a near zero effect size. (A significant p value in the absence of an effect size large enough to be considered practically significant [Lipsey, 1998] indicates that the differences between groups did not become progressively larger across time periods [Rosenthal & Rosnow, 1991].)

Post hoc analysis of the Time Period x Child Functioning interaction for child/adult interaction opportunities found that children's participation in this kind of learning opportunity remained stable across time for higher functioning children and tended to decrease across time for lower functioning children.

Growth Curve Scores. Table 5 shows the results of the linear growth curve analyses of the dependent measures regressed on time period. The main effects analyses are tests of whether the y intercepts of the regressions for the children classified the lowest versus the highest on each independent variable are statistically or practically significantly different from one another, and are interpretable as measures of average group differences only in the absence of a Linear Trend x Research Factor interaction. The main interest in the growth curve analyses is the interactions between person and environment factors and growth patterns.

The main effects findings that are interpretable can be summarized as follows. First, children who participated in activity settings characterized by development-enhancing features were the same children whose parents reported providing them more learning activities and engaging them in more parent/child play activities, but who were observed

participating in fewer child/adult interactions. Second, children participating in a larger variety (number) of activity settings were the same children whose parents reported providing them more learning activities. Third, the greater the adoption and use of the responsive teaching method, the greater the numbers of child/adult interactions that were observed during the study.

The main effects for both number of activity settings and child functioning on parent/child interactions were both qualified by linear trend by research factor interactions. The Linear Trend x Number of Activity Settings interaction showed a linear decrease in child/adult interactions across time among children who participated in a larger variety of activity settings, whereas the children who participated in fewer numbers of activity settings showed neither an increase nor a decrease in the pattern of interactions with adults. The Linear Trend x Child Functioning interaction showed that the lower functioning children were observed interacting with adults less often across time, and that the higher functioning children showed neither an increase nor a decrease in the pattern of interactions with adults.

The Linear Trend x Responsive Teaching interaction for the child/child interaction data showed that greater adoption and use of this instructional practice was related to neither an increase nor a decrease in the pattern of child/child interactions, but that less frequent use of the instructional practice was related to a linear increase in the number of child/child interactions.

Cumulative Learning Opportunities Scores. Results of the analyses of the cumulative score data are also shown in Table 6. The dependent measures were made to be intrinsically linear through the transformation described in the Methods section. The meaning of the chi-squares and ESs, as well as the caveat about interpretation of main effects in the presence and absence of significant interaction terms, are the same as those described for the growth curve analyses of the time period data. Meaningful and substantive interpretations of the findings are limited to the interaction terms that are tests of whether the rates of cumulative change (slopes) in the linear growth curves differ as a function of low versus high group membership on each of the research factors.

Findings showed that the presence of more favorable activity setting characteristics was associated with more rapid rates of increase in the cumulative numbers of both child learning activities and parent/child play opportunities. Children participating in larger numbers of activity settings also showed more rapid rates of increase in the cumulative numbers of child learning activities.

Greater adoption and use of the responsive teaching method was associated with a more rapid rate of increase in the cumulative number of observations of children interacting with adults. The cumulative number of child/ adult interactions increased for lower functioning children more rapidly compared to higher functioning children.

## Child Functioning

Time Period Scores. Repeated measures analyses of the seven child behavior and performance scores produced significant time period differences, [chi square]s = 12.41 to 27.11, ps < .02 to .0001, ESs = 0.35 to 0.64, for five of the seven dependent measures (child progress, child social responsiveness, child cognitive style, child negative affect, and child behavioral style). The chi-squares are omnibus tests indicating that there are between-time period differences in the mean child behavior and performance scores at one or more measurement occasions, whereas the effect sizes indicate that the mean differences on each dependent measure tend to increase across time.

Table 7 shows the main and interaction effect results of the analyses of differences in the time period data. Between-group differences in all seven child behavior and performance measures were associated with main effects variations in person and environment characteristics, or the interactions between these characteristics and time period. In almost every analysis, the presence of more favorable person and environment characteristics was related to enhanced positive and prosocial child functioning and attenuated negative child affect.

Examination of the main effects results showed that children participating in activity settings having development-enhancing characteristics had higher everyday child performance, child progress, and cognitive style scores, and lower negative affect scores, compared to children in the low activity setting characteristics group. The more frequently children participated in activity settings, the less negative affective behavior was observed. The larger the number of activity settings used as sources of learning opportunities, the higher the child positive affect and behavioral style scores for the children. Greater adoption and use of the responsive teaching methods were also related to enhanced positive child affect.

There were a number of Research Factor x Time Period interactions showing that variations in person and environment characteristics were associated with time period differences. Post hoc analysis of the Time Period x Frequency of Participation in Activity Settings interaction produced a significant between-group difference at only one time period, $F(1, 61) = 4.22$, $p < .05$. Consequently, there was no pattern of progressively larger between-group differences on the outcome measure in the time series as evidenced by the small effect size for the interaction term.

Children who participated in a larger variety (number) of activity settings manifested more social responsiveness and more positive affect at the last three of five time periods compared to children who participated in fewer activity settings, Fs(1, 61) = 3.83 to 6.20, ps < .05 to .02. The effect size for the positive affect findings showed that there were progressively larger between-group differences across time period (favoring the children who participated in a larger variety of activity settings), but that differences between groups on the social responsiveness measure showed no similar time series pattern.

Greater adoption and use of the responsive teaching method were associated with more positive affective behavior and more positive child behavioral style at three time periods, Fs (1, 61) = 3.50 to 12.59, ps < .05 to .001. There was no pattern of progressively larger between-group differences across time for positive affect, but there was a trend toward more positive behavior style across time among children whose parents used responsive teaching less often (as evidenced by the effect size for the interaction).

Post hoc analyses of the Time Period x Child Level of Functioning interactions showed that higher functioning children manifested more positive child affect and more positive child behavioral style at only one of the five time periods, $F(1,61) = 4.17$, $p < .05$, and that higher functioning children manifested more negative affect at one time period, $F(1, 61) = 7.60$, $p < .01$. Examination of the Time Period x Child Functioning interaction for the positive child affect measure showed a trend toward lower functioning children displaying more positive affect across time, and higher functioning children displaying less positive affect across time.

Growth Curve Scores. Growth curve analyses of whether there were linear increases or decreases in the child behavior and performance time period scores found significant linear increases for the child progress, social responsiveness, cognitive style, and behavior style measures, [chi square]s = 10.83 to 26.42, ps < .001 to .001, ESs = 0.41 to 0.65, and a linear decrease in the negative affect measure, [chi square] = 6.58, $p < .01$, ES = -0.32.

Table 8 shows the main and interaction effects results for the influences of the person and environment factors on the growth curves of the child behavior and performance measures. The presence of more favorable activity setting characteristics was associated with higher average differences for the everyday child performance, child progress, and cognitive style measures, and lower average differences on the child negative affective behavior measure. Greater adoption and use of responsive teaching were related to greater display of positive affect, and greater adoption and use of this instructional practice and higher functioning child development standing were both related to higher average behavioral style scores.

Findings for both the Linear Trend x Frequency of Participation in Activity Setting interaction for cognitive styles and the Linear Trend x Number of Activity Setting interactions for positive affect indicated more rapid rates of increase in the outcomes where participation in activity settings was more frequent and more varied, respectively. Inspection of the Linear Trend x Child Functioning interaction showed that the rate of increase in positive child affect was more rapid among the lower functioning children compared to the higher functioning children.

Cumulative Child Performance Scores. Table 9 shows the findings from the growth curve analyses of the cumulative child behavior and performance scores. Substantive interest is found primarily in the Linear Trend x Research Factor interactions because these

provide tests of the contributions of variations in person and environment factors to rates of change among children classified as low versus high on each research factor.

Results of the Linear Trend x Person and Environment Factor interactions indicated that the presence of more favorable factors was associated with more rapidly ascending increases in prosocial behavior and slower ascending increases in negative functioning across time. The findings for the Linear Trend x Activity Setting Characteristics interactions indicated that the cumulative scores for everyday child performance and child progress increased more rapidly when activity settings were characterized by development-enhancing features, and that the negative affect scores ascended less rapidly in the presence of more favorable activity setting characteristics.

Inspection of the growth curves for the Linear Trend x Frequency of Participation in Activity Setting interactions found that the cumulative scores for the child social responsiveness and child cognitive style increased more rapidly when the frequency of participation in activity settings was high, and child negative affect increased less rapidly under the same condition. Rates of increases in the cumulative social responsiveness, positive child affect, and child behavior style scores all increased more rapidly among children who participated in a larger variety (number) of activity settings.

Greater adoption and use of the responsive teaching method were associated with more rapidly ascending positive affect and child behavioral style cumulative scores compared to children who experienced less consistent use of this instructional practice. More rapid increases in child negative affect were found among higher functioning children compared to their lower functioning counterparts.

**DISCUSSION**

Findings showed that differences and changes in children's learning opportunities and children's behavior and performance were influenced by variations in a number of person and environment factors, consistent with Bronfenbrenner's (1979, 1992, 1995)contentions about the manner in which proximal processes function as mechanisms influencing child development. Several major observations can be made regarding the overall pattern of findings. First, differences and changes in both children's learning opportunities and children's behavior and performance were multiply determined, as predicted. Second, the influences of the particular person and environment factors we examined were greater for differences and changes in children's behavior and performance compared to differences and changes in children's learning opportunities. Third, the influences of the three different activity setting factors on children's behavior and performance were more pronounced than were the influences of responsive teaching or child functioning on this same class of outcomes.

A simple tally of the person and environment factors most associated with variations in children's learning opportunities and children's behavior and performance found that the development-enhancing characteristics of everyday learning opportunities were the best

predictor of differences and changes in the outcomes we investigated. This pattern of findings supported our hypothesis that children's interests, engagement, exploration, and mastery would be the best predictor of variations in the outcomes of everyday learning opportunities. The relationships between activity setting characteristics and their development-enhancing consequences, however, were differential in nature. Whereas the development-instigating characteristics of activity settings had overall main effects on average differences in both learning opportunities (Tables 4 & 5) and child behavior and performance (Tables 7 & 8), the moderating influences of this environment factor were most pronounced in terms of its effects on the number of cumulative learning opportunities (Table 6) and cumulative measures of child functioning (Table 9). The consequences of the development-enhancing characteristics of activity settings on child functioning have now been replicated in two other investigations. In one study, the main and interaction effects of activity setting characteristics on the same child behavior and performance measures included in this study were found to be almost identical (Trivette, Dunst, Bruder, Raab, & McLean, 2000). In another study, we found similar main and interaction effects of development-enhancing activity setting characteristics on non-English-speaking children's acquisition of English (Bruder, Trivette, Dunst, & Hamby, 2000).

According to Bronfenbrenner (1999), "To be effective, activity must take place 'on a regular basis over an extended period of time'" (p. 6) for developmental consequences to be realized. The fact that variations in learning opportunities would be expected to be associated with differences in child learning and development is not new. Mead (1954) noted a half century ago that differences in "ordinary life situations" (i.e., natural learning environments) account for differences in children's learning and development. Findings from the analyses of the number of activity settings used as sources of learning opportunities and frequency of participation in the activity settings generally support Bronfenbrenner's contention. The variety (number) of activity settings experienced by the study participants was associated with positive consequences in both enhanced learning opportunities and child functioning, and frequency of participation in activity settings was associated with positive effects in enhanced child functioning.

Results from this study both replicate and extend findings from other investigations. They replicate results of other investigations demonstrating that the different activities that make up the fabric of everyday life are important natural learning environments for promoting children's development and functioning (see e.g., Gallimore & Goldenberg, 1993; Goncu, 1999; Hart & Risley, 1995; Rogoff et al., 1991, 1993; Wachs, 2000). The results also replicate results of intervention studies demonstrating that everyday activities provide contextually appropriate and important settings for supporting and strengthening child competence (e.g., Kellegrew, 1998; Odom, Favazza, Brown, & Horn, 2000; Santos & Lignogaris/Kraft, 1997; Stremel et al., 1992).

The findings pertaining to the effects of responsive teaching generally are consistent with other research regarding the influence of social responsiveness as a socio-environmental factor contributing to children's learning and development (e.g., Mahoney, Boyce, Fewell,

Spiker, & Wheeden, 1998; NICHD Early Child Care Research Network, 1999; Odom et al., 2000), although the relative importance of this factor was not as great as hypothesized. There are at least two explanations for this result. The first has to do with how we measured responsive teaching. A self-report parent scale was used as a proxy index of adoption and use of this instructional practice. It could be the case that the self-report scale simply was not a valid measure of implementation of the teaching procedure. Findings from another study (Trivette et al., 2000) mitigate against this explanation. In the replication study of the investigation reported in this article, we used an observation instrument for repeatedly measuring adoption and use of this practice and found even fewer significant main and interaction effects of responsive teaching on child functioning.

A more plausible explanation for the results of this study is found in Bronfenbrenner's (1993) contentions about the development-instigating qualities of the physical environment, Wach's (1979, 1990) research indicating that the physical characteristics of environments indeed have positive behavioral influences independent of social influences, and that physical qualities can supercede the influences of social factors (and vice versa) depending upon the environments experienced by developing children. We placed primary emphasis on activity settings as contexts for learning and found that activities characterized as having certain features indeed had predicted effects. This is not to diminish the importance of adult sensitivity and responsiveness to child behavior as a factor influencing development, but rather to point out that other factors can and do exert influences on child behavior and development.

Our study has both strengths and limitations that need to be pointed out to place the approach to, and results of, the investigation in proper context. Strengths of the study include the relatively unintrusive approach to increasing child participation in activity settings and the effort to document different consequences of naturally occurring everyday learning opportunities. In all but a few instances, parents participating in the study reported that they found the intervention useful, easy to implement, and easily incorporated into daily life. The inclusion of different measures of child learning opportunities and child behavior and performance permitted us to determine the domains of life functioning that are most and least influenced by person and environment factors. For example, the intervention we devised emphasized activities involving parent/child learning opportunities, and we found that the most differences and changes in outcomes involved these types of learning opportunities. In contrast, the intervention did not focus directly on increasing child/child learning opportunities, and indeed we did not get many differences or changes in this particular type of learning opportunity.

The limitations of the study include nonexperimental control over the person and environment factors constituting the focus of analysis and the relative short duration of the study. The fact that we (intentionally) allowed the research factors of interest to vary naturally raises a concern about whether differences were present in the absence of the intervention (i.e., there were preexisting group differences). Our first replication of this study attempted better control, and the findings-to-date indicate that when experimental control is attempted, the results are substantially the same regarding the nature of the

relationships between person and environment factors and the outcomes (Trivette et al., 2000). The short duration of the study raises a concern as to whether more effects would have been detected if the intervention had lasted longer. Inasmuch as participation in activities over extended periods of time has been implicated as necessary for ecological influences to be effective (Bronfenbrenner, 1999), lack of effects could indeed be the result of only 20 weeks of intervention.

Notwithstanding any limitations of the study, the results have direct implications for practice inasmuch as results indicated that the characteristics of everyday learning opportunities matter a great deal in terms of the behavioral consequences. This suggests a need for explicit attention to these particular characteristics as part of natural learning environment interventions. As noted throughout this article, the experiences that make up the fabric of everyday life can be either development. impeding or development-instigating, depending upon their features and characteristics. Learning opportunities that were interesting and engaging and that provided children contexts for exploring, practicing, and perfecting competence proved to be characteristics that were most development-instigating. The implications of this finding are straightforward. Learning activities afforded children in natural environments are more likely to be associated with positive consequences if they mirror the characteristics shown in Figure 1.

Guidelines and descriptions for "doing" natural learning environment interventions are becoming more available (e.g., Hanft & Pilkington, 2000). Our own guidelines and methods call attention to the fact that selecting activity settings as sources of natural learning opportunities must be done carefully to ensure that the experiences afforded children have the highest probability of producing optimal benefits (Dunst, 2001; Dunst & Bruder, 1999a; Dunst, Herter, & Shields, 2000). Studies such as the one reported in this article shed light on the environmental conditions that ought to be emulated to produce desired and positive behavioral consequences.

## APPENDIX: SAMPLE ITEMS FROM THE SCALES USED TO ASSESS CHILD BEHAVIOR AND PERFORMANCE

Child and Parent Experiences Scale

Each Child and Parent Experiences subscale includes different rating scales that assess different features and aspects of child learning activities and child behavior.

* Everyday Performance Subscale (parent ratings of the number of times per day a child produces a variety of behavior)

Sample Items

Enjoys being around other people

Tries hard to do things he or she likes

Is able to get other people's attention

* Child Progress (parent perception of the degree to which his or her child has attained developmental expectations)

Sample Items

Getting along with other children

Being part of family activities

Getting around on his or her own

* Child Learning Opportunities (parent ratings of when, where, and how the parents are able to engage their children in learning activities)

Sample Items

When your child gets to do interesting things

Who your child gets to play with

Where your child has learning opportunities

Parent and Child Play Scale

The Parent and Child Play scale items are each assessed in terms of the occurrence of different play activities rated on a 4-point scale ranging from not at all to every day.

Sample Items

Tickle child to get him or her to laugh

Play lap games such as peek-a-boo, so-big, or pat-a-cake

Play finger games such as "thumbkin," "itsy-bitsy spider," or "two little blackbirds"

Have pretend phone conversations with child

Engage in messy play such as finger paints or water play

Child Behavior Characteristics Rating Scale

Items on each Child Behavior Characteristics subscale have five different response choices for observing and rating child behavior characteristics.

Social Responsiveness

Child's social engagement with adults

Responsiveness to adult initiations and interactions

Cognitive Style

Goal directedness and persistence in attaining desired goals or effects

Attention and persistence in attending to objects, events, and people

Positive Affect

Frequency of occurrence of smiling

Frequency of occurrence of laughter

Negative Affect

Frequency of occurrence of crying

Frequency of occurrence of fussing

Child and Parent Rating Scale

The Child and Parent Rating subscale items are each rated on the same 4-point rating scale varying from occurring not at all to occurring a great deal during the entire observation period.

Behavioral Style

Vocalizes or talks

Excited and interested in people and things

Child/Child Interactions

Number of interactions with younger siblings, friends, cousins, or other children

Parent/Child Interactions

Number of interactions with other siblings, parents, kin, neighbors, or other adults

**TABLE 1. Background Characteristics of the Study Participants**

| Participant | Number | % |
|---|---|---|
| Parent Age | | |
| < 20 | 2 | 3 |
| 20-29 | 17 | 27 |
| 30-39 | 34 | 54 |
| 40+ | 10 | 16 |
| Formal education (yrs.) | | |
| 2-6 | 5 | 8 |
| 7-11 | 5 | 8 |
| 12 | 14 | 22 |
| 13-15 | 25 | 40 |
| 16-20 | 14 | 22 |
| Marital status | | |
| Married/living with partner | 50 | 79 |
| Single | 7 | 11 |
| Separated/divorced | 6 | 10 |
| Employment status | | |
| Not working | 36 | 57 |
| Working part time | 9 | 14 |
| Working full time | 18 | 29 |
| Family | | |
| SES | | |
| Low | 8 | 13 |
| Low/middle | 14 | 22 |
| Middle | 20 | 32 |
| Middle/high | 13 | 21 |
| High | 8 | 13 |
| Economic status | | |
| Economically marginal | 11 | 18 |
| Borderline marginal | 24 | 38 |
| Not marginal | 28 | 44 |
| Ethnicity | | |
| African American | 11 | 17 |
| American Indian | 10 | 16 |
| Asian | 7 | 11 |
| Caucasian/White | 14 | 22 |
| Latino/Hispanic | 14 | 22 |
| Pacific Islander/Hawaiian | 6 | 10 |
| Other | 1 | 2 |

| | | |
|---|---|---|
| Child | | |
| Age (months) | | |
| 0-12 | 6 | 10 |
| 13-24 | 11 | 18 |
| 25-36 | 14 | 21 |
| 37-48 | 11 | 18 |
| 49-60 | 13 | 20 |
| 61-72 | 8 | 13 |
| Diagnosis | | |
| Chromosomal | 12 | 19 |
| Physical disability | 12 | 19 |
| Sensory impairment | 7 | 11 |
| Medically at risk | 6 | 10 |
| Autism | 3 | 5 |
| Speech impairment | 13 | 21 |
| Delayed | 10 | 16 |
| Severity | | |
| At risk | 17 | 27 |
| Delayed | 15 | 24 |
| Mild/moderate | 18 | 28 |
| Severe/profound | 13 | 21 |

**TABLE 2. Independent Measures of Person and Environment Factors**

| | Type of scale | | |
|---|---|---|---|
| Independent measure | Parent self-report | Parent interview | Standard-ized scales |
| Activity Setting Rating Scale | | | |
| Number of activity settings | | x | |
| Activity setting characteristics | | x | |
| Activity setting log | | | |
| Frequency of participation | x | | |
| Responsive teaching | x | | |
| Child functioning | | | x |

| Independent measure | Research factor (a) |
|---|---|
| Activity Setting Rating Scale | |
| Number of activity settings | Mean number of activity settings per week |
| Activity setting characteristics | Factor scores of six activity setting characteristics |
| Activity setting log | |
| Frequency of participation | Mean frequency of participation in activity settings per week |
| Responsive teaching | Total score for adoption and use of the instructional practice |
| Child functioning | Developmental quotients |

(a) A median split of the distribution of scores on each measure was used to constitute low and high "levels" of each research factor and group membership (low vs. high) used as between factor variables in the analyses conducted.

**TABLE 3. Outcome Measures of Child Learning, Opportunities and Child Behavior and Performance**

| | Type of scale | |
|---|---|---|
| Outcome measure | Parent self-report | Investigator observation |
| Child/Parent Experience Scale | | |
| Everyday performance | x | |
| Child progress | x | |
| Child learning opportunities | x | |
| Parent/Child Play Scale | x | |
| Child Behavior Rating Scale | | |
| Social responsiveness | | x |
| Cognitive style | | x |
| Positive affect | | x |
| Negative affect | | x |
| Child/Parent Rating Scale | | |
| Behavioral style | | x |
| Child/child interactions | | x |
| Parent/child interactions | | x |

| | Type of outcome | |
|---|---|---|
| Outcome measure | Child learning opportunity | Child behavior performance |
| Child/Parent Experience Scale | | |
| Everyday performance | | x |
| Child progress | | x |
| Child learning opportunities | x | |
| Parent/Child Play Scale | x | |
| Child Behavior Rating Scale | | |
| Social responsiveness | | x |
| Cognitive style | | x |
| Positive affect | | x |
| Negative affect | | x |
| Child/Parent Rating Scale | | |
| Behavioral style | | x |
| Child/child interactions | x | |
| Parent/child interactions | x | |

| Outcome measure | Number of administrations |
|---|---|
| Child/Parent Experience Scale | |
| Everyday performance | 5 |

| | |
|---|---|
| Child progress | 5 |
| Child learning opportunities | 5 |
| Parent/Child Play Scale | 5 |
| Child Behavior Rating Scale | |
| Social responsiveness | 5 |
| Cognitive style | 5 |
| Positive affect | 5 |
| Negative affect | 5 |
| Child/Parent Rating Scale | |
| Behavioral style | 8 |
| Child/child interactions | 8 |
| Parent/child interactions | 8 |

**TABLE 4. Analysis of Variance Results for the Individual Time Period Learning Opportunities Scores**

| | Learning opportunities | | | |
|---|---|---|---|---|
| | Child learning activities | | Child/child interactions | |
| Research factors | [chi square] | ES | [chi square] | ES |
| | Main effects | | | |
| Activity setting (AS) characteristics | 6.35 ** | .32 | .16 | .05 |
| Frequency of AS participation | 1.02 | .13 | .15 | -.05 |
| Number of activity settings | 12.17 *** | .44 | .06 | .03 |
| Responsive teaching | 2.24 | .19 | .33 | -.07 |
| Child functioning | .87 | -.12 | .05 | -.03 |
| | Interaction effects | | | |
| Time x AS characteristics | 7.64 | -.15 | 7.84 | .11 |
| Time x AS frequency | 3.03 | -.10 | 1.84 | -.15 |
| Time x AS number | 9.73 ** | -.08 | 8.35 | -.14 |
| Time x responsive teaching | .94 | -.02 | 13.37 | -.26 |
| Time x child functioning | 3.61 | -.19 | 9.94 | .06 |

| | Learning opportunities | | | |
|---|---|---|---|---|
| | Child/adult interactions | | Parent/child play | |
| Research factors | [chi square] | ES | [chi square] | ES |
| Activity setting (AS) characteristics | 2.04 | -.18 | 6.30 ** | .32 |
| Frequency of AS participation | .76 | .11 | 1.77 | .17 |
| Number of activity settings | 1.96 | .18 | .08 | .0 |
| Responsive teaching | 5.85 ** | .31 | 2.57 | .21 |
| Child functioning | 3.06 | -.22 | 1.21 | .14 |

| | | | | |
|---|---|---|---|---|
| Time x AS characteristics | 10.17 | .13 | 1.61 | -.14 |
| Time x AS frequency | 6.70 | .06 | 5.38 | .21 |
| Time x AS number | 12.12 | .23 | 1.48 | -.01 |
| Time x responsive teaching | 11.41 | .00 | 5.99 | .16 |
| Time x child functioning | 15.37 * | .30 | 1.17 | -.07 |

Note. Positive effect sizes (ES) indicate that the presence of more favorable person or environment factors is related to higher scores on the dependent measures, whereas the negative ES indicates that the presence of more favorable person or environment factors is associated with lower scores on the dependent measures. Effect sizes for time period x research factor interactions were calculated using orthogonal contrast procedures described by Rosenthal and Rosnow (1991).
* p < .075.
** p < .05.
*** p < .001.

**TABLE 5. Growth Curve Analysis Results for the Individual Time Period Learning Opportunities Scores**

| | Learning opportunities | | | |
|---|---|---|---|---|
| | Child learning activities | | Child/child interactions | |
| Research factors | [chi square] | ES | [chi square] | ES |
| | Main effects | | | |
| Activity setting (AS) characteristics | 5.97 ** | .31 | .04 | -.03 |
| Frequency of AS participation | 2.56 | .20 | .03 | -.02 |
| Number of activity settings | 8.91 ** | .38 | .32 | .07 |
| Responsive teaching | 1.49 | .16 | .01 | .01 |
| Child functioning | .00 | -.01 | .05 | -.03 |
| | Interaction effects | | | |
| Linear x AS characteristics | 1.29 | -.14 | .94 | .12 |
| Linear x AS frequency | .84 | -.11 | .43 | -.08 |
| Linear x AS number | .20 | -.06 | 1.42 | -.15 |
| Linear x responsive teaching | .02 | -.02 | 5.10 ** | -.29 |
| Linear x child functioning | 2.13 | -.18 | .30 | .07 |

| | Learning opportunities | | | |
|---|---|---|---|---|
| | Child/adult interactions | | Parent/child play | |
| Research factors | [chi square] | ES | [chi square] | ES |
| Activity setting (AS) characteristics | 3.68 * | -.24 | 6.39 ** | .32 |
| Frequency of AS participation | .57 | .09 | .07 | .03 |
| Number of activity settings | 5.69 ** | .30 | .31 | .07 |
| Responsive teaching | 3.67 * | .25 | .33 | .07 |
| Child functioning | 7.69 ** | -.35 | 3.05 | .22 |
| Linear x AS characteristics | 1.17 | .14 | .02 | -.02 |
| Linear x AS frequency | .28 | .07 | 2.48 | .20 |

| | | | | |
|---|---|---|---|---|
| Linear x AS number | 3.84 ** | -.25 | .03 | -.02 |
| Linear x responsive teaching | .03 | -.02 | 1.27 | .14 |
| Linear x child functioning | 4.84 ** | .28 | .39 | -.08 |

Note. Positive effect sizes (ES) indicate that the presence of more favorable person or environment factors is related to higher scores on the dependent measures, whereas the negative ES indicates that the presence of more favorable person or environment factors is associated with lower scores on the dependent measures.
* p < .075.
** p < .05.

**TABLE 6. Growth Curve Analysis Results for the Cumulative Time Period Learning Opportunities Scores**

| | Learning opportunities | | | |
|---|---|---|---|---|
| | Child learning activities | | Child/child interactions | |
| Research factors | [chi square] | ES | [chi square] | ES |
| | Main effects | | | |
| Activity setting (AS) characteristics | 5.23 ** | .29 | .05 | .03 |
| Frequency of AS participation | 3.68 * | .24 | .01 | -.01 |
| Number of activity settings | .27 | .06 | .17 | .05 |
| Responsive teaching | .51 | .09 | .85 | .12 |
| Child functioning | .05 | -.03 | .06 | .03 |
| | Interaction effects | | | |
| Linear x AS characteristics | 4.93 ** | .28 | .03 | -.02 |
| Linear x AS frequency | .43 | .08 | .04 | -.03 |
| Linear x AS number | 16.65 | .51 | .54 | .09 |
| Linear x responsive teaching | 1.62 | .16 | .02 | -.02 |
| Linear x child functioning | .24 | -.06 | .75 | -.11 |

| | Learning opportunities | | | |
|---|---|---|---|---|
| | Child/adult interactions | | Parent/child play | |
| Research factors | [chi square] | ES | [chi square] | ES |
| Activity setting (AS) characteristics | .03 | .02 | 2.01 | .18 |
| Frequency of AS participation | .39 | .08 | .39 | .08 |
| Number of activity settings | .14 | .05 | .33 | .07 |
| Responsive teaching | .99 | .13 | 1.20 | .14 |
| Child functioning | .13 | -.04 | 1.75 | .17 |
| Linear x AS characteristics | 1.79 | -.17 | 7.48 ** | .34 |
| Linear x AS frequency | 1.11 | .13 | .25 | .06 |
| Linear x AS number | 1.70 | .16 | .00 | .01 |
| Linear x responsive teaching | 5.96 ** | .31 | .01 | .01 |
| Linear x child functioning | 4.55 ** | -.27 | 2.06 | .18 |

Note. Positive effect sizes (ES) indicate that the presence of more favorable person or environment factors is related to higher scores on the dependent measures, whereas the negative ES indicates that the presence of more favorable person or environment factors is associated with lower scores on the dependent measures.
* p < .075.
** p < .05.

**TABLE 7. Analysis of Variance Results for the Time Period Child Behavior and Performance Scores**

| | Child behavior and performance | | | |
|---|---|---|---|---|
| | Everyday performance | | Child progress | |
| Research factors | [chi square] | ES | [chi square] | ES |
| | | Main effects | | |
| Activity setting (AS) characteristics | 10.28 ** | .40 | 4.19 ** | -.26 |
| Frequency of AS participation | .55 | .09 | .97 | .12 |
| Number of activity settings | .19 | .05 | .78 | .11 |
| Responsive teaching | .35 | .08 | .22 | .06 |
| Child functioning | .03 | -.02 | .10 | .04 |
| | | Interaction effects | | |
| Time x AS characteristics | 6.61 | -.09 | 4.18 | -.20 |
| Time x AS frequency | 14.26 ** | -.15 | 1.52 | .08 |
| Time x AS number | .71 | -.05 | 7.01 | -.08 |
| Time x responsive teaching | 1.58 | -.06 | 3.10 | .20 |
| Time x child functioning | 1.46 | -.12 | 2.05 | .01 |
| | Child behavior and performance | | | |
| | Social responsiveness | | Cognitive style | |
| Research factors | [chi square] | ES | [chi square] | ES |
| | | Main effects | | |
| Activity setting (AS) characteristics | 1.39 | .15 | 4.34 ** | .26 |
| Frequency of AS participation | 2.05 | .18 | .39 | .08 |
| Number of activity settings | 2.31 | .19 | .15 | .05 |
| Responsive teaching | 1.31 | .15 | .31 | .07 |
| Child functioning | .00 | .01 | 1.02 | .13 |
| | | Interaction effects | | |
| Time x AS characteristics | 6.07 | .03 | 6.52 | -.13 |
| Time x AS frequency | 2.20 | .08 | 6.97 | .31 |
| Time x AS number | 9.40 * | .12 | 3.90 | .09 |
| Time x responsive teaching | 3.34 | .17 | 4.75 | .05 |
| Time x child functioning | 4.99 | -.07 | 4.40 | -.12 |

| Research factors | Child behavior and performance: Positive affect [chi square] | Positive affect ES | Negative affect [chi square] | Negative affect ES |
|---|---|---|---|---|
| **Main effects** | | | | |
| Activity setting (AS) characteristics | .28 | .07 | 5.75 ** | -.30 |
| Frequency of AS participation | .04 | -.02 | 3.19 ** | -.22 |
| Number of activity settings | 20.44 | .57 | .00 | .00 |
| Responsive teaching | 5.04 ** | .29 | .03 | .02 |
| Child functioning | .00 | .00 | 2.97 | .22 |
| **Interaction effects** | | | | |
| Time x AS characteristics | 5.49 | -.10 | 4.68 | .03 |
| Time x AS frequency | .77 | -.01 | 5.31 | -.18 |
| Time x AS number | 8.64 * | .22 | 4.05 | -.10 |
| Time x responsive teaching | 11.74 ** | .04 | 1.56 | .11 |
| Time x child functioning | 11.80 ** | -.39 | 14.31 ** | .09 |

| Research factors | Child behavior and performance: Behavioral style [chi square] | Behavioral style ES |
|---|---|---|
| **Main effects** | | |
| Activity setting (AS) characteristics | .90 | .12 |
| Frequency of AS participation | 2.17 | .18 |
| Number of activity settings | 5.53 ** | .30 |
| Responsive teaching | 2.61 | .21 |
| Child functioning | .21 | .06 |
| **Interaction effects** | | |
| Time x AS characteristics | 8.50 | .02 |
| Time x AS frequency | 11.88 | .07 |
| Time x AS number | 13.17 | .12 |
| Time x responsive teaching | 20.81 ** | -.19 |
| Time x child functioning | 15.76 ** | -.04 |

Note. Positive effect sizes (ES) indicate that the presence of more favorable person or environment factors is related to higher scores on the dependent measures, whereas the negative ES indicates that the presence of more favorable person or environment factors is associated with lower scores on the dependent measures. Effect sizes for Time Period x Research Factor interactions were calculated using orthogonal contrast procedures described by Rosenthal and Rosnow (1991).
* $p < .075$.
** $p < .05$.

**TABLE 8. Growth Curve Analysis Results for the Individual Time Period Child Behavior and Performance Scores**

| Research factors | Child behavior and performance: Everyday performance [chi square] | ES | Child progress [chi square] | ES |
|---|---|---|---|---|
| **Main effects** | | | | |
| Activity setting (AS) characteristics | 8.45 ** | .37 | 6.05 ** | .31 |
| Frequency of AS participation | 1.87 | .17 | .09 | .04 |
| Number of activity settings | .40 | .08 | .68 | .16 |
| Responsive teaching | .97 | .13 | .47 | -.09 |
| Child functioning | .13 | .04 | .01 | -.01 |
| **Interaction effects** | | | | |
| Linear x AS characteristics | .35 | -.07 | 2.04 | -.18 |
| Linear x AS frequency | 1.57 | -.16 | .47 | .09 |
| Linear x AS number | .19 | -.05 | .56 | -.09 |
| Linear x responsive teaching | .35 | -.08 | 2.51 | .20 |
| Linear x child functioning | .84 | -.11 | .01 | .01 |

| Research factors | Child behavior and performance: Social responsiveness [chi square] | ES | Cognitive style [chi square] | ES |
|---|---|---|---|---|
| **Main effects** | | | | |
| Activity setting (AS) characteristics | .44 | .08 | 3.28 * | .23 |
| Frequency of AS participation | .81 | .11 | .41 | -.08 |
| Number of activity settings | .63 | .10 | .19 | -.05 |
| Responsive teaching | .02 | .02 | .08 | .04 |
| Child functioning | .18 | .05 | 2.26 | .19 |
| **Interaction effects** | | | | |
| Linear x AS characteristics | .04 | .03 | 1.30 | -.14 |
| Linear x AS frequency | .26 | .06 | 6.14 ** | .31 |
| Linear x AS number | .78 | .11 | .51 | .09 |
| Linear x responsive teaching | 1.40 | .15 | .07 | .03 |
| Linear x child functioning | .19 | -.05 | 1.16 | -.14 |

| Research factors | Child behavior and performance: Positive affect [chi square] | ES | Negative affect [chi square] | ES |
|---|---|---|---|---|
| **Main effects** | | | | |
| Activity setting (AS) characteristics | .32 | .07 | 3.94 * | -.22 |
| Frequency of AS participation | .01 | .01 | .00 | .00 |
| Number of activity settings | 5.36 ** | .29 | 1.62 | .16 |
| Responsive teaching | 4.72 ** | .28 | .18 | -.05 |

| | | | | |
|---|---|---|---|---|
| Child functioning | 2.25 | .19 | 1.50 | .15 |
| | | Interaction effects | | |
| Linear x AS characteristics | .43 | -.08 | .09 | .04 |
| Linear x AS frequency | .02 | -.02 | 2.55 | -.20 |
| Linear x AS number | 3.38 * | .23 | .81 | -.11 |
| Linear x responsive teaching | .01 | .01 | .69 | .11 |
| Linear x child functioning | 9.07 ** | -.38 | .30 | .07 |

| | Child behavior and performance | | | |
|---|---|---|---|---|
| | Behavioral style | | | |
| Research factors | [chi square] | ES | | |
| | Main effects | | | |
| Activity setting (AS) characteristics | 2.14 | .18 | | |
| Frequency of AS participation | 1.69 | .16 | | |
| Number of activity settings | .43 | .08 | | |
| Responsive teaching | 4.26 ** | .27 | | |
| Child functioning | 4.38 ** | .26 | | |
| | Interaction effects | | | |
| Linear x AS characteristics | .04 | .02 | | |
| Linear x AS frequency | .35 | .07 | | |
| Linear x AS number | .89 | .12 | | |
| Linear x responsive teaching | 2.54 | -.20 | | |
| Linear x child functioning | .18 | -.05 | | |

Note. Positive effect sizes (ES) indicate that the presence of more favorable person or environment factors is related to higher scores on the dependent measures, whereas the negative ES indicates that the presence of more favorable person or environment factors is associated with lower scores on the dependent measures.
* p < .075.
** p < .05.

**TABLE 9. Growth Curve Analysis Results for the Cumulative Time Period Child Behavior and Performance Scores**

| | Child behavior and performance | | | |
|---|---|---|---|---|
| | Everyday performance | | Child progress | |
| Research factors | [chi square] | ES | [chi square] | ES |
| | Main effects | | | |
| Activity setting (AS) characteristics | .21 | -.06 | 2.22 | .19 |

| | | | | |
|---|---|---|---|---|
| Frequency of AS participation | .17 | .05 | .03 | -.02 |
| Number of activity settings | .05 | .03 | .38 | .08 |
| Responsive teaching | 1.28 | .15 | .26 | -.07 |
| Child functioning | .00 | .01 | .26 | -.06 |
| | | Interaction effects | | |
| Linear x AS characteristics | 12.26 *** | .44 | 5.76 ** | .30 |
| Linear x AS frequency | 1.18 | .14 | .53 | .09 |
| Linear x AS number | .06 | .03 | .21 | .06 |
| Linear x responsive teaching | .01 | -.01 | .07 | -.03 |
| Linear x child functioning | .05 | .03 | .00 | .00 |

| | Child behavior and performance | | | |
|---|---|---|---|---|
| | Social responsiveness | | Cognitive style | |
| Research factors | [chi square] | ES | [chi square] | ES |
| | | Main effects | | |
| Activity setting (AS) characteristics | 1.40 | .15 | 1.60 | .16 |
| Frequency of AS participation | .00 | .01 | .08 | -.04 |
| Number of activity settings | 1.32 | .14 | .00 | .00 |
| Responsive teaching | .51 | -.09 | 1.03 | -.13 |
| Child functioning | .13 | .04 | .00 | -.01 |
| | | Interaction effects | | |
| Linear x AS characteristics | .32 | .07 | .87 | .12 |
| Linear x AS frequency | 3.41 * | .23 | 3.94 ** | .25 |
| Linear x AS number | 4.04 ** | .25 | .00 | .01 |
| Linear x responsive teaching | 2.27 | .19 | .18 | .05 |
| Linear x child functioning | .05 | -.03 | .04 | .03 |

| Research factors | Child behavior and performance: Positive affect [chi square] | ES | Negative affect [chi square] | ES |
|---|---|---|---|---|
| | | Main effects | | |
| Activity setting (AS) characteristics | 4.22 ** | .26 | 1.27 | -.14 |
| Frequency of AS participation | .31 | -.07 | 2.29 | -.19 |
| Number of activity settings | 3.35 * | .23 | 1.34 | -.14 |
| Responsive teaching | .72 | -.11 | .70 | -.11 |
| Child functioning | 3.68 * | .24 | .45 | -.08 |
| | | Interaction effects | | |
| Linear x AS characteristics | .10 | .04 | 3.87 * | -.21 |
| Linear x AS frequency | .00 | .01 | 4.87 ** | -.28 |
| Linear x AS number | 19.49 **** | .56 | .01 | .01 |
| Linear x responsive teaching | 3.96 ** | .26 | .06 | .03 |
| Linear x child functioning | 1.56 | -.16 | 3.82 ** | .25 |

| Research factors | Chil behavior and performance: Behavioral style [chi square] | ES |
|---|---|---|
| | Main effects | |
| Activity setting (AS) characteristics | 1.11 | .13 |
| Frequency of AS participation | 6.41 ** | .32 |
| Number of activity settings | .02 | .02 |
| Responsive teaching | 4.08 ** | .26 |
| Child functioning | 3.10 | .22 |
| | Interaction effects | |
| Linear x AS characteristics | 1.50 | .15 |
| Linear x AS frequency | .69 | .10 |
| Linear x AS number | 4.49 ** | .27 |
| Linear x responsive teaching | 3.06 | .22 |
| Linear x child functioning | .39 | .08 |

Note. Positive effect sizes (ES) indicate that the presence of more favorable person or environment factors is related to higher scores on the dependent measures, whereas the negative ES indicates that the presence of more favorable person or environment factors is associated with lower scores on the dependent measures.
* p < .075.
** p < .05.
*** p < .001.
**** p < .0001.

**FIGURE 2. Example of an activity schedule used as a reminder to increase child participation in everyday naturally occurring learning opportunities.**

ACTIVITY SCHEDULE
Child's Name Marci B. Parent's Name Brandi B. Date June 8

| | DAYS | | |
|---|---|---|---|
| ACTIVITY SETTINGS | Monday | Tuesday | Wednesday |
| Sandbox at the Local Park | | | |
| Bathtime | X | | X |
| Getting Dressed for Bed | X | X | X |
| Shopping at the Mall | | | |
| Eating Breakfast at Kitchen Table | X | X | X |
| Car Rides to Grocery Store | X | | X |
| Feeding Ducks and Seagulls at Community Pond | | | |
| Playing with Brother on the Living Room Floor | | X | |
| Feeding the Family Cats and Dog | X | X | X |
| Brother's Basketball Practice/Games at the School Gym | X | | X |
| Brushing Teeth and Washing Hands | X | X | X |
| Library Story Hour | | X | |

| | DAYS | | |
|---|---|---|---|
| ACTIVITY SETTINGS | Thursday | Friday | Saturday |
| Sandbox at the Local Park | | | X |
| Bathtime | | X | |
| Getting Dressed for Bed | X | X | X |
| Shopping at the Mall | | | X |
| Eating Breakfast at Kitchen Table | X | X | X |
| Car Rides to Grocery Store | | | X |
| Feeding Ducks and Seagulls at Community Pond | | | X |
| Playing with Brother on the Living Room Floor | X | X | X |
| Feeding the Family Cats and Dog | X | X | X |
| Brother's Basketball Practice/Games at the School Gym | | | X |
| Brushing Teeth and Washing Hands | X | X | X |
| Library Story Hour | X | | |

| | DAYS |
|---|---|
| ACTIVITY SETTINGS | Sunday |

| | |
|---|---|
| Sandbox at the Local Park | X |
| Bathtime | X |
| Getting Dressed for Bed | X |
| Shopping at the Mall | X |
| Eating Breakfast at Kitchen Table | X |
| Car Rides to Grocery Store | |
| Feeding Ducks and Seagulls at Community Pond | X |
| Playing with Brother on the Living Room Floor | X |
| Feeding the Family Cats and Dog | X |
| Brother's Basketball Practice/Games at the School Gym | |
| Brushing Teeth and Washing Hands | X |
| Library Story Hour | |

**FIGURE 3. Example of an activity setting by child behavior matrix used to reinforce and facilitate child behavior in the context of everyday naturally occurring learning opportunities.**

ACTIVITY SETTING BY CHILD BEHAVIOR MATRIX

Child's Name Andrew J. Parent's Name Jacki J. Date December 3

| | ACTIVITY SETTINGS | | |
|---|---|---|---|
| CHILD BEHAVIOR | Neighbor-hood Walks | Grocery Shopping | Reading at Bedtime |
| Walks beside family member without assistance | X | X | |
| Points to objects or pictures in response to question "Where's --? | | X | X |
| Says hello to friends as greeting | X | X | |
| Uses spoon to eat | | | |
| Verbally requests materials | | X | X |
| Puts on/takes off coat | X | X | |
| Helps with chores | | X | |
| Kicks a ball | | | |
| Turns pages in books | | | X |
| Shares toys with others | | | |

| | ACTIVITY SETTINGS | | |
|---|---|---|---|
| CHILD BEHAVIOR | Sunday School | Visiting Parents' Friends | Taking a Bath |
| Walks beside family member without assistance | | X | |
| Points to objects or pictures in response to question "Where's --? | X | | X |
| Says hello to friends as greeting | X | X | |
| Uses spoon to eat | | | |
| Verbally requests materials | | | X |
| Puts on/takes off coat | X | X | |
| Helps with chores | | | X |
| Kicks a ball | | X | |
| Turns pages in books | X | X | |
| Shares toys with others | X | X | |

| | ACTIVITY SETTINGS | | |
|---|---|---|---|
| CHILD BEHAVIOR | Eating Meals at Home | Getting Dressed | Eating Out |
| Walks beside family member without assistance | | | X |
| Points to objects or pictures in response to question "Where's --? | | X | |
| Says hello to friends as greeting | | | X |
| Uses spoon to eat | X | | X |

| | | | |
|---|---|---|---|
| Verbally requests materials | X | X | X |
| Puts on/takes off coat | | | X |
| Helps with chores | X | X | |
| Kicks a ball | | | |
| Turns pages in books | | | |
| Shares toys with others | | | |

ACTIVITY SETTINGS

| CHILD BEHAVIOR | Playtime with Brother |
|---|---|
| Walks beside family member without assistance | X |
| points to objects or pictures in response to question "Where's --? | |
| Says hello to friends as greeting | |
| Uses spoon to eat | |
| Verbally requests materials | |
| Puts on/takes off coat | X |
| Helps with chores | |
| Kicks a ball | X |
| Turns pages in books | X |
| Shares toys with others | X |

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