ENGAGEMENT BEHAVIORS OF YOUNG CHILDREN WITH DISABILITIES: RELATIONSHIPS WITH PRESCHOOL TEACHERS' IMPLEMENTATION OF EMBEDDED INSTRUCTION

By

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To my wife, Şerife Rakap, for her love, encouragement, and support.

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LIST OF ABBREVIATIONS

ABI	Activity-based Intervention
ACT	Activity Categorization System
CASPER II	Code for Active Student Participation and Engagement II
CIA	Child-initiated Activity
DEC	Division for Early Childhood
EAHCA	Education for All Handicapped Children Act
EBOS-RVI	Engagement Behavior Observation System - Research Version I
EBOS-RVII	Engagement Behavior Observation System - Research Version II
ECERS-R	Early Childhood Environment Rating Scale-Revised
EIFEL	Embedded Instruction for Early Learning Project Team
EILT	Embedded Instruction Learning Trial
EIOS-RVI	Embedded Instruction Observation System – Research Version I
E-QUAL III	Engagement Quality Measurement System III
ESCAPE	Eco-behavioral System for the Complex Assessment of Preschool Environments
FAPE	Free and Appropriate Public Education
ICER	Individual Child Engagement Record
ICS	Individualized Curriculum Sequencing Model
IDEA	Implementation of the Individuals with Disabilities Education Act
IEP	Individualized Educational Program
LRE	Least Restrictive Environment
MTS	Momentary Time Sampling
NAEYC	National Association for the Education of Young Children
PIR	Partial Interval Recording

PL	Public Law
PLA-CHECK	Planned Activity Check
RA	Routine
STARE	Scale for Teachers Assessment of Routines Engagement
T	Transition
TBT	Transition-based Teaching
TDA	Teacher-directed Activity

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Engagement is hypothesized to be an important mediating factor in young children's development and learning. A major purpose of early intervention for young children with disabilities is to promote child engagement. While child engagement and related factors have been descriptively investigated since the 1970s, few studies have systematically examined relationships between practitioners' implementation of instructional approaches and the engagement behaviors of young children with disabilities. One promising instructional approach designed to alter the engagement behaviors of young children with disabilities during preschool classroom activities is embedded instruction.

The purpose of the present study was to investigate corollary relationships between the engagement behaviors of four young children with disabilities during two types of child-initiated activities and their teachers' implementation of embedded instruction learning trials (EILTs). EILTs data were obtained from a previously conducted single-subject experimental study involving four teachers. The single-subject experimental study was designed to evaluate functional relationships between teachers'

exposure to three components of an embedded instruction professional development intervention and their implementation of EILTs. The present study explored changes in children's engagement behaviors across single-subject experimental study phases and examined corollary relationships between teachers' implementation of EILTs and child engagement behaviors.

The Engagement Behavior Observation System: Research Version II (EBOS-RVII) was used in the present study to quantify child engagement behaviors. Data sources were 269 videotapes collected for the four participating children across the experimental phases of the single-subject study. The child-initiated activities captured on these videotapes were classified as either social-oriented or materials-oriented and the EBOS-RVII coding system was applied to children's behavior within each type of activity.

Child engagement behaviors and teachers' implementation of EILTs across each experimental phase were examined separately relative to baseline. Results showed children generally exhibited higher-level engagement behaviors and teachers generally increased their implementation of EILTs across phases and activity types. Corollary relationships between child engagement behaviors and teachers' implementation of EILTs were explored for each teacher-child dyad, using visual inspection and rank-order correlation analyses. Corollary relationships were found between select child engagement behaviors and teachers' implementation of EILTs. Recommendations for future research and practice are provided based on study findings.

CHAPTER 1
INTRODUCTION

The practice of including young children with delays or disabilities in early childhood settings in which all children play, develop, and learn has been in existence for over three decades (Odom, 2000; 2002). Data suggest the numbers of young children with disabilities being supported in inclusive early learning settings is growing (Grisham-Brown, Schuster, Hemmeter, & Collins, 2000; Horn, Lieber, Li, Sandall, & Schwartz, 2000; Odom, 2000). The percentage of preschool children with disabilities receiving services in inclusive classroom settings increased from 40% in 1987-88 to 51% in 2007 (Odom, 2002; US Department of Education, 2010). According to a recent report provided to Congress by the U.S. Department of Education on the implementation of the Individuals with Disabilities Education Act (IDEA; 2010), about one-third of preschool-age children with disabilities (34.1%) served under Section 619 of IDEA received all of their special education and related services full-time in early learning settings primarily designed for children without disabilities and about 17% of preschool children with disabilities received these services part-time in early learning settings mainly designed for children without disabilities. These data indicate that access to inclusive early learning settings for young children with disabilities has improved somewhat over a 20-year period (i.e., 11% increase). Nevertheless, more than half of preschool-age children with disabilities served under IDEA are not receiving special education and related services in inclusive early learning settings.

Several reviews of the literature have been conducted that focus on preschool inclusion (e.g., Buysse & Bailey, 1993; Buysse, Bailey, Smith, & Simeonsson, 1994; Odom, 2000; Odom & Diamond, 1998; Odom et al., 2004; Salend & Duhaney, 1999).

Select findings from these reviews have indicated that (a) children with mild disabilities are more likely to be enrolled in inclusive classrooms than children with severe disabilities, (b) the quality of environments in inclusive early childhood settings is comparable to quality in segregated classrooms or classrooms serving only typically developing children, (c) teachers and family members generally express positive attitudes toward the inclusion of young children with disabilities, and (d) practitioners' implementation of individualized instructional approaches to create learning opportunities for children resulted in positive social, developmental, and academic outcomes for young children with disabilities who received services and supports in inclusive early learning settings when compared to their peers with disabilities who received services and supports in segregated classrooms.

The latter finding from the inclusion reviews suggests that it is not only access to high-quality inclusive early learning settings but instruction received in those settings that is important (Snyder, McLaughlin, & Denney, 2011). Recommended practices in early childhood special education emphasize both access ***and*** participation as key features of inclusion (Division for Early Childhood [DEC]/National Association for the Education of Young Children [NAEYC], 2009). Participation refers to child engagement and learning in everyday activities, settings, and environments. Participation in the preschool curriculum is enhanced when practitioners use intentional and systematic instructional approaches during ongoing activities and routines in inclusive early learning settings (Wolery, 2005). Naturalistic instructional approaches have been identified as intentional approaches to instruction that show promise for supporting the development, engagement, and learning of preschool children with disabilities. These approaches emphasize providing learning opportunities for children during ongoing classroom activities, routines, and transitions (Snyder, Hemmeter, McLean, Sandall, & McLaughlin, in press).

Embedded instruction is a naturalistic instructional approach designed to promote child engagement and learning in everyday activities, routines, and transitions by focusing on *what to teach* (i.e., functional, generative, and measurable priority learning targets), *when to teach* (i.e., ongoing activities, routines, and transitions), *how to teach* (i.e., using intentional and systematic instructional procedures to create embedded learning opportunities), and *how to evaluate* (i.e., monitoring implementation of instruction and child progress toward achieving learning targets). In embedded instruction, child engagement and learning is supported by identifying times and activities when [learning opportunities] for teaching a child's priority learning targets are implemented in ongoing activities, routines, and transitions in preschool classrooms (Snyder et al., in press).

Inclusive preschool classrooms include a variety of activities, some of which primarily set the occasion for children to have social interactions with peers and adults (i.e., social-oriented activities such as dramatic play in the housekeeping area; Hendrickson, Strain, Tremblay, & Shores, 1981; Martin, Brady, & Williams, 1991; Quilitch & Risley, 1973; Tremblay, Strain, Hendrickson, & Shores, 1980) while others primarily involve the use or manipulation of classroom materials (i.e., materials-oriented activities such as playing with blocks or puzzles; Hendrickson et al., 1981; Quilitch & Risley, 1973; Tremblay et al., 1980). These different types of activities can have unique characteristics and task "demands" or expectations (Kontos, Burchinal, Howes, Wisseh,

& Galinsky, 2002; Vitiello, Booren, Downer, & Williford, 2012). In addition, priority learning targets vary in the types of behaviors that are the focus for embedded instruction (e.g., social, pre-academic, motor, language). Thus, certain activities might be more suitable for providing intentional and systematic instruction on particular types of priority learning targets as part of embedded learning opportunities for preschool children with disabilities. In embedded instruction and other naturalistic instructional approaches, practitioners consider characteristics of activities and their demands, the learning target behavior, and the "match" between these two elements when planning for and implementing embedded learning opportunities (Snyder et al., in press). Researchers have hypothesized that practitioners' delivery of embedded learning opportunities focused on specific learning targets during different types of activities might result in children demonstrating different engagement behaviors (Malmskog & McDonnell, 1999; McWilliam & Bailey, 1992; Snyder, Sandall et al., 2009).

A review of the literature conducted by Snyder et al. (2013) summarized the empirical literature on naturalistic instructional approaches. Of the 44 studies these authors reviewed, 15 specifically focused on embedded instruction. Across these 15 studies, the authors examined relationships between the use of embedded learning opportunities during ongoing classroom activities, routines, and transitions and child learning outcomes. Findings from the review showed that embedded instruction was an effective approach for teaching children with disabilities a range of skills associated with different developmental domains (e.g., pre-academic, communication, social, and motor) during ongoing classroom activities in inclusive preschool settings. None of these studies, however, investigated relationships between the implementation of embedded learning opportunities within an embedded approach to instruction and child engagement during ongoing classroom activities.

Given engagement is considered to be a necessary condition for learning and development (McWilliam, Trivette, & Dunst, 1985), it seems important to examine relationships between children's engagement behaviors and practitioners' implementation of embedded instruction. It is also important to examine whether observed engagement behaviors differ across different types of activities in the context of embedded instruction. The purpose of the present study, therefore, was to quantify observed engagement of young children with disabilities during social-oriented and materials-oriented classroom activities and examine corollary relationships between children's engagement behaviors and practitioners' implementation of embedded instruction.

Background for the Study

Features of Preschool Inclusion

The joint position statement of the Division for Early Childhood (DEC) and the National Association for the Education of Young Children (NAEYC) on early childhood inclusion highlights three defining features: (a) access, (b) participation, and (c) supports (DEC/NAEYC, 2009). *Access* emphasizes providing young children with disabilities entrée to a range of learning opportunities, activities, settings, and environments. *Participation* extends the concept of access by highlighting children's ***engagement and learning*** in everyday activities, settings, and environments. To help ensure participation, naturalistic instructional approaches such as embedded instruction often are used. The *support* feature highlights the importance of having an infrastructure of systems-level supports to assist professionals and organizations that provide inclusive services to young children with disabilities and their families. Some of these system-level supports include incentives for inclusion, adjustments to staff-child ratio to ensure that each child's needs can be addressed by the program staff, and providing practitioners with opportunities to participate in ongoing professional development activities to acquire knowledge, skills, and dispositions needed to implement practices that support inclusion and result in positive learning outcomes for young children with disabilities. This means practitioners working with young children with disabilities should have opportunities to access high quality professional development focused on research-based instructional approaches such as embedded instruction to support children's engagement and learning in inclusive preschool settings.

With the passage of the Education for All Handicapped Children Act (EAHCA) in 1975, all public school systems were required to provide a free and appropriate public education (FAPE) for children and youth with disabilities. The FAPE provisions were extended to preschool-age children (ages 3 to 5 years) during the reauthorization of the EAHCA in 1986 (P.L. 99-457). The 1986 reauthorization specified that states had 5 years to implement fully a preschool program for young children with disabilities, which became known as the Section 619 preschool program. Each successive reauthorization of the law has specified that FAPE should occur in the least restrictive environment (LRE) to the extent appropriate for the child. LRE for preschool children with disabilities has been interpreted to mean that young children with disabilities should have opportunities to learn in close proximity to peers without disabilities (Odom et al., 2004). Since the passage of P.L. 99-457, the LRE provision has been applied to preschool-age children with disabilities and the number of children with disabilities supported in inclusive early childhood settings has increased somewhat during this time (Grisham-Brown et al., 2000; Odom, 2000; 2002; US Department of Education, 2010).

For inclusion to be successful and meaningful for practitioners and young children, designing early childhood settings and learning environments to facilitate access for preschool children with disabilities will not be sufficient. Children with disabilities need targeted or individualized instruction to participate fully in activities and routines designed to support their development and learning (Horn & Banerjee, 2009; Odom et al., 2004; Snyder et al., in press). Adults who interact with young children with disabilities in inclusive settings need to be able to implement naturalistic instructional approaches, such as embedded instruction, to promote the engagement and learning of young children with disabilities in typically occurring, developmentally appropriate activities (Buysse & Hollingsworth, 2009).

Support for Implementation of Naturalistic Instructional Approaches

Many preschool teachers report they lack confidence and competence to address the developmental and instructional needs of young children with disabilities in inclusive settings (Buysse, Wesley, Keyes, & Bailey, 1996; Early & Winton, 2001; Snyder, Denney, Pasia, Rakap, & Crowe, 2011). These practitioners also report the need for professional development to support their implementation of instructional approaches such as embedded instruction (Odom et al., 2004; Snyder et al., 2013; Snyder, Hemmeter, Meeker, Kinder, Pasia, & McLaughlin, 2012; Snyder & Wolfe, 2008). Although preschool teachers validated embedded instruction as a useful approach for teaching young children with disabilities (Horn et al., 2000; Sandall & Davis, 2004), studies demonstrated it and other naturalistic instructional approaches often are not implemented with fidelity by teachers without systematic support for implementation (Filla, Wolery, & Anthony, 1999; Horn et al., 2000; McBride & Schwartz, 2003; Pretti-Frontczak & Bricker, 2001; Schuster, Hemmeter, & Ault, 2001; Smith, Warren, Yoder, & Feurer, 2004; Snyder, Hemmeter, McLaughlin, Algina et al., 2011).

Odom (2009) reported that without professional development support that includes an individualized follow-up component (e.g., coaching, performance feedback, or consultation), practitioners are not able to implement multi-component empirically supported practices such as naturalistic instructional approaches consistently and accurately. Efforts designed to help teachers of preschool children with disabilities learn about and implement naturalistic instructional approaches, including embedded instruction, to support engagement and learning of these children should include a follow-up component that provides teachers with support during their initial implementation (Snyder et al., in press). Moreover, it is important to examine relationships between teachers' fidelity of implementation of embedded instruction and child engagement and learning.

Naturalistic Instructional Approaches

Naturalistic instructional approaches are used to provide intentional and systematic instruction during typically occurring classroom activities to young children with disabilities to support their engagement and learning. Several different terms have been used in the extant literature to refer to naturalistic instructional approaches. The most common approaches described in the literature include: (a) milieu teaching, (b) transition-based teaching, (c) naturalistic teaching, (d) activity-based intervention, (e) the individualized curriculum sequencing model, and (f) embedded instruction (Snyder et al., 2013). Detailed descriptions of these approaches are presented in Chapter 2.

Naturalistic instructional approaches involve four common features. First, instruction occurs within typically occurring classroom activities, routines, and transitions. Second, the content of instruction focuses on skills needed by the child to participate fully in these activities, routines, and transitions. Third, instructional learning trials are initiated by the child or by an adult attending to the child's preferences and interests, and the child's response is followed by a natural or logically planned consequence. Finally, intentional and systematic instruction is provided by adults who interact regularly with the child (Rule, Losardo, Dinnebeil, Kaiser, & Rowland, 1998; Snyder et al., 2013).

Despite differences in the term used to refer to the naturalistic instructional approach, a primary emphasis in each of these approaches is embedding instructional learning trials to create opportunities for children to respond during typically occurring activities (Odom et al., 2004). The results of the systematic review of the literature conducted by Snyder et al. (2013) showed that when preschool teachers and other professionals implemented instructional learning trials frequently and with fidelity within the framework of naturalistic instructional approaches, including embedded instruction, children with disabilities had more opportunities to respond. As a result of receiving multiple and sufficient opportunities to respond and learn, these children acquired targeted skills; often generalized the skills across settings, people, and materials; and generally maintained the skills over time.

Context for the Study

Embedded Instruction

As one of the most commonly used naturalistic instructional approaches, embedded instruction shares the four features of naturalistic instructional approaches described previously. Snyder and her colleagues (2009) operationalized these features by developing four procedural components for implementing embedded instruction. These include (a) considering what a child with disabilities knows and can do and what the child needs to learn and be able to do (i.e., target skills) to participate meaningfully in activities, routines, and transitions (i.e., *what to teach*); (b) identifying activities, routines, and transitions (and developmentally appropriate tasks within them) that typically occur during a preschool day in which it is logical and appropriate to provide instruction on target skills (i.e., *when to teach*); (c) implementing embedded learning trials using intentional and systematic instructional procedures to provide opportunities for children to be engaged and to respond as well as to help children learn the skills they need to participate meaningfully in everyday activities, routines, and transitions (i.e., *how to teach*), and (d) evaluating implementation of embedded instruction and its impacts on child engagement and learning (i.e., *how to evaluate*).

In their review of the literature focused on naturalistic instructional approaches, Snyder et al. (2013) identified and reviewed 44 studies that examined the relationships between the use of embedded learning opportunities within naturalistic instructional approaches and child engagement and learning outcomes. Of the 44 studies reviewed, 15 specifically focused on investigating relationships between the use of embedded instruction and child learning outcomes. Forty-five preschool children with disabilities participated in the 15 studies. Thirty-five intervention providers implemented embedded instruction across a variety of classroom activities and routines. The majority of the intervention providers were naturalistic intervention agents such as teachers, paraprofessionals, the child’s personal assistant, assistant teachers, or the special education teacher. The activities and routines in which embedded instruction was implemented included centers, small-group, large-group, circle, and meals. In the 15 studies, embedded instruction learning trials (EILTs) were used by intervention agents to teach children with disabilities target skills associated with pre-academic, communication, social, motor, adaptive, and cognitive domains. Findings from the reviewed studies showed that practitioners' or other professionals' use of embedded instruction to provide young children with disabilities with opportunities to respond and to learn was effective in helping these children acquire new skills associated with a variety of learning domains. A few studies reported generalization (*n* = 6) and maintenance (*n* = 5) data. Across these studies, 12 of 14 children generalized skills across different settings, materials, and people and 12 of 13 children maintained skills as measured by follow-up probes conducted from 1 to 4 weeks after the intervention ended.

The findings from the review conducted by Snyder et al. (2013) showed that research evidence to date supports the use of EILTs within an embedded instruction approach for teaching preschool children with disabilities a range of skills in inclusive preschool settings. Nevertheless, none of the 15 embedded instruction studies included in the review investigated relationships between practitioners' use of EILTs to create opportunities for children to respond and child engagement. The review of the 44 studies included only one study (i.e., Malmskog & McDonnell, 1999) that examined relationships between naturalistic instruction and child engagement. This study used a single-subject experimental multiple baseline across participants design to investigate relationships between naturalistic teaching (a different naturalistic instructional approach) during free-play activities and the engagement of young children with disabilities. Results of this study showed that the percentage of intervals in which participating children were actively engaged in free-play activities increased for all three children after the teachers' implementation of naturalistic teaching strategies and two children maintained their active engagement during follow-up sessions conducted weekly or bi-weekly after the study ended until the end of the school year (i.e., 1 week to 8 weeks).

A separate review of the literature was conducted for the present study to identify empirical studies that investigated relationships between adults' use of intentional and systematic instructional procedures during ongoing classroom activities (which were not implemented as part of an embedded instruction approach) and child engagement. Three studies were identified (Appanaitis, 2003; Bevill, Gast, Maguire, & Vail, 2001; Danko, 2004). These three studies were not identified during the review conducted by Snyder and colleagues (2013), because terms the author(s) used to characterize interventions implemented in their studies differed from the search terms used by Snyder et al. to identify studies for their review.

In the next section, these three studies targeting individual child engagement during ongoing preschool activities along with the study conducted by Malmskog and McDonnell (1999) are briefly described. Findings from these studies, together with the research evidence on embedded instruction, guided the development of the conceptual framework and the research questions for the present study.

Intervention Studies on Child Engagement

Four studies were identified using systematic search procedures described in detail in Chapter 2. These studies examined relationships between the implementation of a naturalistic instructional approach (Malmskog & McDonnell, 1999) or the use of intentional and systematic instructional procedures during ongoing classroom activities and the engagement of young children with disabilities (Appanaitis, 2003; Bevill et al., 2001; Danko, 2004). These studies were reviewed and characterized with respect to the (a) instructional procedure or approach investigated, (b) research method and design used, (c) characteristics of child participants, (d) activity in which the intervention was implemented, (e) intervention agent, (f) measurement of engagement, and (g) results. These descriptive characteristics of the reviewed studies are shown in Table 1-1. A detailed description of each study is provided in Chapter 2.

Procedure or approach studied. Across the four studies, researchers investigated the effects of the implementation of several intentional and systematic instructional procedures or other intervention strategies on the observed engagement of young children with disabilities. The procedures or interventions were (a) zone defense scheduling, incidental teaching, and data collection (Appanaitis, 2003); (b) picture cues and correspondence training procedures (Bevill et al., 2001); (c) visual support strategies (Danko, 2004); and (d) naturalistic teaching strategies (Malmskog & McDonnell, 1999).

Method. In all four studies, the researchers employed single-subject experimental research designs. The designs used were multiple-probe design across participants (Bevill et al., 2001; Malmskog & McDonnell, 1999), multiple-probe, counterbalanced ABCD design across participants (Appanaitis, 2003), and multiple baseline design across participants (Danko, 2004).

Child participants. Fifteen children with disabilities participated in the four studies. Of the 15 participants, 9 were male and 6 were female. The studies included 10 Caucasian, 3 Hispanic, and 2 African-American participants. Children ranged between 35 months to 66 months of age with a mean of 53 months. With respects to disabilities, children had autism (*n* = 5), developmental delay (*n* = 3), Down syndrome (*n* = 3), communication disorders (*n* = 2), speech and language impairments (*n* = 1), and severe multiple disabilities (*n* = 1).

Activities. Across the four studies, practitioners or researchers implemented the intentional and systematic instructional procedures during free play activities (Appanaitis, 2003; Bevill et al., 2001; Malmskog & McDonnell, 1999), or circle time (Danko, 2004). Free play activities in which the interventions were implemented included block center, water or sand table, house/kitchen center, book center, art, literacy center, listening center, computers, and play dough. Circle-time activities involved attendance/greetings, calendar/weather, songs, lesson, and story.

Intervention agent. Intentional and systematic instructional procedures across the studies were implemented by either classroom teachers who regularly interacted with participating children with disabilities (Appanaitis, 2003; Danko, 2004) or a researcher who was conducting the study (Bevill et al., 2001; Malmskog & McDonnell, 1999).

Measurement of child engagement. Across the studies, child engagement during classroom activities was measured using observational engagement measures with different structures. In two studies (Bevill et al., 2001; Malmskog & McDonnell, 1999), researchers used engagement measures that categorized children's observed behaviors as engaged and non-engaged. In the Danko (2004) study, the researcher used an engagement measure that had three codes: active engagement, attentional engagement, and nonengagement. Appanaitis (2003) used the E-Qual III (McWilliam & de Kruif, 1998), an observational engagement measure with multiple engagement codes to evaluate child engagement behaviors and engagement partners.

Across the four studies, the activities in which the interventions occurred and in which child engagement was measured were held constant in one study (Danko, 2004) and they varied in the other studies. In the Danko (2004) study, observed engagement of participating children was evaluated during circle time throughout the study. In the other studies, the type of activities in which the intervention was implemented varied based on participating children's play preferences. Observed engagement behaviors and partners were not measured based on the type of play activities.

Results. Across the four studies, the use of intentional and systematic instructional procedures during ongoing classroom activities was associated with positive changes in engagement of all participating children with disabilities and these effects were maintained for four children in two studies during the follow-up sessions conducted weekly or every other week for approximately 8 weeks after the studies ended until the end of school year (Danko 2004; Malmskog & McDonnell, 1999). Two of the four studies reported data on intervention agents' implementation of intentional and systematic instructional procedures and investigated corollary relationships between their implementation and child engagement (Danko 2004; Malmskog & McDonnell, 1999). Findings from the reviewed studies showed that the teachers' or researchers' use of intentional and systematic instructional procedures or a naturalistic instructional approach during ongoing classroom activities to provide children with disabilities opportunities to respond was positively related to change in children's engagement.

Research studies conducted with school-age children have also demonstrated relationships among opportunities for students to respond, students' engagement, and their learning (e.g., Brophy & Good, 1986; Johnson, McDonnell, Holzwarth, & Hunter, 2004; McDonnell, Thorson, McQuivey, & Kiefer-O'Donnell, 1997). In these studies, the number and type of opportunities students have during classroom activities to respond has been found to be strongly associated with academic engaged time. In turn, academic engaged time (e.g., writing, problem solving, discussion, and debate) has been found to be a predictor of academic achievement. Although a similar link between practitioners' use of systematic and intentional instructional learning trials within ongoing classroom activities to create opportunities for young children to respond and child learning outcomes is established in the early childhood literature (e.g., Snyder et al., 2013), relationships between the former and child engagement has been explored in only four studies. None of these studies involved embedded instruction. Researchers measuring engagement with samples of school-age children have also reported students have increased levels of engagement and, as a result, learn more effectively when their teachers intentionally and systematically deliver instruction with fidelity during classroom activities (Brophy, 1986; Brophy & Alleman, 1991).

The way in which observed engagement is defined and measured in the early childhood literature is different than the way academic engaged time is defined and measured in school-age literature. Academic engaged time in the school-age literature typically is measured by calculating the amount of time a student is interacting with peers, adults, or materials. Although this method is similar to how engagement of young children was initially measured, early childhood researchers have proposed different definitions for engagement and have developed additional measures to quantify observed engagement.

Conceptual Framework

In view of the evidence from the literature focused on relationships between intentional and systematic instructional procedures for preschool children with disabilities and child engagement as well as literature related to opportunities to respond, academic engaged time, and learning of school-age children, a need exists to examine further relationships among embedded instruction learning opportunities, child engagement, and child learning. Based on findings in the empirical literature, it is hypothesized that when practitioners implement EILTs intentionally, systematically, accurately, and with sufficient intensity during ongoing classroom activities, young children with disabilities will have more opportunities to respond. Increased opportunities to respond will result in positive changes in observed child engagement behaviors, and these positive changes in observed child engagement during ongoing classroom activities will support children's learning (Snyder et al., in press).

Findings from several descriptive studies have documented that practitioners report they generally lack confidence and competence to implement multi-component, empirically supported practices such as embedded instruction consistently and accurately (Buysse et al., 1996; Pretti-Frontczak & Bricker, 2001). High quality professional development that includes follow-up support has been proposed as a mechanism for increasing teachers' frequent and accurate use of embedded instruction practices (Snyder, Hemmeter, Sandall, & McLean, 2010; Snyder, Denney et al. 2011).

Figure 1-1 illustrates the hypothesized relationships among high quality professional development, teachers' implementation of embedded instruction, and child engagement and learning. Of particular interest for the present study are relationships between teachers' implementation of EILTs and observed engagement behaviors and partners of young children with disabilities.

Defining Engagement in Early Childhood

Engagement has been defined as the amount of time children spend interacting with their social and nonsocial environments at different levels of competence and in a developmentally and contextually appropriate manner (McWilliam & Bailey, 1992; McWilliam et al., 1985). Engagement is considered a necessary condition to promote development and learning (McWilliam et al., 1985). This conceptualization of engagement has been influenced by four lines of research: time-on-task and academic achievement (e.g., Fisher & Berliner, 1985; Fisher et al., 1978, as cited in Stallings, 1980; Greenwood, 1991), mastery motivation (e.g., Gilmore & Cuskelly, 2009; Jennings, Yarrow, & Martin, 1984; Morgan, MacTurk, & Hrncir, 1995; Skinner & Belmont, 1993; Turner & Johnson, 2003), eco-behavioral assessment (e.g., Brown, Favazza, & Odom, 1995; Carta, Sainato, & Greenwood, 1988; Cataldo & Risley, 1973; Doke & Risley, 1972), and engagement research (e.g., Kishida & Kemp, 2009; McWilliam & de Kruif, 1998; McWilliam et al., 1985).

Researchers have proposed that high quality engagement is a critical factor that mediates young children's learning (e.g., Buysse & Bailey, 1993; De Kruif & McWilliam, 1999; Jones & Warren, 1991; Kishida, Kemp, & Carter, 2008; McWilliam et al., 1985). More specifically, these and other researchers suggest that when engagement is intentionally and systematically promoted, young children with and without disabilities are likely to have more opportunities to respond and learn targeted behaviors within the developmentally appropriate activities of the preschool classroom (Kishida et al., 2008; McWilliam & Casey, 2008).

Measuring Engagement of Young Children

The importance of engagement in developmental change and its mediating influence on children's learning has led researchers to conduct extensive research on this topic since the mid-1970s. Early studies of child engagement (a) examined the influences of environmental factors (e.g., group size, activity schedule and type, arrangement of classroom materials, adult interaction styles) on engagement (Doke & Risley, 1972; Dunst, McWilliam, & Holbert, 1986; LeLaurin & Risley, 1972); (b) investigated relationships between disability and young children's engagement (Bailey, McWilliam, Ware, & Burchinal, 1993; McCormick, Noonan, & Heck, 1998; McWilliam & Bailey, 1995); and (c) compared engagement levels of children with and without disabilities (e.g., Cavallaro & Porter, 1980; Guralnick, 1990; Guralnick & Groom, 1987; Odom, Jenkins, Speltz, & DeKlyen, 1982). Results from these studies showed that children with disabilities (a) tend to be engaged with the social and nonsocial environment for less time and at less advanced levels than children without disabilities (Cavallaro & Porter, 1980; Guralnick, 1990; Guralnick & Groom, 1987; Odom et al., 1982; (b) spend most of their time in early learning environments as passively nonengaged (Bailey et al., 1993); (c) spend more time interacting with adults than their peers when they are engaged (McWilliam & Bailey, 1995); and (d) play alone, meaning they often are not engaged with peers or adults (Cavallaro & Porter, 1980; Guralnick, 1990; Guralnick & Groom, 1987; Odom et al.,1982).

Risley and his colleagues conducted several studies focused on measuring engagement of preschool children who were at-risk for delays and disabilities during typically occurring classroom activities and routines (Cataldo & Risley, 1973; Doke & Risley, 1972; LeLaurin & Risley, 1972; Montes & Risley, 1975). In these studies, engagement was (a) characterized by children's active participation in the environment, (b) considered to be a dichotomous variable (i.e., engaged or nonengaged), (c) measured by the percentage of children participating in the planned activity, and (d) examined and measured across groups of children, not for an individual child.

Informed by the findings of research conducted by Risley and his colleagues that illustrated the relationships between factors related to the classroom environment and engagement of young children who are at-risk for delays or disabilities, researchers developed an assessment approach, known as eco-behavioral assessment to gather environmental and behavioral information about young children's experiences within early childhood settings (Carta et al., 1988). This assessment approach has mainly been used to evaluate program quality and intervention effectiveness (e.g., Brown, Odom, Li, & Zercher, 1999; Carta, Atwater, Schwartz, & Miller, 1990; Carta, Greenwood, & Robinson, 1987; Powell, Burchinal, File, & Kontos, 2008; Schwartz, Carta, & Grant, 1996). Nevertheless, several of the eco-behavioral assessment systems included variables related to environment, teacher, and student, including student engagement. Within the eco-behavioral assessment approach, individual child engagement is (a) evaluated as a subcategory under student-related variables, (b) defined as "actively attending to or involved in an activity" (Brown et al., 1999; Carta et al., 1987), and (c) measured by the percentage of intervals in which a specific engagement behavior (e.g., manipulate, self-care, transition, social) is observed.

A shift from quantifying children's engagement as either engaged or nonengaged to examining hierarchical engagement behaviors and engagement partners occurred in the early 1990s as researchers began to develop measures to assess the engagement of individual children rather than evaluating engagement of all children in a classroom. McWilliam and Bailey (1992) proposed an engagement framework that specified five levels of competence associated with the engagement construct. Hierarchical engagement behaviors included non-engaged, transient, undifferentiated, elaborative, and sustained. In addition, this framework allowed researchers to quantify the engagement type (i.e., engaged with adult, peer, or material).

Based on the framework developed by McWilliam and Bailey (1992), McWilliam and his colleagues have refined the engagement framework and developed or revised several measures to assess young children's engagement by what they refer to as level (i.e., hierarchical engagement behavior) and type (i.e., engagement partner). This framework has been operationalized on two measures: (a) the Engagement Quality Measurement System III [E-Qual III; McWilliam & de Kruif, 1998] and (b) the Scale for Teachers Assessment of Routines Engagement [STARE; McWillliam, 2000]). The E-Qual III (McWilliam & de Kruif, 1998) includes multiple hierarchical engagement codes to characterize children's observed engagement with respect to levels and types of engagement behaviors. Engagement levels are persistence, symbolic, encoded, constructive, differentiated, focused attention, casual attention, undifferentiated, and nonengaged. Engagement types are kid, grown-up, object, and self (or body parts).

Engagement is defined as the amount of time children spent interacting with the environment at different levels of competence and is measured using momentary time sampling procedures (McWilliam & de Kruif, 1998).

With the changes in the measurement of child engagement from quantifying the amount of time all children in a classroom or individual children in a classroom are engaged or nonengaged to examining hierarchical engagement behaviors and partners, researchers have begun to investigate factors associated with children's engagement. One factor influencing observed child engagement that has recently been investigated is the type of activities implemented in preschool classrooms (e.g., Hamilton, 2005; Powell et al., 2008; Vitiello et al., 2012).

Activity Type in Preschool and Child Engagement

A variety of scheduled activities and routines take place in preschool classrooms. These include arrival, circle-time, centers, free-play, outside play, toileting, snacks, and meals (Hamilton, 2005). Some of these scheduled activities include different subtypes of activities. For example, free-play or center-time activities often provide children with opportunities to select from a wide variety of concurrently available activities including literacy center, science center, dramatic play, computers, block center, art center, or games with rules. Many preschool play activities can be broadly classified as being primarily social-oriented or materials-oriented. In social-oriented activities, activity characteristics and structures set the occasion for children to interact with peers or adults in the classroom. Although social-oriented activities can often involve the use and manipulation of classroom materials, the primary emphasis is on social interaction with people during the activity. In materials-oriented activities, activity characteristics and structures set the occasion for children to play with classroom materials or focus on a task that involves manipulation of classroom materials. Although these activities might also include interactions with peers or adults, the main focus of observed child engagement often is on the materials.

Researchers have acknowledged that different classroom activities and routines have distinctive characteristics and task demands or expectations (Kontos et al., 2002; Powell et al., 2008; Vitiello et al., 2012). Some activities, therefore, might be more suitable for different types of embedded learning opportunities and these different types of embedded learning opportunities might set the occasion for children to demonstrate different observed engagement behaviors (Snyder, Sandall et al., 2009). For example, during a drawing activity that primarily involves manipulation or use of materials, practitioners can implement embedded learning opportunities where children respond using fine motor skills (e.g., holding a crayon and making marks on paper). The type of embedded learning opportunities delivered during activities that are mainly focused on the use of materials might occasion different engagement behaviors than embedded learning opportunities provided within a pretend play activity in which children interact with peers and adults.

Several descriptive studies have investigated relationships between activity type and young children’s engagement (e.g., Hamilton, 2005; Kontos et al., 2002; Kontos & Keyes, 1999; Powell et al., 2008 Vitiello et al., 2012). Findings from these studies have shown that child engagement behaviors vary based on the activity type. For example, Kontos et al. (2002) found that children were more likely to engage with materials during art activities (e.g., coloring) while Vitiello and her colleagues (2012) reported that a greater amount of positive engagement with peers took place during free-play activities.

Nevertheless, studies investigating the relationships between activity type and child engagement have been descriptive, and therefore the associations between these two variables in relation to teachers' implementation of systematic and intentional instructional approaches such as embedded instruction have not been investigated. Moreover, the majority of these studies have primarily included typically developing children.

Accumulating research evidence suggests relationships exist between activity type and child engagement behaviors. In addition, it is important to consider activity characteristics and demands when planning and delivering embedded learning opportunities. A need exists to examine observed engagement behaviors and partners of children with disabilities during different types of classroom activities and in relation to teachers' implementation of embedded learning opportunities.

Rationale for the Study

Substantial empirical evidence exists in the early childhood special education literature to assert that naturalistic instructional approaches, including embedded instruction, are effective for teaching skills to preschool children with disabilities in inclusive preschool settings. Moreover, findings from a number of studies showed that with support for implementation through training or professional development, naturalistic intervention agents (e.g., classroom teachers, teacher assistants/aides, or paraprofessional) are able to implement these approaches with fidelity (Horn et al., 2000; McBride & Schwartz, 2003; Schepis, Ownbey, Parsons, & Reid, 2000; Snyder, Hemmeter, McLaughlin, Algina et al., 2011). Naturalistic intervention agents' implementation of EILTs to create opportunities for children to respond during ongoing classroom activities not only helps children to acquire skills but also supports children to generalize and maintain skills.

Four single-subject experimental studies were identified that investigated the engagement of young children with disabilities in relation to their teachers' or researchers' implementation of intentional or systematic instructional procedures (Appanaitis, 2003; Bevill et al., 2001; Danko, 2004) or a naturalistic instructional approach (Malmskog & McDonnell, 1999). None of these studies focused on examining relationships between practitioners' frequent and accurate use of EILTs during ongoing classroom activities to create opportunities for children with disabilities to respond and children's observed engagement behaviors. Research has shown that embedded instruction learning trials were implemented frequently and accurately by practitioners when they received professional development (Snyder, Hemmeter, McLaughlin, Algina et al., 2011). Moreover, research has shown a positive relationship between practitioners' frequent and accurate implementation of EILTs and child learning outcomes (Snyder, Hemmeter, McLaughlin, Algina et al., 2011). Given the positive relationship between the implementation of EILTs and child learning, embedded instruction might create intentional opportunities for children to respond and enhance young children's engagement during ongoing classroom activities.

The present study was designed to investigate corollary relationships between teachers' frequent and accurate use of EILTs and observed child engagement behaviors and partners during two types of child-initiated activities. To explore these corollary relationships, a measure was needed to quantify child engagement. In three of the four studies previously reviewed (Bevill et al., 2001; Danko, 2004; Malmskog &

McDonnell, 1999), the researchers evaluated the relationships between the implementation of intentional and systematic instructional procedures and child engagement using engagement measures that had two (i.e., engaged and nonengaged), or three (i.e., active engagement, attentional engagement, or nonengagement) engagement behavior codes. Although this approach to measuring engagement allowed researchers to identify times when a child is engaged or not engaged, it does not permit a nuanced examination of the type of behaviors children demonstrate when they are engaged. For example, when basic engagement measures are used, advanced (e.g., completing puzzle) and low level (e.g., watching a friend building a castle from blocks) engagement behaviors are grouped under the same category of "engaged." Only one of the studies reviewed examined associations between a child's engagement and the implementation of a package of intervention strategies by using a behavioral observation system (E-Qual III; McWilliam & de Kruif, 1998) that includes multiple codes for engagement level and type (Appanaitis, 2003).

In the present study, the Engagement Behavior Observation System-Research Version II (EBOS-RVII; Embedded Instruction for Early Learning Project [EIFEL Project], 2012), an observational coding system adapted from the E-QUAL-III, was used to investigate observed child engagement behaviors and partners during social-oriented and materials-oriented activities and corollary relationships between child engagement behaviors and practitioners' implementation of EILTs across successive phases of a single-subject experimental study. The EBOS-RVII includes seven hierarchical codes to measure child engagement behaviors and four codes to measure engagement partners and all codes are operationally defined.

Three of the four studies that examined the changes in child engagement in relation to teachers' or researchers' use of intentional and systematic instructional procedure were implemented during scheduled free-play periods (Appanaitis, 2003; Bevill et al., 2001; Malmskog & McDonnell, 1999), while one study was implemented during circle-time activities (Danko, 2004). A variety of short, sub-activities are included within center- and circle-time activities, including a mix of social-oriented and materials-oriented activities. These activities with distinctive characteristics and demands set the occasion for a range of embedded learning opportunities for children with disabilities to respond and learn. The use of embedded learning opportunities focused on certain learning target skills might encourage children to demonstrate different engagement behaviors. Moreover, studies conducted with typically developing children have shown that observed child engagement behaviors and partners vary based on activity type. None of the four reviewed studies examined the relationships between activity type and engagement behaviors and partners of young children with disabilities when their teachers implemented embedded instruction or other intentional and systematic instructional approaches. The current study was designed to investigate corollary relationships between child engagement behaviors and partners and teachers' implementation of EILTs during social-oriented and materials-oriented classroom activities.

One of the key features of naturalistic instructional approaches is that intentional and systematic instruction is provided by adults who interact regularly with the child. These adults might include preschool teachers, paraprofessionals, therapists, and assistant teachers. In only two of the four studies reviewed (Appanaitis, 2003; Danko,

2004) did naturalistic intervention agents' implement the instructional procedures during ongoing classroom activities. The present study was designed to examine the relationships between naturalistic intervention agents' (i.e., preschool teachers) implementation of embedded instruction and child engagement.

Purpose of the Study

The purpose of the present study was to investigate corollary relationships between the engagement behaviors of four young children with disabilities during two types of child-initiated activities and their teachers' implementation of embedded instruction learning trials (EILTs). EILTs data were obtained from a previously conducted single-subject experimental study involving four teachers (EIFEL Project; Snyder, Hemmeter, Sandall, & McLean, 2007). The single-subject experimental study was designed to evaluate functional relationships between teachers' exposure to three components of an embedded instruction professional development intervention and their implementation of EILTs. The present study explored changes in children's engagement behaviors across single-subject experimental phases and examined corollary relationships between teachers' implementation of EILTs and child engagement behaviors.

The Engagement Behavior Observation System: Research Version II (EBOS-II) was used in the present study to quantify child engagement behaviors. Data sources were 269 videotapes collected for the four participating children across the experimental phases of the single-subject study. The child-initiated activities captured on these videotapes were classified as either social-oriented or materials-oriented and the EBOS-II coding system was applied to children's behavior within each type of activity.

The following research questions were addressed in the present study:

1. What changes occurred in observed child engagement behaviors during social-oriented and materials-oriented child-initiated activities across experimental phases?

2. Did teachers' frequent and accurate use of embedded instruction learning trials change during social-oriented and materials-oriented child-initiated activities across experimental phases?

3. Were there corollary relationships between child engagement behaviors and teacher implementation of embedded instruction learning trials during social-oriented and materials-oriented child-initiated activities across experimental phases?

Table 1-1. Study characteristics

Citation	Approach or Procedure	Design	Intervention Agent	Duration of Training Session	Treatment Fidelity Reported
Appanaitis (2003)	Zone defense scheduling, incidental teaching, and data collection procedures	Multiple-probe, counterbalanced ABCD single-subject experimental design across participant	Teacher	3, 30-45 minute long training sessions	Yes
Bevill, Gast, Maguire, & Vail (2001)	Picture display, picture display plus verbal prompt, and reinforcement of correspondence procedures	Multiple-probe, single-subject experimental design across participants	Researcher	Not reported	Yes
Danko (2004)	Visual support strategies	Multiple baseline, single-subject experimental design across participants	Teacher	6 meetings in 2 weeks	Yes
Malmskog &McDonnell (1999)	Naturalistic teaching strategies	Multiple-probe, single-subject experimental design across participants	Researcher	Not reported	Yes

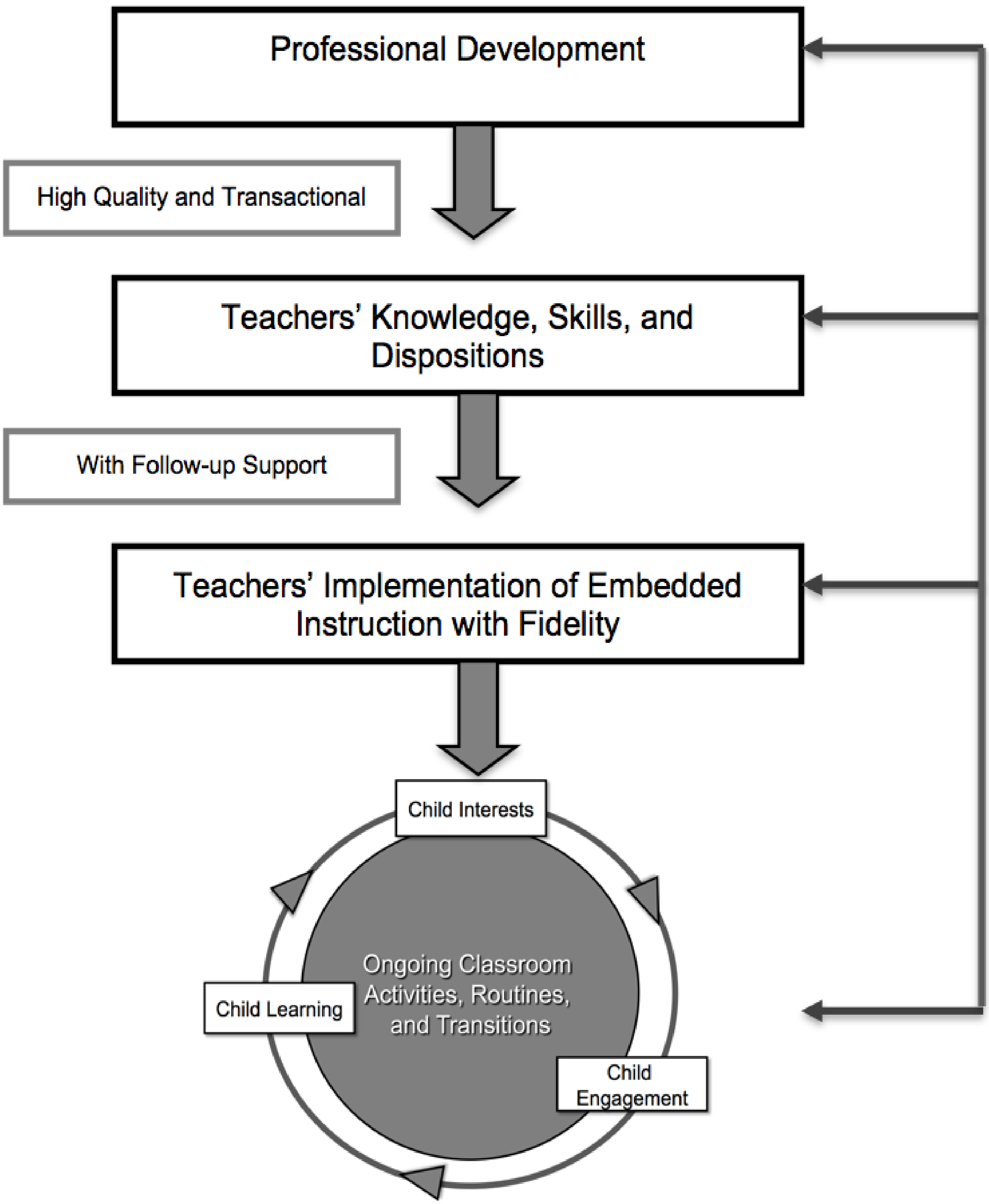

Figure 1-1. Conceptual framework (adapted from Dunst, 2000; Snyder, Denney et al. 2011)

CHAPTER 2
LITERATURE REVIEW

The purpose of the present study was to examine corollary relationships between observed engagement behaviors of young children with disabilities during child-initiated, social-oriented and materials-oriented activities and their teachers' implementation of embedded instruction learning trials (EILTs). This chapter presents a review of the literature related to (a) the empirical evidence related to functional relationships between implementation of naturalistic instructional approaches, including embedded instruction, and child engagement and learning; (b) defining and measuring child engagement; (c) activities as contexts for engagement and learning; and (d) the characteristics of intervention studies focused on observed engagement of young children with disabilities during ongoing classroom activities.

The chapter is divided into four major sections. The first section reviews the literature related to naturalistic instructional approaches and embedded instruction. The second section reviews the literature on engagement and related constructs (i.e., time-on-task and mastery motivation) and discusses issues related to defining and measuring child engagement. The third section describes studies that investigated the relationships between activity types and child engagement. The fourth section contains a review of four intervention studies that examined relationships between the use of intentional and systematic instructional procedures during ongoing classroom activities and observed engagement of young children with disabilities.

Naturalistic Instructional Approaches and Embedded Instruction

The last 35 years have witnessed dramatic changes in the services provided to young children with disabilities in the United States. Instead of receiving educational and developmental services full-time in segregated classrooms or schools, many young children with disabilities have access to inclusive early learning settings where children with and without disabilities play, develop, and learn together (Bricker, 2000; Hemmeter, 2000). Findings from reviews of the literature on preschool inclusion (e.g., Buysse & Bailey, 1993; Buysse et al., 1994; Odom, 2000; Odom & Diamond, 1998; Odom et al., 2004; Salend & Duhaney, 1999) have repeatedly emphasized that for inclusion to be successful and meaningful for children with disabilities, practitioners must implement individualized instructional approaches to create learning opportunities for children to respond and learn.

Recommended practices in early intervention consider both access and participation as key features of inclusion (DEC/NAEYC, 2009). While *access* highlights the importance of young children with disabilities having entrée to a range of learning opportunities, activities, settings, and environments, *participation* extends the concept of access by emphasizing children's engagement and learning within everyday activities, settings, and environments. The participation of young children with disabilities in the preschool curriculum is enhanced when practitioners implement intentional and systematic instructional approaches during ongoing activities and routines in inclusive early learning settings (Wolery, 2005).

Naturalistic instructional approaches have been identified as intentional and systematic approaches that show promise for supporting the development, engagement, and learning of preschool children within ongoing classroom activities by providing children with multiple opportunities to respond (Snyder et al, 2013).

Snyder and colleagues (2013) identified a number of naturalistic instructional approaches in the extant literature. These approaches included the individualized curriculum sequencing model, milieu teaching, naturalistic teaching, activity-based intervention, transition-based teaching, and embedded instruction. Despite being referred to by different terms, these approaches share several common features. First, systematic and intentional instruction is delivered in the context of daily activities, routines, and transitions of early childhood settings, including home, childcare centers, preschool classrooms, and other community settings. Second, learning targets and skills addressed during instruction are those that the child needs to meet activity characteristics or "demands" and to participate more fully in ongoing activities and routines. Third, instructional episodes are generally child-initiated or initiated by a caregiver based on the child's interests or focus of attention. When a learning target behavior occurs, an instructional episode ends with a natural or logically planned consequence. Fourth, adults who implement naturalistic instructional approaches are those who interact with the child on a regular basis and who are natural participants in the child's everyday environments (Horn & Banerjee 2009; Rule et al., 1998; Snyder et al., 2013).

Although naturalistic instructional approaches share the four features described above, each approach also has unique features and procedural components. The next section provides a summary of research focused on naturalistic instructional approaches to support the engagement and learning of young children with disabilities and contains two parts. First, a brief history of the development of naturalistic instructional approaches is presented. Second, the research base for naturalistic instructional approaches and embedded instruction is summarized.

Development of Naturalistic Instructional Approaches

Background. In early programs serving young children with disabilities, instruction was often delivered in “contrived” environments using discrete instructional trials. Discrete instructional trials begin with an instruction or question from the teacher (antecedent), followed by a response from the child, and a consequence delivered by the teacher. Discrete trial instruction often occurs in a highly structured, teacher-controlled manner and intertrial intervals are very short (often less than 3 sec) (Lovaas, Koegel, Simmons, & Long, 1973; Nordquist & Wahler, 1973; Snyder & Lindstedt, 1985). In discrete trial instruction, the child and teacher often sit face-to-face at a table with minimal distraction in the environment and the teacher presents consecutive “discrete” trials until the child demonstrates acquisition and mastery, typically at pre-determined criterion levels (Delprato, 2001). This method of teaching has been repeatedly demonstrated to be effective for promoting skill acquisition and achieving fluency. Researchers, however, have questioned whether, without systematic programming, skills are generalized across people, settings, or materials, and whether learners are able to maintain and adapt skills learned in contrived contexts (Baer, Wolf, & Risley, 1968; Elliot, Hall, & Soper, 1991; Hart & Risley, 1968; Stokes, Baer, & Jackson, 1974).

Incidental teaching. In the 1960s, Hart and Risley developed a naturalistic teaching procedure referred to as incidental teaching. Incidental teaching was designed to increase the amount and complexity of language used by children who were from families identified as economically disadvantaged and also to increase generalized and spontaneous use of language. Hart and Risley (1975) described this procedure as “the interaction between an adult and a child, which arises naturally in an unstructured situation and which is used by the adult to transmit information, or give the child practice in developing a skill." In an incidental teaching episode, an instructional trial starts when the child expresses interest in materials in the environment, and request assistance from the adult. For example, the child might look in the direction of an object and point at the object. The adult "follows the child's attentional lead" and uses prompts (e.g., asks "What do you want?") to support the child to produce a "correct" responses (e.g., child says "I want the train"). This response is followed by a natural consequence (e.g., access to the material or activity).

Hart and Risley conducted several studies to investigate the effectiveness of incidental teaching for facilitating language and communication skills of young children (Hart & Risley 1968; 1974; 1975; 1980). For example, Hart and Risley (1968) observed 11 children of families identified as economically disadvantaged during free play activities in preschool classrooms over 8 months and examined the effects of incidental teaching in these children's language abilities. The use of incidental teaching was associated with increases in unprompted use of compound sentences and spontaneous speech. Hart and Risley (1974) examined the effects of using incidental teaching on the spontaneous speech of 12 preschool children who were at-risk for delays and disabilities during free-play periods over 8 months and reported all 12 participants increased their use of noun and adjective-noun combinations to request.

The studies conducted by Hart and Risley investigating the impacts of the implementation of incidental teaching during ongoing classroom activities only included children who were at-risk for delays and disabilities due to the socioeconomic status of their families and primarily focused on improving the language skills of these children.

Milieu teaching. Using incidental teaching as a foundation and based on promising findings from research conducted by Hart, Risley, and colleagues, other researchers have refined, extended, and experimentally validated the incidental teaching procedure. Mand-model and naturalistic time delay procedures arose as an extension of incidental teaching in early 1980s (Halle, 1982; Halle, Baer, & Spradlin, 1981; Rogers-Warren & Warren, 1980; Warren, McQuarter, & Rogers-Warren, 1984). Later in the same decade, Warren and Kaiser (1986) referred to a set of teaching procedures including model, mand-model, naturalistic time delay, and incidental teaching as *milieu teaching*. Table 2-1 presents descriptions of and examples for milieu teaching procedures. Kaiser (1993) described milieu teaching as “a naturalistic, conversation-based teaching procedure in which the child’s interest in the environment is used as a basis for eliciting elaborated child communicative responses” (p. 77). In milieu teaching, the adult arranges the environment to promote child engagement, and uses naturally occurring antecedents and consequences to teach target language skills to young children. A milieu teaching instructional trial begins when a child is interested in or focused on a toy, object, or activity in the environment. The adult follows the child’s lead to initiate instruction. A “correct” child behavior following an instruction or question results in a consequence that is inherent to the language response (Warren & Kaiser, 1986). In the early 1990s, the milieu teaching approach was expanded with the addition of responsive interaction strategies (e.g., taking and balancing verbal turns with a child, or mirroring the child’s actions and mapping language onto these actions) and the new approach was called *enhanced milieu teaching* (Hemmeter & Kaiser, 1994; Kaiser, 1993; Kaiser & Hester, 1994). Both milieu teaching and enhanced milieu teaching were among the first multi-component naturalistic instructional approaches described in the literature. Snyder et al. (2013) identified four studies in the literature that investigated the relationships between the use of milieu teaching procedures during ongoing preschool activities and learning outcomes of young children with disabilities (i.e., Kaczmarek, Hepting, Dzubak, 1996; McCathren, 2000; Olive et al., 2007; Yoder et al., 1995). These studies included 42 children with disabilities and focused on teaching preschool children with disabilities communication and language skills. Across the studies, the researchers reported positive outcomes with respect to children's learning; all 42 children acquired the skills taught; 2 generalized and maintained the skills.

Individualized curriculum sequencing model. Early naturalistic instructional approaches were developed to teach language and communication skills to young children with disabilities or those at-risk. In the 1980s, a group of researchers at the University of Kansas developed the individualized curriculum sequencing model (ICS) to teach a variety of skills to children and youth with significant disabilities and evaluated the effectiveness of the model (Bambara, Warren, & Komisar, 1988; Mulligan, Guess, Holvoet, & Brown, 1980). The ICS model focused on identifying curriculum content based on inter-related skills ("skill clusters") required in a specific setting in which the child participated and providing instruction that sequenced trials in natural ways to emphasize the use of skills that were meaningful to the child in the context of ongoing activities or routines (Bambara et al.,1988; Holvoet, Guess, Mulligan, & Brown, 1980). According to Holvoet et al. (1980), identifying content that was relevant to the child and providing instruction that was sequenced meaningfully and conducted in relevant contexts would improve a student's ability to use the skills when needed. In this approach, to facilitate generalization, skills were taught across a variety of classroom activities, in different locations, with different materials, and when possible, across trainers (Bambara et al., 1988). The ICS model helped inform the development of multi-component naturalistic instructional approaches that were specific to early childhood (e.g., activity-based instruction; Bricker & Cripe, 1989).

Snyder et al. (2013) identified one study in the literature that investigated the effects of using the ICS model during ongoing classroom activities on children's learning (Bambara et al., 1988). Using a multiple probe across behaviors single-subject experimental research design, this study investigated the effects of the ICS model on the acquisition and generalization of skills from communication, motor, and pre-academic domains by two preschool children with disabilities. Three skills were taught to each child within three different activities using a system of least prompts instructional procedure. Results indicated that both children acquired the three skills and one generalized all skills with at least 70% accuracy.

Activity-based intervention. Activity-based intervention (ABI) was developed in the early 1990s as another naturalistic instructional approach to curriculum and instruction. ABI has been revised several times over 20 years (Bricker & Cripe, 1989, 1992; Bricker, Pretti-Frontczak, & McComas, 1998; Pretti-Frontczak & Bricker, 2004). ABI was initially defined as "a child-directed, transactional approach that embeds training on a child's individual goals and objectives in routine or planned activities and uses logically occurring antecedents and consequences to develop functional and generalizable skills” (Bricker & Cripe, 1989, p. 253; Bricker et al., 1998, p. 11). Pretti-Frontczak and Bricker (2004) described ABI as a naturalistic approach that aims to “promote the acquisition and generalization of functional and developmentally appropriate skills in young children by embedding multiple learning opportunities into authentic activities using logically occurring antecedents and timely feedback” (p. 30). ABI involves four key components: (a) using child-directed, routine, and planned activities, (b) providing multiple and varied embedded learning opportunities, (c) delivering timely and integral feedback and consequences, and (d) developing functional and generative skills (Pretti-Frontczak & Bricker, 2004).

Snyder et al. (2013) identified two studies in the literature that examined the effects of using ABI during preschool activities on the learning outcomes of young children with disabilities (Apache, 2005; Losardo & Bricker, 1994). The two studies included 34 children with disabilities and focused on teaching young children with disabilities skills associated with communication and motor domains. The use of ABI was found to be effective in promoting skill acquisition for 34 children, generalization for 6 children, and maintenance for 6 children.

Transition-based teaching. In response to the findings of research showing that preschool children spent a high percentage of their time in transition between activities and areas during a school day (e.g., Sainato & Lyon, 1989; Sainato, Strain, Lefebvre, & Rapp, 1987), Wolery and his colleagues developed transition-based teaching (TBT) in the 1990s. Transition-based teaching is defined as “a technique designed to use transitions as instructional opportunities and involves delivering a brief trial or trials at the beginning of a transition (Werts, Wolery, Holcombe-Ligon, Vassilaros, & Billings, 1992). In this approach, the teacher secures the child's attention and provides an instructional trial using a teaching procedure (e.g., progressive time delay or constant time delay) once a transition between activities or areas is initiated. The instructional trial or trials were typically brief and focused on a discrete (often pre-academic) skill that was not necessarily relevant to the transition. The intent of this approach was to use the time spent in transition to maximize instructional time and therefore, to maximize learning opportunities presented to young children with disabilities (Werts et al., 1992; Wolery, Anthony, & Heckathorn; 1998).

Snyder et al. (2013) identified three studies in the literature that investigated the effects of using TBT on learning outcomes of young children with disabilities (Werts, et al., 1992; Wolery et al., 1998; Wolery, Doyle, Gast, Ault, & Simpson, 1993). These studies included 11 children with disabilities and focused on skills associated with pre-academic and communication domains. The use of TBT was found to be effective in promoting skill acquisition for 11 children, generalization for 7 children, and maintenance for 4 children.

Naturalistic teaching. Naturalistic teaching is another multi-component instructional approach that emerged in the literature in the late 1980s and1990s. This approach has an emphasis on the use of naturally occurring activities in the child's everyday environment as instructional opportunities and addresses skills that are functional for the child (Fox, & Hanline, 1993; Malmskog, & McDonnell, 1999; Peck, Killen, & Baumgart, 1989). In naturalistic teaching, instructional interactions (a) are brief and distributed over a period of time during a school day, (b) are child-initiated and responsive to the children's behaviors, and (c) end with naturally occurring consequences or feedback (Fox & Hanline, 1993; Rule et al., 1998).

Snyder et al. (2013) identified 13 studies in the literature that investigated relationships between the use of naturalistic teaching during ongoing classroom activities and child learning outcomes (Table 2-2 lists the 13 studies). These studies included 60 children with disabilities. Researchers primarily addressed skills from communication, social, pre-academic, and motor domains. The use of naturalistic teaching during ongoing classroom activities was found to be effective in promoting skill acquisition for 56 children, generalization for 11 children, and maintenance for 23 children.

Embedded instruction. Embedded instruction first emerged in the literature in 1984, but the majority of the studies focused on this multi-component naturalistic instructional approach have been implemented since 2000. Snyder et al. (in press) described embedded instruction as identifying times and activities when [learning opportunities] for teaching a child's priority learning targets are implemented in ongoing activities, routines, and transitions [of inclusive preschool classrooms]. In embedded instruction, child engagement and learning in everyday activities, routines, and transitions is supported by focusing on what to teach, when to teach, how to teach, and how to evaluate. What to teach refers to functional, generative, and measurable priority learning targets. When to teach emphasizes the use of ongoing activities, routines, and transitions as instructional contexts. How to teach highlights the use of intentional and systematic instructional procedures to create embedded learning opportunities and to provide embedded instruction learning trials (EILTs). How to evaluate refers to the activities for monitoring implementation of instruction and child progress toward achieving learning targets (Snyder et al., in press).

Based on the literature reviewed, Snyder et al. (2013) identified six key procedural components for embedded instruction in their review of the literature focused on naturalistic instructional approaches. First, embedded instruction addresses skills that support access, participation, and membership of young children with disabilities in an early learning classroom. Second, embedded instruction emphasizes providing children with disabilities opportunities to learn and master skills within the activities, routines, or transitions in which the use of the skills is logical and appropriate based on activity characteristics and demands. Third, practitioners teach skills to young children with disabilities within and across everyday activities, routines, or transitions to enhance generalization and adaptation. Fourth, in embedded instruction, authentic activities and materials that are readily available within ongoing classroom activities, routines, and transitions are used to support engagement and learning of young children with disabilities. Fifth, practitioners use intentional and systematic instructional strategies to promote child engagement and learning. Sixth, practitioners monitor their implementation of EILTs and child progress toward achieving learning targets.

Snyder et al. (2013) identified 15 studies in the literature that investigated the effects of using embedded instruction during ongoing classroom activities, routines, and transitions on child learning outcomes. Table 2-2 presents a list of these 15 studies. Findings associated with these studies were described in Chapter 1. The findings are summarized in the next section.

Research-base for Naturalistic Instructional Approaches and Embedded Instruction

Snyder et al. (2013) conducted a systematic review to examine the empirical literature focused on naturalistic instructional approaches. For a study to be included in this review, it had to meet four criteria. The study had to (a) be empirically based research focused on a naturalistic instructional approach, (b) be published in a peer-reviewed journal, (c) include at least one child with a disability who was between the ages of 36 and 60 months at the beginning of the study, and (d) be implemented in the context of typically occurring activities, routines, or transitions of preschool classrooms.

Article search. The process to identify potential studies for the review involved four stages. First, an electronic search was conducted using all the databases in EBSCO Host and Web of Knowledge, and four databases in Wilson Web (i.e., Education Full Text, Education Index Retro, ERIC, Social Science Full Text). Combinations of the following search terms were used: embed*, transition-based, natural*, incidental, activity-based, milieu/enhanced milieu, responsive interaction, individualized curriculum sequencing, strateg*, instruction/intervention/teaching, and presc*. Articles identified in this stage were screened using the inclusion criteria described above.

Second, an ancestral hand search of the reference lists of all articles that met the inclusion criteria from the initial screening was conducted. Moreover, an existing reference list for a grant that focused on embedded instruction for early learning was reviewed to identify additional studies (Snyder et al., 2007). Third, names of known researchers who have conducted research on naturalistic instructional approaches in early childhood settings were searched using the databases previously described.

Fourth, studies identified through the hand search, grant reference list, and name search were searched in EBSCO Host database to generate additional indexing or search terms. These terms were used to conduct an additional database search using EBSCO Host. Terms included language, teaching, preschool, imitation, and disabilit*. Database searches were not limited by time restrictions.

The four-stage process resulted in 696 unique articles. The abstract of each unique article identified through the search process was screened using a screening tool that was created based on the inclusion and exclusion criteria described previously. The screening processes resulted in 38 articles that met the inclusion criteria. Of 38 articles, 5 included multiple case studies or experiments (Table 2-2). Across these 5 articles, 12 case studies or experiments were reported and 11 met the inclusion criteria. Thus, the review included 44 studies from 38 articles that were published between 1981 and 2009. Across the 44 studies, six different terms were used by the researchers to characterize the naturalistic instructional approach implemented in their studies: *embedded instruction* (*n* = 15), *naturalistic teaching* (*n* = 13), *milieu teaching* (*n* = 4), *transition-based teaching* (*n* = 3), *activity-based intervention* (*n* = 2), and *individualized curriculum sequencing model* (*n* = 1). In four studies, a specific term was not used to refer to the naturalistic instructional approach. Snyder et al. (2013) referred to two studies as using a *combined approach* because the authors of the studies described the intervention as including two approaches. Culatta, Kovarsky, Theadore, Franklin, and Timler (2003) used a naturalistic instructional approach with direct instruction, and McBride and Schwartz (2003) examined the effects of activity-based intervention followed by activity-based intervention with discrete trials. Table 2-2 shows the author(s) and publication year for each reviewed article by naturalistic instructional approach.

In the section below, a brief summary of the findings from the review conducted by Snyder et al. (2013) with respect to the relationships between the implementation of the naturalistic instructional approaches and child learning outcomes is presented. The summary includes findings related to (a) the study participants (i.e., participating children and adults who implemented the naturalistic instructional approaches), (b) the research methods and designs, (c) skills addressed using naturalistic instructional approaches, and (d) skill acquisition, generalization and maintenance. In addition to the overall findings for all naturalistic instructional approaches across 44 studies, findings for the 15 embedded instruction studies are presented separately.

Child participants. Two hundred and eighteen children with disabilities participated in the 44 studies focused on naturalistic instructional approaches. Across the 44 studies, 43 reported information about gender and 38 reported the mean ages for participating children. Studies included 68 female and 140 male children with disabilities. The mean age of participating children was 51.1 months (*SD*= 7.3). Participating children had a variety of disabilities including developmental delay (*n* = 101), speech and language delay (*n* = 46), autism spectrum disorder (*n* = 37), Down syndrome (*n* = 12), cerebral palsy (*n* = 7), multiple disabilities (*n* = 5; e.g., deaf-blind, intellectual and physical disabilities), and other disabilities (*n* = 8; e.g., 13-q syndrome, attention deficit and hyperactivity disorder, mental retardation). For two children, a specific disability category was not reported but the researchers noted these children had delays.

Forty-five children with disabilities participated in the 15 studies in which an embedded instruction approach was used. Of 45 children, 33 (73%) were male and 12 (27%) were female. The mean age for participating children was 54.3 months (*SD*= 5.7). With respect to children's disabilities, 14 (31%) children were characterized as developmentally delayed or at-risk for developmental delay. Other disabilities that participating children had at study entry included speech and language delay (*n* = 10; 22%), autism spectrum disorder (*n* = 9; 20%), multiple disabilities (n = 4; 9%), cerebral palsy (*n* = 3; 7%), Down syndrome (*n* = 2; 4%), and other disabilities (*n* = 2; 4%). A specific disability category was not reported for one child across the reviewed studies but the researchers noted the child had delays.

Adult participants. One hundred and thirty individuals implemented the naturalistic instructional approaches in the 44 studies. These individuals included 66 preschool teachers, 39 teacher aids or assistant teachers, 14 graduate students, 4 therapists, 4 personal assistants, 2 researchers, and 1 special education teacher. Information about intervention providers' gender, age, teaching experiences, and level of education was included in very few studies.

Across the 44 studies, information was provided about intervention providers' teaching experience (*n* = 21), level of education (*n* = 19), gender (*n* = 13), and age (*n* = 6). For the studies reporting gender, 36 female and 1 male intervention providers were included. For the studies reporting age, the mean was 31 years (ranging from 23 to 55 years). Studies in which level of education was reported included 51 intervention providers who had or were working toward a bachelor's degree or higher, 6 with an associate's degree, 6 who either held or were working toward a high school diploma or equivalent, and 1 with a Child Development Associate credential. For the studies reporting teaching experience of intervention providers, experience ranged from no experience to 22 years with a mean of 7.2 years (*SD*= 5.2).

The 15 studies focused on embedded instruction included 35 intervention providers including 16 (46%) teachers, 7 (20%) paraprofessionals, 5 (14%) researchers or graduate students, 4 (11%) personal assistants, 2 (6%) assistant teachers, and 1 (3%) special education teacher. Across the 15 studies, 6 (40%) reported levels of education and teaching experiences of intervention providers. Information about the age and gender of intervention providers was provided in 4 (27%) studies and 1 (7%) study, respectively. For the studies in which gender was reported, 14 female and 1 male intervention providers were included. In the studies reporting age, the mean was 30.5 years (ranging from 23 to 41 years). For the studies reporting education and teaching experience, nine intervention providers had a bachelor's degree or higher and six had a high school degree or lower. On average, these intervention providers had 8.5 years of teaching experience (*SD*= 7.0).

Research methods and designs. Across 44 studies focused on naturalistic instructional approaches, single-subject experimental research designs were used in 40 studies; a two-group pretest/posttest design was used in 2 studies; an observational, nominal descriptive design was used in one study; and a quasi-experimental crossover design was used in one study. The single subject experimental research designs included multiple baseline designs across participants (*n* = 22), behaviors (*n* = 10), and settings (*n* = 1); alternating treatments design (*n* = 3); and ABAB/reversal design (*n* = 3). One study used both a withdrawal and a multiple-baseline across participants design.

In the 15 embedded instruction studies, researchers used a single-subject experimental research design in 14 studies and an observational, nominal descriptive design in 1 study. The single subject experimental research designs included multiple baseline design across participants (n = 10) and behaviors (n = 2) and ABAB/reversal design (n = 2).

Target skills. In 43 of 44 studies focused on naturalistic instructional approaches, researchers reported the naturalistic instructional approach was used to address at least one targeted skill for participating children. In the Schepis et al. (2001) study, the child-focused skills targeted were not reported, but the researchers collected data on children's responses to teacher-initiated cues during embedded instruction. Snyder et al. (2013) grouped target skills addressed using naturalistic instructional approaches under six domain categories: (a) pre-academic, (b) social, (c) communication, (d) motor, (e) adaptive, and (f) cognition. Across 43 studies in which target skills for participating children were reported, 26 studies addressed target skills from the communication domain, 18 studies addressed target skills from the pre-academic domain, 11 studies addressed target skills from the social domain, 9 studies addressed target skills from the motor domain, 4 studies addressed target skills from the adaptive domain, and 2 studies addressed target skills from the cognitive domain.

Across the 15 embedded instruction studies, 8 studies addressed target skills from the pre-academic domain, 5 studies addressed target skills from the communication domain, 3 studies addressed target skills from social and motor domains, and 1 study addressed target skills from adaptive and cognitive domains.

Across the 44 studies reviewed, the Malmskog and McDonnell (1999) study was the only one that investigated the effects of teacher-mediated naturalistic intervention strategies used during free-play activities on the observed engagement of three young children with developmental delay. Snyder et al. (2013) categorized engagement with peers and materials under social and motor skill domains, respectively. A detailed description of this study is presented later in this chapter.

Child learning outcomes-acquisition. Data on skill acquisition were reported for 210 participating children with disabilities in 43 studies. In the Pretti-Frontczak and Bricker (2001) study, the researchers investigated practitioners' implementation of embedded instruction and did not report child outcome data. This study was excluded from the summary of findings presented below.

Of 210 children with disabilities for whom skill acquisition data were reported, 206 demonstrated acquisition of target skills after their teachers began to implement naturalistic instructional approaches. Only 4 children with disabilities did not demonstrate acquisition of targeted skills in relation to an intervention providers' use of a naturalistic instructional approach.

Across 14 embedded instruction studies, skill acquisition data were reported for 38 children. Researchers reported positive outcomes associated with the use of embedded instruction for 37 of these children. In the Grisham-Brown et al. (2000) study, one child's percentage of correct responses on learning targets did not increase above baseline levels after embedded instruction was initiated.

Child learning outcomes-generalization. Generalization data were reported for 49 children in 18 studies (i.e., 23% of all children and 40% of all studies). Researchers presented some form of evidence that 46 of the 49 children with disabilities for whom generalization data were reported generalized the skills they learned across settings, materials, people, or responses and only three children with disabilities did not generalize the skills they learned as part of the naturalistic instruction interventions.

In 6 of the 14 studies focused on embedded instruction, researchers reported generalization data for 14 young children with disabilities (i.e., 37% of all children who participated in 14 embedded instruction studies). Of the 14 children, 12 generalized the skills they learned across new settings and responses. One child in Horn et al. (2000) study and one child in Venn et al. (1993) study did not generalize the newly learned skills across settings.

Child learning outcomes- maintenance. Maintenance data were reported for 58 children with disabilities across 19 studies (i.e., 28% of all children and 43% of all studies). Of the 58 children for whom the maintenance data were reported, 50 demonstrated targeted skills during maintenance probe sessions that were conducted, on average, 3.4 weeks after the intervention condition ended and 8 children with disabilities did not maintain skills.

Researchers in 5 of the 14 embedded instruction studies reported maintenance data for 13 young children with disabilities (i.e., 34% of all children who participated in the 14 embedded instruction studies). Twelve of the 13 children who participated in studies focused on embedded instruction demonstrated targeted skills during maintenance probe sessions. One child in the Grisham-Brown, Pretti-Frontczak, Hawkins, and Winchell (2009) study did not demonstrate the targeted skill during maintenance probe sessions.

Summary

Several naturalistic instructional approaches have been developed to support engagement and learning of young children with disabilities within ongoing activities, routines, or transitions of preschool classrooms since the 1960s, beginning with incidental teaching and extending to multi-component approaches such as activity-based intervention and embedded instruction. Although different terms have been used to characterize these approaches, central to all naturalistic instructional approaches is "embedding" learning trials to create opportunities for children to respond within typically occurring activities, routines, or transitions (Odom et al., 2004). Researchers have evaluated the impacts of practitioners' and researchers' use of embedded learning trials within naturalistic instructional approaches (including embedded instruction approaches) on young children's learning and reported positive child learning outcomes (i.e., acquisition, generalization, and maintenance). Nevertheless, only one study of those reviewed by Snyder et al. (2013) focused on examining the relationships between the use of a naturalistic instructional approach (i.e., naturalistic teaching) and child engagement. Thus, further research that investigates how practitioners' use of naturalistic instructional approaches is related to children's engagement during different types of classroom activities is needed.

Engagement

Engagement has been defined as the amount of time children spend interacting with their social and nonsocial environments at different levels of competence and in a developmentally and contextually appropriate manner (McWilliam & Bailey, 1992; McWilliam et al., 1985). Researchers in early childhood and early childhood special education have proposed that high quality engagement within and across environments is a critical factor that supports young children's development and learning (e.g., Buysse & Bailey, 1993; De Kruif & McWilliam, 1999; Jones & Warren, 1991; Kishida et al., 2008; McWilliam et al., 1985).

The importance of engagement in developmental change and its mediating impacts on young children's learning has led early childhood researchers to conduct numerous research studies about this topic since the mid-1970s (e.g., Appanaitis, 2003; Bevill et al., 2001; Carta et al., 1987; Cavallaro & Porter, 1980; Danko, 2004; Doke & Risley, 1972; Guralnick & Groom, 1987; Kishida et al., 2008; Krantz & Risley, 1977; LeLaurin & Risley, 1972; Malmskog & McDonnell, 1999; McWilliam & Ware, 1994; Powell et al., 2008; Raspa, McWilliam, & Ridley, 2001).

This research has resulted in more elaborate conceptualizations of child engagement and engagement measures. Contemporary definitions of engagement encompass quantity (i.e., amount of time engaged) and quality (i.e., level of competence) components. This conceptualization of engagement has been influenced by four lines of research: (a) time-on-task, (b) mastery motivation, (c) eco-behavioral assessment, and (d) engagement.

In this section, research on time-on-task, mastery motivation, and eco-behavioral assessment, and engagement is reviewed and issues related to measuring child engagement are discussed. Content below is organized under four subsections. First, an overview of the research focused on time-on-task is presented. Second, research focused on mastery motivation is reviewed. Third, eco-behavioral research influencing the current conceptualization and measurement of engagement is described. Fourth, an overview of research focused on child engagement is presented.

Research on Time-on-Task

The interest in time-on-task as an important instructional variable began as early as the 1920s. Over the last 90 years, numerous research studies have examined the effects of time-on-task in relation to learning for students in grade schools. Early studies in this area investigated classroom “involvement” or the amount of time students spent in school as an indicator of teacher effectiveness (e.g., Bloom, 1956; Bloom & Statler, 1957; Butler, 1925, as cited in Karweit, 1984; Finch & Nemzek, 1940; Ziegler, 1928, as cited in Karweit, 1984). In this research, the concept of “time” was defined broadly to include years of schooling and number of school days or hours per year (Butler, 1925, as cited in Karweit, 1984; Douglas & Ross, 1965; Karweit, 1976). Given the broad description of time and differences in how time was measured, estimates of the strength of the relationship between time and learning varied widely. Although early studies reported a positive relationship between time spent in school and learning, several studies conducted in the 1970s found no relationship between these two variables and concluded that learning depends on how students use the available time for learning, not just the amount of time available (Harnischfeger & Wiley, 1978; Stallings, Needels, & Stayrook, 1979). As a result, researchers began to investigate relationships between time-on-task or time engaged in learning and students’ academic achievement and success.

Time-on-task is defined as the amount of time children or students spend attending to or engaging with particular materials, activities, or tasks that have instructional goals (Berliner, 1990). Research on time-on-task has its origins in Carroll’s model of school learning developed in the 1960s (Carroll, 1963). In this model, time is considered a key learning variable and it is acknowledged that students differ in the amount of time they need to learn specific content (Bloom, 1974). In an effort to identify variables that accounted for school learning, Carroll (1963) identified five variables that he proposed were closely associated with learning: (a) aptitude (i.e., the amount of time that a student needs to reach a criterion level of learning); (b) opportunity to learn (i.e., the amount of time given to a student for learning); (c) perseverance (i.e., the amount of time a student devotes to a learning task); (d) a student's ability to understand instruction; and (e) quality of instruction.

The amount of time a student devotes to a learning task (i.e., time-on-task) and its relation to academic achievement has been investigated for many years and the link between these variables has been well established (Denham & Lieberman, 1980; Fisher & Berliner, 1985; Greenwood, 1991; Stallings, 1975; Stallings, Cory, Fairweather, & Needels, 1977; Wyne & Stuck, 1979). For example, Wyne and Stuck (1979) investigated the relationship between time-on-task and achievement in reading in underachieving elementary school students. This two-group, pretest-posttest design study showed that students whose teachers were trained to implement a curriculum designed to promote high levels of time-on-task behaviors (i.e., intervention group) were on-task significantly more than their peers who were in control group. Additionally, students in the intervention group received significantly higher scores on standardized reading tests than did their peers in the control group.

In the 1970s, Fisher and colleagues at Far West Laboratory conducted several studies to investigate the relationships between "allocated academic learning time" and students' academic achievement (Fisher et al., 1978, as cited in Stallings, 1980; Stallings, 1975). As cited in Stallings (1980), Powell and Dishaw reported that allocated academic learning time ranged from 62 -123 minutes per school day for second grade students and from 49 to 105 minutes for fifth grade students. In this study, the researchers found that the correlation between allocated learning time and student achievement varied depending on the type of achievement that was measured (e.g., reading or math). In another study, Stallings (1980) found that amount of time allocated for reading, mathematics, and academic verbal interactions was related to student academic achievement. In two other studies, Fisher and colleagues found that students whose teachers were able to generate high levels of on-task behavior and low error rates in relation to student responding had students who evidenced higher levels of achievement when compared to student peers without these conditions (Fisher et al., 1978, as cited in Stallings, 1980; Fisher & Berliner, 1985).

Several researchers have conducted literature reviews to examine the association between time-on-task and student achievement, and also have concluded that there is a significant positive correlation between the two variables (Frederick & Walberg, 1980; Karweit, 1984; Stallings, 1980). Research on time-on-task was an initial attempt to investigate the amount of time students spend on tasks during classroom activities and their achievement in school. Although the majority of research related to time-on-task was conducted with school-age children, findings from this research led early childhood researchers to consider how young children spend their time in early learning contexts and to examine observed child engagement (i.e., engaged/non-engaged) during classroom activities.

Research on Mastery Motivation

In addition to time-on-task, theory and research related to mastery motivation has influenced current conceptualizations of observed child engagement. Mastery motivation is considered to be one of the core concepts in human development (Shonkoff & Phillips, 2000). Roots of the mastery motivation construct can be traced back to the work of White (1959), who developed a framework to explain how human beings were able to master their environments in ways that could not be explained by maturation alone. According to White (1959), young children have an innate desire and intrinsic motivation to explore and learn about their environment. This desire and motivation is driven by satisfaction and self-efficacy that results from successfully learning or mastering a skill (Parish, 2008).

Several definitions of mastery motivation exist in the literature. Morgan et al. (1995) defined the concept as “a psychological force that originates without the need for extrinsic reward, and leads an infant or young child to attempt to master tasks for the intrinsic feeling of efficacy” (p. 6). McCall (1995) defined mastery motivation as “disposition to persistently attempt to attain a goal in the face of moderate uncertainty about whether the goal can be achieved” (p. 227). As noted in this definition, a core component of mastery motivation is persistence.

According to Wachs and Combs (1995), mastery motivation includes three domains: (a) social mastery motivation, (b) object mastery motivation, and (c) gross motor mastery motivation. Social mastery motivation is reflected in children’s attempts to interact or engage with individuals in the environment to achieve a social goal. Children with high levels of social persistence tend to make repeated attempts to interact with other individuals (e.g., peers or adults) in the environment and engage in pretend play activities. Object mastery motivation is children’s goal-directed or exploratory interactions with the physical environment. Children with high levels of object persistence have a tendency to investigate and work with objects (e.g., toys) for extended amounts of time while attempting to use them successfully. Gross motor mastery motivation refers to the intrinsic drive to master play experiences and fundamental gross motor skills (Parish, 2008). Children with high levels of gross motor persistence tend to repeat motor tasks (e.g., throwing) until they can successfully perform them (Pipp-Siegel, Sedey, VanLeeuwen, & Yoshinaga-Itano, 2003).

The literature contains a number of studies that have demonstrated the association between mastery motivation behaviors in infancy and concurrent and future performance on measures of cognitive abilities, providing evidence for the role of mastery motivation on children's cognitive development and learning (e.g., Gilmore & Cuskelly, 2009; Jennings et al., 1984; Lange, MacKinnon, & Nida, 1989; Messer, Rachford, McCarty, & Yarrow, 1987; Niccols, Atkinson, & Pepler, 2003; Skinner & Belmont, 1993; Turner & Johnson, 2003; Yarrow, Morgan, Jennings, Harmon, & Gaiter, 1982).

Research comparing infants and toddlers with and without disabilities in terms of the development of mastery motivation behaviors revealed somewhat inconsistent results. For example, in a study comparing infants with Down syndrome with infants without disabilities, MacTurk, Vietze, McCarty, McQuiston and Yarrow (1985) found no noteworthy differences between the two groups in task persistence. Ruskin, Mundy, Kasari, and Sigman (1994) also compared infants with Down syndrome with infants without disabilities and reported no noteworthy difference in terms of ratios of non-goal-oriented play with objects to goal-directed mastery motivation. Jennings, Connors, and Stegman (1988) compared children with physical disabilities with their same-age peers without physical disabilities and found that children with physical disabilities exhibited lower levels of persistence on problem-solving tasks than their peers without disabilities.

Current conceptualization of observed child engagement, particularly conceptualizations involving hierarchical engagement behaviors, includes some concepts from the mastery motivation literature (e.g., persistence, social mastery, object mastery).

Eco-behavioral Research

Eco-behavioral research focuses on assessment and intervention designed to reveal concurrent and sequential interrelationships between an individual and environmental stimuli (Greenwood, 1985). Eco-behavioral assessment tools allow researchers to evaluate individuals' interactions with each other in relation to environmental variables. The goal of eco-behavioral research is to determine the association between aspects of a classroom environment (e.g., teacher behavior, instructional activities, tasks, and grouping arrangements) and children's behaviors (e.g., engagement; Powell et al., 2008). With this approach, researchers obtain a more detailed description of what happens in the classroom by focusing on the likelihood of children's behaviors co-occurring with particular environmental conditions (Powell et al., 2008).

The contributions of ecological theory and applied behavior analysis to early childhood special education are significant (Barnett et al., 1997). These influences are observed in research focusing on examining engagement of young children in ecological contexts (McWilliam & Bailey, 1992). As a result of eco-behavioral research, a number of observational assessment instruments have been developed to describe classroom instructional and interactional quality, including the relationships among instructional context, teacher, and child behaviors. In these eco-behavioral assessment instruments, engagement is often included as a child behavior category.

Eco-behavioral measures with engagement component. Findings of the research focusing on investigating the relationships between factors related to classroom environment and engagement of young children with disabilities or those who are at-risk for delay and disabilities (e.g., Doke & Risley, 1972; LeLaurin & Risley, 1972; Montes & Risley, 1975) led to the development of ecobehavioral assessment systems to obtain environmental and behavioral information about the experiences of young children with and without disabilities in early childhood settings (Carta et al., 1988). Researchers have primarily used this assessment approach to examine the quality of early childhood settings and the effectiveness of intervention efforts (e.g., Brown et al., 1999; Carta, Atwater, Schwartz, & Miller, 1990; Carta, Greenwood, & Robinson, 1987; Powell et al., 2008; Schwartz et al., 1996). Two ecobehavioral assessment tools have been used widely: (a) the Eco-behavioral System for the Complex Assessment of Preschool Environments (ESCAPE; Carta, Greenwood, & Atwater, 1985) and (b) the Code for Active Student Participation and Engagement II (CASPER II; Brown et al., 1995). Table 2-3 provides descriptions of engagement components in these measures.

Eco-behavioral System for the Complex Assessment of Preschool Environments (ESCAPE). The ESCAPE (Carta et al., 1985) is an observational measure designed to quantify ecological, teacher, and student variables that affect program outcomes on a day-to-day basis. It includes three major variable categories and 12 subcategories: (a) ecological variables (i.e., designated activity, activity initiator, materials, location, grouping, and composition); (b) teacher variables (i.e., teacher definition, teacher behaviors, and teacher focus); and (c) student variables (i.e., appropriate behavior, inappropriate behavior, and talk). Children's engagement behaviors are coded under the student variables category. Appropriate engagement behavior codes include attend, manipulate, self-care, transition, gross motor, pretend, academic work, sign/recite, none, and can't tell. Inappropriate engagement behavior codes include off-task, inappropriate location, self-stimulation, none, and can't tell. Talk codes include talk to teacher, talk to peer, undirected, none, and can't tell.

The ESCAPE uses momentary time sampling procedure to collect data during multiple classroom activities and routines. The observers follow an individual child while conducting the assessment and codes three subcategories at each 15-sec interval. Therefore, one pass through all 12 subcategories requires four, 15-sec intervals (totaling up to 1 minute). All scores are expressed as percentage of intervals. Inter-observer agreement data reported by the authors ranged between 72% and 95% across subcategories (Carta et al., 1987).

Code for Active Student Participation and Engagement II (CASPER II). The CASPER II was developed by revising the Code for Active Student Participation and Engagement and Eco-behavioral System for the Complex Assessment of Preschool Environments (Brown et al., 1995). CASPER II is designed to assess eco-behavioral variables that an individual child experiences within preschool settings. The measure includes seven ecological variables to gather information about preschool environments and the behavior of adults and children within those environments. These variables include group arrangement, peer group composition, activity area, initiator of the activity, child behavior, child social behavior, and adult behavior. Each variable includes hierarchical codes that are used during behavioral observations. Engagement behaviors are categorized under child social behavior. Engagement is defined as actively attending to or involved in an activity and does not include children's passive attending or listening behaviors (Brown et al., 1999).

A momentary time-sampling procedure is used to collect contextual and behavioral information where observers watch a child for 2-sec and record one of the hierarchical codes for each of seven eco-behavioral variables during the next 28 sec. In general, an assessment session lasts 30 minutes (Brown et al., 1999). Data for the hierarchical codes are reported as percentages of intervals. Brown and his colleagues (1999) reported inter-observer percentage agreement scores and Cohen's kappa coefficients for child social behaviors. The mean inter-observer percentage agreement score across the child social behaviors was 75% (range = 38% to 94%). The mean kappa coefficient was .73 (range = .40 to .89).

Engagement Research

A number of engagement measures have been developed, field-tested, and revised since the early 1970s. These engagement measures are grouped under two categories: (a) class-wide or group engagement measures and (b) child-level engagement measures. Descriptions of class-wide or group engagement measures and child-level engagement measures are provided in Table 2-4 and Table 2-5, respectively.

Class-wide or group engagement measures

Planned Activity Check (PLA-Check). Among the first engagement measures described in the literature was PLA-Check, developed by Risley and his colleagues at the University of Kansas in the early 1970s. PLA-Check was designed to quantify group engagement during planned preschool activities. The Planned Activity Check (PLA-

Check; Cataldo & Risley, 1973) was initially developed for program evaluation and comparison purposes in response to issues raised about the ineffectiveness of standardized tests administered to individual children as a way to evaluate classroom practices. According to Risley (1972), "the direction and extent of engagement with the physical and social environment appears to be an almost universal indication of the quality of a living setting for children" (p.98).

Cataldo and Risley (1973) defined engagement as active participation in planned activities and appropriate use of materials presented in the activity. PLA-Check involves sampling children's behavior as they participate in specific, defined activities. In order to use this behavioral observation system, a list of materials and behaviors that are designated as appropriate is compiled for each activity. A group of children is observed at the end of predetermined intervals (e.g., 15 sec), and the children who are engaged in the materials or behaviors of interest are counted. The percentage of children who are appropriately engaged in behaviors and materials are calculated (Doke & Risley, 1972). This observational measure is used to differentiate engagement from nonengagement.

Risley and his colleagues conducted several studies with preschool children using PLA-Check in early 1970s (e.g., Doke & Risley, 1972; Krantz & Risley, 1977; LeLaurin & Risley, 1972; Montes & Risley, 1975; Quilitch & Risley, 1973; Twardosz, Cataldo, & Risley, 1974). In this research, they investigated the effects of environmental factors (e.g., classroom arrangements, materials, organization of daily routines) on children's engagement. For example, Doke and Risley (1972) investigated the effect of two types of activity schedules on children's participation in preschool activities. They found that preschool children’s participation remained equally as high when they were required to follow a schedule of activities in sequence, as when they were allowed to choose freely between several activity options. In another study, LeLaurin and Risley (1972) compared the effects of “man-to-man” versus zone staff assignment on the length of transitions and preschool children’s engagement. These researchers found that dividing classrooms into specific zones and assigning an adult for each zone shortened the length of transitions and resulted in increases in the percentage of children engaged.

Studies using the PLA-Check generally reported high levels of inter-observer score agreement. For example, mean IOA percentage scores across the four studies ranged from 70% to 95% (Doke & Risley, 1972; LeLaurin & Risley, 1972; Quilitch & Risley, 1973; Twardosz et al., 1974).

The PLA-Check was developed to measure the engagement of a group of children. Researchers involved in its development operationalized engagement as a dichotomous variable (i.e., engaged and nonengaged). In addition, the majority of the research studies conducted to examine observed child engagement using PLA-Check only included preschool children who were at-risk for delays and not young children with disabilities.

Additional research focused on defining and measuring observed child engagement for groups of children was conducted by other researchers and increasingly included children with disabilities (e.g., McWilliam & Bailey, 1995; McWilliam et al., 1985). This research mainly focused on examining the influence of disability and environmental factors on young children’s engagement. In these studies, researchers used an adapted version of PLA-Check (called Engagement Check).

Engagement Check. McWilliam et al. (1985) used a modified version of PLA-Check to investigate the usefulness of behavior engagement as an outcome measure to evaluate two types of early intervention programs (i.e., traditional and non-traditional). The majority of children served in traditional programs were children with mental retardation, while the non-traditional programs served children with disabilities, children who were at-risk for developmental delays, and children who did not have disabilities. Classrooms in non-traditional programs were physically arranged according to learning zones, used classroom schedules that allowed short and organized transitions from one zone to another, assigned personnel to learning zones, emphasized the use of incidental teaching for instruction, and focused on function-based instruction within the context of ongoing classroom activities as opposed to isolated one-to-one instruction. Traditional programs focused on one-to-one instruction and assignment of staff to individual children. When compared to non-traditional classrooms that focused on engagement as the outcome of instruction, classrooms in traditional programs emphasized children's behavior at predetermined criterion levels. In this study, engagement referred to the amount of time children spent interacting with the environment in a developmentally appropriate manner, which was operationally defined as “attention to or active participation in classroom activities as reflected by vocalizing, manipulating objects, looking, approaching, or affective expression.” According to the authors, an instantaneous time sampling procedure was employed every 15 sec for the duration of the observation session (i.e., approximately 2 hour). During behavioral observations, three aspects of the situation were coded: (a) the type of classroom activity that occurred, (b) the number of children present for the activity, and (c) the number of children engaged. Engagement was scored only if a child's behavior was contextually appropriate, meaning appropriate for the activity in which the child participated. Overall classroom engagement was computed by calculating the percentage of children in the classrooms who were engaged during specified classroom activities.

Findings from this study showed that class-wide engagement levels differed as a function of the program type and classroom activities within programs, and were more stable in the non-traditional program. For example, while percentages of children engaged during large-group and free-play activities were relatively high for non-traditional programs, percentage of children engaged during circle time was higher for traditional programs. Inter-observer percentage agreement data were reported for the number of children present and for the number of children engaged. The mean inter-observer percentage agreement scores were 91% (range = 80% to 95%) and 88% (range = 72% to 95%), respectively.

The adapted version of PLA-Check was called the Engagement Check (McWilliam, 1998) and underwent several revisions. The difference between the two engagement measures (the PLA-Check and Engagement Check) is that the latter measure does not require observers to list materials and behaviors that are considered appropriate for the activity in which children's engagement is measured. Not requiring observers to list materials and behavior on the Engagement Check provides a way to measure engagement during different activities and routines of the preschool classrooms without developing inventories of acceptable and expected behavior. Both measures treated engagement as a dichotomous variable.

Child-level engagement measures

In initial research focusing on engagement of young children with and without disabilities, engagement was often measured as a dichotomous variable (i.e., engaged and non-engaged). In these studies, engagement usually was defined as active participation in the environment and investigators examined and measured engagement across groups of children (Doke & Risley, 1972; Krantz & Risley, 1977; LeLaurin & Risley, 1972; McWilliam & Bailey, 1995; McWilliam et al., 1985). A shift from quantifying children's engagement as engaged and non-engaged to examining quality (i.e., levels of competence) of observed engagement occurred in the early 1990s as researchers began to develop engagement measures to evaluate individual child engagement during classroom activities rather than assessing engagement at the classroom level.

McWilliam and Bailey (1992) defined engagement as "the amount of time children spend interacting with the environment at different levels of competence" and proposed an engagement model that divided the concept of "engaged" into five levels of competence. The hierarchical engagement behaviors included non-engagement, transient engagement, undifferentiated engagement, elaborative engagement, and sustained engagement. This model also allowed researchers to quantify engagement types. These included adults, peers, and materials.

McWilliam and his colleagues have developed and revised several engagement measures to assess these levels and types of young children's engagement. These include the Engagement Quality Measurement System III (E-Qual III; McWilliam & de

Kruif, 1998) and the Scale for Teachers Assessment of Routines Engagement (STARE; McWillliam, 2000). In addition to these two measures, two other engagement measures were identified that used an adapted version of the engagement model developed by McWilliam and Bailey (1992). These measures also are designed to measure individual child engagement: Individual Child Engagement Record (ICER; Kishida & Kemp, 2009) and the Engagement Behavior Observation System- Research Version II (EBOS-RVII; EIFEL Project, 2012). Table 2-5 provides descriptions of child-level engagement measures.

Engagement Quality Measurement System III (E-Qual III). The E-Qual III (McWilliam & de Kruif, 1998) is an observational coding system that uses a momentary time sampling procedure. In this coding system, nine hierarchical engagement levels are categorized under five broad categories. These included sophisticated engagement (levels: persistence, symbolic, encoded, constructive), differentiated engagement (level: differentiated), focused engagement (level: focused attention), unsophisticated engagement (levels: undifferentiated, casual attention), and non-engagement. Engagement types included engagement with kid, grown-up, object, and self.

At the end of each observation session, the frequencies for each of the observed engagement level and type codes are summed individually and divided by the total number of intervals coded to obtain the percentage of intervals for each level and type of child engagement (McWilliam & de Kruif, 1998).

Several studies have been conducted using the E-Qual III (de Kruif & McWilliam, 1999; Raspa et al., 2001). De Kruif and McWilliam (1999) observed 62 infants and preschool-age children with and without disabilities during free play, structured activities, and mealtimes in a university-based childcare center to investigate multivariate relationships among developmental age, global engagement, and observed child engagement. Researchers used E-Qual III to evaluate individual child engagement and trained four graduate students for 6–8 weeks to establish a minimum 80% level of agreement on all categories of the E-Qual III. The mean inter-observer agreement percentage scores across the engagement codes during the study ranged from 94% to 99%, with an overall mean of 97%. Mean kappa scores across the codes ranged from .37 to .84, with an overall mean kappa value of .52.

Rapsa et al. (2001) investigated the relationships between childcare quality and child engagement by observing 78 toddlers in 17 childcare centers. Researchers used the E-Quall III to measure individual child engagement and trained the observers to an inter-observer percentage agreement score of 85% with a master code on three consecutive 5-minute videotapes. Reliability checks were conducted for 148 observation sessions (21% of total number of sessions). Mean kappa coefficient across all engagement codes on the E-Qual III was .63 (range = .35 - .96), with a 93% interobserver agreement on occurrence plus nonoccurrence. The results of this study showed that global classroom quality was related only to sophisticated engagement, not to other engagement levels.

Scale for Teachers Assessment of Routines Engagement (STARE). The STARE (McWilliam, 2000) is another observational measure that is designed to quantify children’s engagement during typically occurring classroom routines over the course of a school day. In this measure, the raters observe a child for 10 minutes during a classroom routine (e.g., arrival, circle time, centers/free play, snack/lunch, or outside) and first rate the amount of time the child is engaged with adults, peers, and materials using a 5-point scale (1 = *none of the time* to 5 = *all of the time*). Next, the observer estimates the number of minutes the child spent in each of five levels of engagement (i.e., non-engaged, unsophisticated, average, advanced, sophisticated). Casey and McWilliam (2007) presented data on interrater score reliability for the STARE. The authors compared a teacher's ratings of five children's engagement with their own ratings. Four children had disabilities, developmental delay (*n* = 3) and Down syndrome (*n* = 1), and one child did not have disabilities. They ranged from 22 months to 31 months in age. Four children were boys and one was a girl. The researchers did not provide information about the participating teacher. The teacher completed the STARE for two children per day for 10 consecutive days. Inter-observer percentage agreement scores ranged between 91% and 100% for the engagement behavior categories and between 80% and 90% for engagement partners.

Individual Child Engagement Record (ICER). Kishida and Kemp (2009) developed an engagement measure known as the Individual Child Engagement Record (ICER) to provide researchers and practitioners with a way to measure child engagement during classroom activities. The ICER includes four engagement codes: (a) active engagement, (b) passive engagement, (c) active non-engagement, and (d) passive non-engagement. Kishida et al. (2008) investigated inter-observer score agreement and concurrent score validity of the ICER. The study included five children with disabilities (three boys and two girls), with a mean age of 46.2 months (range = 31 months to 61 months). Children were enrolled in a university-linked early intervention program. Children's engagement behaviors were observed during mealtime, free play, and structured group time activities. Each child was filmed for 10 minutes during each of three activities (15 10-minute video clips, or 150 minutes in total). Three observers were trained on the E-Qual III and ICER and reached criterion level of performance in inter-observer percentage agreement scores with master codes before beginning study coding (i.e., 80% inter-observer percentage agreement for 5 consecutive coding sessions for E-Qual III and at least 80% inter-observer percentage agreement for a session). The primary coder for the study was an early childhood special education teacher, while the secondary observer was an undergraduate student in psychology. The third coder was a senior researcher who was involved in the revisions of the ICER. Results of this study showed inter-observer mean score agreement for discriminating engagement from non-engagement was 91.4%. Interobserver agreement (IOA) at 80% and above (Kazdin, 1982) was reported for only one of the four individual engagement codes. With the exception of the active engagement code (mean IOA = 86.7%), the mean IOA scores reported were lower than 70%. A large positive and statistically significant correlation ($r = .98$, $p < .001$) was reported between overall engagement as measured by the ICER and the E-Qual III (i.e., active plus passive engagement in the ICER and all engaged behaviors except undifferentiated in E-Qual III).

Summary

Researchers evaluating the relationships between time and academic achievement in grade school defined and measured time by the number of years students spent in schools, the number of school days in a school year, or the number of hours in a school day. Differences in definition and measurement of time resulted in mixed findings about the effects of time on achievement or learning. While several studies found a positive relationship between time spent in schools and academic achievement, other studies reported no relationship between the two variables (Harnischfeger & Wiley, 1978; Stallings et al., 1979). These equivocal findings led researchers to investigate how students use the time available for learning and its relationship with academic achievement. The unit of measurement in this body of research was the amount of time students spent engaged with particular materials, activities, or tasks that have instructional goals (i.e., time-on-task), using direct observations of students or students' self-reports.

Neither direct observation nor self-report methods used to measure the amount of time students spent on-task allowed researchers to evaluate fully if students were engaged when they appeared to be engaged or when they reported that they were engaged. For example, a student who is looking at a page in the book during a reading activity would be considered "on-task." However, there is no way of knowing if the student is engaged in reading while looking at the book or if she or he is thinking about something else (e.g., her or his birthday party). In addition, students may report inaccurate information about their time-on-task time in order to look "good" in the classroom or "better" than their classmates (a concept known as social desirability bias).

At the preschool level, early research defining and measuring child engagement focused on examining classroom-wide engagement rather than evaluating individual child engagement (e.g., Doke & Risley, 1972; Krantz & Risley, 1977; LeLaurin & Risley, 1972; McWilliam et al., 1985). In this research, engagement was treated as a dichotomous variable (i.e., engaged versus nonengaged). A shift in the measurement of child engagement began in the early 1990s when researchers developed engagement measures to assess the quality of individual child engagement (e.g., EIFEL, 2012;

McWilliam & Bailey, 1992; McWilliam & de Kruif, 1998; Kishida & Kemp, 2009). These measures have allowed researchers to not only quantify the amount of time children are engaged, but also evaluate the quality of their engagement

Activities as Contexts for Engagement

Preschool classrooms include a variety of scheduled activities including circle-time, center-time, mealtime, self-care routines, outdoor play, and transition. Some of these activities contain short subtypes of activities. For example, center-time activities might include greeting, songs, calendar, weather, pre-academic tasks (e.g., numbers, colors, shapes), and story. Likewise, center-time or free-play activities might include literacy center, science center, dramatic play, computers, block center, art center, floor toys, or games with rules. These different types of classroom activities can have unique characteristics and task characteristics or “demands” (Kontos et al., 2002; Vitiello et al., 2012). For example, some activities such as dramatic play might set the occasion for children to interact with peers or adults, while others (e.g., puzzles, computers) primarily involve interaction with materials (Hendrickson et al., 1981; Martin et al., 1991; Quilitch & Risley, 1973; Tremblay et al., 1980).

Researchers have suggested that certain classroom activities might be more suitable for providing intentional and systematic instruction on priority learning targets as part of embedded learning opportunities for preschool children with disabilities (Malmskog & McDonnell, 1999; McWilliam & Bailey, 1992; Snyder, Sandall et al., 2009). Practitioners using embedded instruction consider characteristics and demands of activities, the behavior specified in the learning target, and the “match” between the two as they plan for and implement embedded learning opportunities during logical and developmentally appropriate classroom activities (Snyder et al., in press). It has been hypothesized that practitioners' implementation of embedded learning opportunities focused on specific learning targets during different types of activities might result in children demonstrating different engagement behaviors (Malmskog & McDonnell, 1999; McWilliam & Bailey, 1992; Snyder, Sandall et al., 2009).

Several researchers have suggested that certain types of classroom activities elicit more competent or complex child behaviors (including engagement) than others (Hadeed & Sylva, 1996; Howes & Smith, 1995; Kontos et al., 2002; Kontos & Keyes, 1999). Powell and his colleagues (2008) grouped preschool classroom activities broadly in two categories as academic activities (shared book reading, circle-time activities, matching, coloring, sorting activities) and play activities (free-choice or center-time activities) and noted these two broadly defined types of activities might occasion different child engagement behaviors. The authors asserted that free-play activities support children's active engagement while academic activities generally support passive engagement. Vitiello et al. (2012) also asserted that teachers' use of different activity types during a school-day might be associated with children's frequency and quality of engagement with peers, adults, and tasks. Although a number of researchers have acknowledged activity type and characteristics might have differential influences on child engagement, only a few studies have been conducted to date to investigate relationships between different classroom activities and child engagement (Hamilton, 2005; Kontos et al., 2002; Kontos & Keyes, 1999; Powell et al., 2008; Vitiello et al., 2012).

In an international study, Hamilton (2005) compared the influences of activity types and characteristics on the engagement of Australian preschool children with

Down syndrome (*n* = 10) and their peers without disabilities (*n* = 20) in inclusive preschool classrooms. The author used the ESCAPE (Carta et al., 1985) to evaluate children's social engagement behavior and reported that social engagement of young children with disabilities was independent of the nature of the activity while children without disabilities demonstrated marked differences among activities. For children without disabilities, high rates of social engagement were observed during dramatic play and outdoor play activities. Based on the findings, the author suggested that having access to different preschool classroom activities alone might not be sufficient for children with disabilities to demonstrate social engagement behaviors. Teacher- or peer-mediated instructional strategies (such as those that might be used as part of embedded instruction) were recommended to promote social interaction between children with and without disabilities.

Kontos and her colleagues conducted a series of studies in which they investigated the relationships among child (age, gender, language) and classroom (activity, teacher involvement) characteristics and engagement with peers and objects (Kontos et al., 2002; Kontos & Keyes, 1999). In these studies, the researchers used the Howes Peer Play Scale (Howes & Matheson, 1992) to evaluate children's social interactions with peers and the Howes Object Play Scale (Howes & Stewart, 1987) to assess children's interactions with objects. In the Kontos et al. (2002) study, the researchers observed 225 preschool children from 61 classroom in 46 early childhood centers in Hawaii using the Howes Peer Play Scale (Howes & Matheson, 1992) to evaluate children's social interactions with peers and the Howes Object Play Scale (Howes & Stewart, 1987) to assess children's interaction with objects. The results of the study showed that when child and classroom contextual characteristics were controlled, activity type and teacher involvement were significant predictor of children's interaction with peers and objects. These researchers found that children's interactions with objects were more likely to occur during creative activities (e.g., open-ended art activities with no designated finished product such as finger-painting, coloring) rather than activities that involve manipulatives or gross motor activities.

In the Kontos and Keyes (1999) study, the researchers observed 60 preschool children over a 6-week period. They found that children's interactions with objects were more likely to take place during dramatic play activities and in art activities (only when teachers were present). Social interaction between peers generally occurred when children were in an activity with a peer or a small number of peers.

In another study, Powell et al. (2008) investigated the relationships among activity types, particular group configurations, teacher behaviors, and child engagement. These researchers observed child engagement behaviors of 138 children from low-income, minority families in 12 classrooms across 12 urban schools. The engagement behaviors used in the study were actively engaged, attentive, disorganized, off task, and disengaged. Results of the study showed that during academic activities, children were most likely to be actively engaged if they were in a peer group and were monitored and provided affirmation by a teacher. During play activities, children were more likely to be actively engaged when they were playing alone. Active engagement was defined as "child had focused attention and is actively talking or manipulating or using materials relevant to the task at hand" (p. 114).

Vitiello and her colleagues (2012) investigated the sources of variability in preschool children's positive and negative engagement with teachers, peers, and tasks by including factors related to child (age, gender) and classroom activity settings (e.g., teacher-structured activities, outdoor activities, and transitions). Participants were 283 preschool children from 84 classrooms primarily serving socioeconomically and linguistically disadvantaged children. Each child's engagement was measured multiple times within a single school day using an observational measure known as inClass (Downer, Booren, Lima, Luckner, & Pianta, 2010). Findings from this study showed that (a) children's engagement varied significantly across the school day; (b) a greater degree of positive engagement with peers and tasks took place during free-play activities, while teacher-structured activities were associated with more positive engagement with teachers; and (c) transitions were associated with less positive teacher and task engagement.

Summary. Advances in the measurement of engagement have led researchers to investigate factors that might influence observed child engagement behaviors and partners. Activity type and characteristics and instructional strategies are among the factors that have been researched. Several of the reviewed studies provide preliminary evidence for relationships between activity type and observed child engagement behaviors and partners. The majority of these studies, however, were conducted with children who are at-risk for delays or disabilities or children without disabilities. Only one study (Hamilton, 2005) included children with disabilities and findings from that study related to children with disabilities were contradictory to those associated with children without disabilities, suggesting that engagement behaviors and partners of children with disabilities might not vary based on activity type. Moreover, these studies were descriptive or correlational and did not investigate relationships between activity type and child engagement in relation to teachers' implementation of a naturalistic instructional approach, such as embedded instruction. Further research is needed to investigate the relationships between activity types and engagement of young children with disabilities in relation to their teachers' implementation of embedded instruction.

Intervention Studies on Individual Child Engagement during Classroom Activities

The systematic review of the literature conducted by Snyder et al. (2013) showed that practitioners' and researchers' use of embedded learning trials as part of embedded instruction or other naturalistic instructional approaches were effective in teaching preschool children with disabilities a wide range of skills during ongoing activities occurring in preschool settings. As described earlier, none of the studies in which embedded instruction was examined and only one study focused naturalistic teaching (i.e., Malmskog & McDonnell, 1999) investigated relationships between teachers' implementation of instruction during ongoing classroom activities and child engagement.

In the present study, a literature review was conducted to identify additional studies (beyond Malmskog and McDonnell) that examined relationships between the use of intentional and systematic instructional procedures during ongoing classroom activities and the engagement of young preschool children with disabilities.

Inclusion and exclusion criteria. For a study to be included in this review, it had to meet four criteria. First, the study had to be empirically based research focused on investigating the relationships between the use of intentional and systematic instructional procedures during ongoing classroom activities and engagement of young preschool children with disabilities. Second, the study had to be published in a peer-reviewed journal or as a dissertation. Third, the study had to include at least one child with a disability who was between the ages of 36 and 60 months at the beginning of the study. Fourth, child engagement had to be reported as an outcome measure.

Article search. A systematic review of the empirical literature was conducted to identify studies that met the inclusion criteria. The process to identify potential studies for the review involved two stages. In the first stage, an electronic search was conducted using seven databases in EBSCOhost Web (i.e., Academic Search Premier, CINAHL, ERIC, MEDLINE, Professional Development Collection, Psychology and Behavioral Sciences Collection, PsycINFO), two databases in Wilson Web (i.e., Education Full Text, Social Sciences Full Text), Web of Science, and Dissertation and Theses Full Text (Proquest). The term *engagement* was used along with combinations of the following search terms to conduct the electronic database search: child*, presc*, disability*, intentional, systematic, instruction*, intervention, strateg*, or procedure*. In this stage, 261 studies were identified and screened.

Four studies were qualified for the review based on the inclusion criteria (Appanaitis, 2003; Bevill et al., 2001; Danko, 2004; Malmskog & McDonnell, 1999). In the second stage, an ancestral hand search of the reference lists of all three articles that met the inclusion criteria from the initial screening was conducted. No additional study qualified for the review in this stage.

Although some of the terms used in this review were also used by Snyder and colleagues (2013) in their systematic review of the literature focused on naturalistic instructional approaches, only one study included in their review qualified for this review (i.e., Malmskog & McDonnell, 1999). In this section, the three studies identified from the literature review and the study conducted by Malmskog and McDonnell (1999) are described in detail. The studies are described in order based on their similarities with the present study. The study that is most similar to the current study (Appanaitis, 2003) is described last.

Description of the Studies

Malmskog & McDonnell (1999). The authors employed a multiple-probe, single-subject experimental design across three participants to assess the effects of researcher-implemented adult-mediated strategies often associated with naturalistic instructional approaches (i.e., joint attention, time delay, prompts) on the percentage of intervals in which participating children were engaged during play activities (e.g., block area, water or sand table, house/kitchen area, book area, art centers, and literacy center).

In the baseline phase, classroom teachers were instructed to engage in routine interactions with children during play activities and the researcher (i.e., interventionist) was present during this phase so the presence of an observer was similar between the baseline and subsequent intervention phase. During the intervention phase, the researcher implemented the intervention strategies during ongoing play activities in four phases. In Phase I, the researcher modeled the appropriate play behavior and provided the child with a verbal prompt to imitate without waiting for the child to initiate a response (0-sec delay). In Phases II and III, the researcher waited 20-sec for the child to initiate engagement. When the child exhibited the play behavior (i.e., was “engaged”) within 20 sec, reinforcement was provided. If the child did not engage within 20 sec, models and verbal prompts were provided in Phase II and only verbal prompts were provided in Phase III. In Phase IV, prompts were eliminated and reinforcement was provided at a reduced rate. Only the baseline phase was staggered across participants. The researchers implemented successive phases based on a pre-established criterion (i.e., when a child was engaged at least 75% of intervals for 3 consecutive days).

Data on children's engagement were collected during 30-minute play activities across each study phase (Table 2-6 shows more information about measurement of engagement in this study). The researchers used two codes to measure engagement: actively engaged and not actively engaged (Table 2-7 shows definitions of engagement codes).

Results showed that the percentage of intervals in which participants were actively engaged in play activities increased for all three children following the researcher's implementation of Phase I. Improvements in active engagement for all three children were maintained as the level and amount of teacher assistance decreased. Two children were reported to maintain the percentage of intervals in which they were actively engaged after the intervention ended. Maintenance probes were conducted 1 week after the participants reached criterion level of performance in the last intervention phase and continued until the end of the school year.

In this study, the intervention strategies were implemented by the researcher (not by a natural intervention agent). Depending on classroom schedule, children's engagement behaviors were observed and evaluated during a variety of play activities including social-oriented and materials-oriented play activities. However, the influences of the researcher’s use of intervention strategies on children’s engagement were not examined based on the type of play activity.

Bevill, Gast, Maguire, and Vail (2001). Bevill and her colleagues (2001) investigated the effects of an intervention package consisting of three phases (i.e., picture display, picture display plus verbal prompt, and reinforcement of correspondence) on the engagement of young children with significant developmental delays during ongoing free-play activities using a multiple-probe, single-subject experimental design across four participants. During the probe condition (phase A), the researcher (a) asked each participating child to sit at a table, (b) placed photographs of six activity options in front of the child, and (c) asked the child to select three activities, place their selection on the planning board, and play in each activity area for 7 minutes. The activity options included housekeeping, dollhouse, blocks and transportation, books, listening center, computer, easel and painting, play dough, art, and music. The picture display condition (phase B) involved the same procedures used in phase A but in this condition, following completion of the plan to play in three activity areas, the child was provided immediate consequences, regardless of their actual engagement during the play activities. During the picture display plus verbal prompt condition (phase C), once children completed their plan, received consequence for the plan, and hung their planning board, the investigator provided a verbal prompt to the children to remind them to look at their plan if they forgot what they were going to play and no other verbal prompts were provided to use the board during the free play period. In the reinforcement of correspondence condition (phase D), children were provided consequences contingent upon correspondence between their plans and their play in each activity area. During a study phase, if a child reached the criterion level of performance (i.e., completion of all three planned activities for 3 of 4 school days and being engaged during all intervals within three activities on each of 3 days), no further study phases were implemented.

Data on children's engagement were collected daily during three, 7-minute play activities (21 minutes total) across each study phase (Table 2-6 for more information about measurement of engagement in this study). The researchers defined engagement as "being in a planned play area, appropriately interacting with materials in the manner in which they were intended to be used, with eyes open and focused on materials or people in the activity area" (Bevill et al., 2001, p. 134). The researchers did not define 'appropriate' or 'people' although the latter likely referred to either adults or other children. Children's engagement was evaluated by calculating percentage of intervals in which children were engaged during the play activities.

Results of the study showed the use of the instructional procedures were effective in increasing engagement for all four children. The level of instruction needed by each child to reach criterion varied. One child required only the picture display phase to reach criterion, one child required both picture display and picture display plus verbal prompt phases to reach criterion levels of performance, and the other two children required all three intervention phases to reach the criterion level of performance.

In this study, one of the researchers implemented the intervention being investigated during play activities. Two engagement codes were used to characterize child engagement: engaged and non-engaged. While children were observed during different play activities based on their choice of three activities from the list of available classroom activities (which included both social-oriented and materials-oriented activities), the effects of implementation of intervention strategies on child engagement were not investigated based on the type of play activity.

Danko (2004). This researcher examined the effects of an intervention that used visual supports to promote the engagement of three preschool children with autism during circle time using a multiple baseline across participant single-subject experimental design. During the baseline condition, teachers were asked to conduct circle-time activities in the way they typically did and they were not provided any specific information about how to interact with the children or conduct these activities. During the training phase, the researcher met with each teacher six times over 2 weeks in the teacher's classroom to discuss what visual support strategies would be appropriate for circle-time activities, and how to use visual support materials with children during circle-time activities. Each training session lasted approximately 30 minutes. In the training, teachers were taught three types of visual support strategies to use during circle-time activities: (a) activity visual supports (e.g., adding props, hands-on materials, and actions to circle time); (b) instructional visual supports (e.g., visual schedule of circle-time activities, creating song posters, using choice boards); and (c) organizational visual supports (e.g., providing clear visual boundaries, arranging environment to promote attention). In the intervention phase, teachers were instructed to use the visual support strategies during circle-time activities. Circle-time activities in which the intervention was implemented included attendance /greetings, calendar/weather, songs, lesson, and story.

Data on children's engagement and teachers' implementation of visual support strategies were collected during circle-time activities 3 times a week in 10-15 minute observation sessions during baseline and intervention phases of the study. No data on child engagement and teacher implementation were collected during the training phase. Maintenance data were collected once every other week for two children and their teachers until the end of the study (Table 2-6 for more information about measurement of engagement in this study). Three engagement categories were used to define child engagement: active engagement, attentional engagement, or nonengagement (Table 2-7 for definitions of engagement codes).

Results of the study showed teachers increased their implementation of visual support strategies from 30%-40% in baseline to 55% to 80% in the intervention phase. These increases were maintained during the follow-up phase conducted once every other week for 6-10 weeks after the intervention ended. With the increases in teachers' implementation of visual support strategies, the percentage of time in which children demonstrated (a) active and attentional engagement behaviors during circle-time activities increased for 2 of 3 children and were maintained during the follow-up phase conducted once every other week for 6-10 weeks after the intervention ended, and (b) nonengagement decreased below baseline levels for all three children and these decreases were maintained during the follow-up phase.

In this study, preschool teachers (natural intervention agents) implemented the intervention during a single scheduled classroom activity (i.e., circle time). Three engagement categories were used to characterize child engagement behaviors: active engagement, attentional engagement, or nonengagement. The researcher evaluated the corollary relationship between teachers' implementation of visual support strategies and changes in child engagement behaviors using visual analysis techniques to interpret the results of the single-subject experimental research design.

Appanaitis (2003). Appanaitis (2003) conducted a research study to evaluate the effects of preschool teachers' use of three intervention strategies (e.g., zone defense scheduling, incidental teaching, and data collection) on the engagement behavior of five preschool children with disabilities during free-play activities using a multiple-probe counterbalanced ABCD single-subject experimental design. In this study, the A phase represented the baseline phase, B was the implementation of zone defense scheduling alone, C was the implementation of zone defense scheduling and incidental teaching together, and D was the implementation of all three strategies together. Zone defense scheduling involved (a) arranging the environment to divide the classroom into clearly defined activity areas, and (b) assigning staff to be responsible for specific duties in each activity area to maximize the quantity of time that staff were available to children. Incidental teaching involved following children's cues (e.g., request for help, interest in classroom materials) to initiate an interaction with them. Data collection consisted of teachers collecting data on target children's engagement, hypothesizing that it would increase teachers' awareness of child engagement behaviors and help them to support children's engagement during classroom activities. The order in which the strategies were implemented was counterbalanced across participants.

In the baseline phase, teachers were instructed to do what they would typically do during free-play activities. In this phase, the researcher collected 30 minutes of engagement data 1 day each week for each of four children and 2 to 3 days each week (intensive baseline) for the fifth child who was randomly selected to move into the intervention phase A first (Table 2-6 for more information about measurement of engagement in this study).

The researcher used the E-QUAL III (McWilliam & de Kruif, 1998) to measure children's engagement. Nine levels of engagement included on the E-QUAL III (i.e., persistence, symbolic, encoded, constructive, differentiated, focused attention, casual attention, undifferentiated, and nonengagement; Table 2-7 for definitions of engagement codes) were subsequently grouped under five categories (i.e., sophisticated engagement, differentiated engagement, focused engagement, unsophisticated engagement and nonengagement) and four engagement types (i.e., with adults, peers, materials, and self).

Child engagement for each of five engagement categories were coded and graphed. Each child was required to have a stable baseline for all engagement categories before they entered the first intervention phase and their teachers received training on one of the three strategies. Once the randomly selected first child reached a stable baseline for all engagement categories, the researcher provided training to his teacher on one of three strategies (e.g., data collection). The training session lasted 30-45 minutes. Following training, the teacher was instructed to implement the strategy. New intervention phases were introduced when the child had a stable data pattern for all engagement categories in the last three data points after the fifth data collection session. Once the first child entered the first intervention phase, another child was randomly selected to start intensive baseline. The same procedures were implemented across all children. Maintenance data were collected for 2 of 5 participating children for 30 minutes, 1 day each week for 4-5 weeks after the last intervention phase ended.

Results of the study showed that compared to baseline levels, a slight increase in the percentage of intervals spent in sophisticated and differentiated engagement was observed for 4 of 5 children. For sophisticated engagement, the increase occurred after the introduction of the data collection procedure (i.e., the first intervention phase) for child 1, incidental teaching (i.e., the first intervention phase) for child 2, incidental teaching with zone defense scheduling (i.e., the second intervention phase) for child 3, and all three procedures (i.e., the third intervention phase) for child 4. For differentiated engagement, the increase occurred after the introduction of the data collection procedure (i.e., the first intervention phase) for two children, and all three procedures (i.e., the third intervention phase) for two children. In addition, a slight decrease in the percentage of intervals spent in unsophisticated engagement or non-engaged was observed for all 5 children. No changes were observed in focused attention. For unsophisticated engagement, the decrease occurred after the introduction of data collection procedure with incidental teaching (i.e., the second intervention phase) for child 1, incidental teaching with zone defense scheduling (i.e., the second intervention phase) for child 2, all three procedures (i.e., the third intervention phase) for child 3, zone defense scheduling (i.e., the first intervention phase) for child 4, and the data collection procedure (i.e., the first intervention phase) for child 5. For nonengagement, the decrease occurred after the introduction of the data collection procedure (i.e., the first intervention phase) for child 1, incidental teaching (i.e., the first intervention phase) for child 2, incidental teaching with zone defense scheduling (i.e., the second intervention phase) for child 3, zone defense scheduling (i.e., the first intervention phase) for child 4, and the data collection procedure (i.e., the first intervention phase) for child 5.

In this study, the researcher trained preschool teachers (natural intervention agents) to implement the strategies being investigated and provided detailed information about the training procedures. The researcher used an engagement measure that included multiple codes to characterize children's observed engagement behaviors. Children were observed during different play activities (including social-oriented and materials-oriented activities) depending on the classroom schedules. The percentage of intervals children were engaged in different types of play activities was not evaluated and reported separately.

Summary

The four studies described above examined the relationships between the use of intentional and systematic instructional procedures during ongoing classroom activities and the engagement behaviors of young children with disabilities. Each study used a single-subject experimental research method. Three studies were implemented during free play activities and one study was implemented during circle time. In two studies, the intervention was implemented by a "natural" intervention agent (e.g., classroom teachers and assistant teachers). In three studies, researchers either employed engagement measures that categorized children's engagement behaviors as engaged or non-engaged or used an engagement measure that contained three codes for characterizing children's engagement. In one study, an observational engagement measure with multiple engagement codes was used to evaluate levels and types of observed child engagement. The results of the four studies showed that teachers' or researchers' use of intentional and systematic instructional procedures to provide children with disabilities opportunities to respond positively influenced these children's engagement within ongoing classroom activities.

Overall Summary of the Literature

Early childhood special education literature contains substantial evidence to support the existence of a functional relationship between teachers' implementation of naturalistic instructional approaches such as embedded instruction and preschool children's acquisition of targeted skills. Several researchers have reported that naturalistic intervention agents (e.g., classroom teachers, teacher assistants/aides, or paraprofessional) are able to implement these approaches with fidelity when they receive support for implementation through training or professional development, (Horn et al., 2000; McBride & Schwartz, 2003; Schepis et al., 2000; Snyder, Hemmeter, McLaughlin, Algina et al., 2011). Practitioners' implementation of embedded learning trials to create various opportunities for children to respond during ongoing classroom activities helps these children to acquire, generalize, and maintain targeted skills.

Four single-subject experimental studies were identified in the early childhood special education literature that examined the engagement of young children with disabilities in relation to their teachers' or researchers' implementation of intentional or systematic instructional procedures or a naturalistic instructional approach (Appanaitis, 2003; Bevill et al., 2001; Danko, 2004; Malmskog & McDonnell, 1999). None of these studies investigated relationships between children's observed engagement behaviors and practitioners' frequent and accurate use of embedded instruction learning trials (EILTs) during ongoing classroom activities to create opportunities for children with disabilities to respond. Previous research has shown that EILTs can be implemented frequently and accurately by practitioners when they receive support through professional development (Snyder, Hemmeter, McLaughlin, Algina et al., 2011). Moreover, previous research has shown that when practitioners' implement EILTs frequently and accurately to create opportunities for children to respond, this implementation is associated with positive child learning outcomes (Snyder, Hemmeter, McLaughlin, Algina et al., 2011). Given the positive relationships between practitioners' use of EILTs and child learning outcomes, early childhood researchers have hypothesized that embedded instruction might be an effective way to promote and enhance young children's engagement during ongoing classroom activities and that engagement might be a mechanism related to child learning.

In three of the four studies reviewed, researchers evaluated the relationships between the implementation of intentional and systematic instructional procedures and child engagement using engagement measures that either had two (i.e., engaged and nonengaged), or three (i.e., active engagement, attentional engagement, or nonengagement) engagement behavior codes. Although these approaches to measuring engagement allowed researchers to identify whether a child is engaged or actively or attentively engaged, they do not permit a nuanced examination of the type of behaviors children demonstrate when they are engaged. For example, when basic engagement measures are used, advanced (e.g., talking about a friend's birthday party that occurred a week ago) and low level (e.g., watching a friend playing with sand) engagement behaviors are grouped under the same category of "engaged." Only the study conducted by Appanaitis (2003) examined associations between a child's engagement and the implementation of instructional strategies using a behavioral observation system (E-Qual III) that included multiple codes for type and level of engagement.

Three of the four studies that investigated the relationships between child engagement and use of intentional and systematic instructional procedure by teachers or researchers were implemented during scheduled free-play periods (i.e., Appanaitis, 2003; Bevill et al., 2001; Malmskog & McDonnell, 1999). The other study was implemented during circle-time activities (Danko, 2004). Center- and circle-time include a variety of short, sub-activities, including a mix of social-oriented and materials-oriented activities. These activities, with distinctive characteristics and demands, set the occasion for a range of embedded learning opportunities for children with disabilities to respond and learn. The use of embedded learning opportunities focused on various learning target skills might encourage children to demonstrate different engagement behaviors. Moreover, studies conducted with children without disabilities have shown that child engagement behaviors and partners vary based on activity type. None of the reviewed studies investigated the relationships between activity type and engagement behaviors of young children with disabilities when their teachers or a researcher implemented embedded instruction or other intentional and systematic instructional approaches.

One of the key features of naturalistic instructional approaches is that adults who interact with the child on a regular basis provide intentional and systematic instruction during ongoing classroom activities. In only two of the four studies (Appanaitis, 2003; Danko, 2004) did naturalistic intervention agents' implement the instructional procedures during ongoing classroom activities.

Engagement is hypothesized to be an important mediating factor in young children's development and learning. A major purpose of early intervention for young children with disabilities is to promote child engagement. Embedded instruction has been identified as a promising instructional approach to alter the engagement behavior of young children with disabilities. Given the status of the extant literature, the purpose of the present study was to examine corollary relationships between observed engagement behaviors of young children with disabilities and their teachers' implementation of EILTs during social-oriented and materials-oriented classroom activities.

Table 2-1. Description of and examples for milieu teaching procedures

Procedure	Description	Example
Model	Prompting a child verbally to imitate modeled language response.	- Child looks at cookie jar during snack. - Adult: “Say ‘cookie’.” - Child: “Cookie.” - Adult: “Cookie for Adam.”
Mand/Model	Prompting child verbally for communicative response and modeling response if the child fails to demonstrate the response.	- Adult: “What do you want for lunch?” - Child: No response. - Adult: “Chicken or hot dog?” - Child: “Hot dog.” - Adult: “Say, ‘I want hot dog’.” - Child: “I want hot dog.” - Adult: “You want hot dog for lunch” and gives a hot dog to the child.
Naturalistic time delay	Waiting with an expectant look for child to initiate spontaneous request/interactions	- Before an activity on the playground, child is putting on his coat. - Adult hold on the coat, looks at the child, and waits (usually 5 sec). - Child: “Coat please.” - Adult: “Here is your coat” and gives it to the child.
Incidental teaching	Interaction between an adult and a child, which arises naturally in an unstructured situation and which is used by the adult to transmit information, or give the child practice in developing a skill.	- Adult opens the toy cabinet. - Child tries to grab a toy from one of the shelves. - Adult puts her hand over child’s hand on top of the toy and wait expectantly. - Child does not respond. - Adult: “What do you want?” - Child: “Car.” - Adult: “That’s right, car,” and allows the child to take the car.

Table 2-2. Studies reviewed by type of naturalistic instructional approach, author(s), and year of publication

Approach	Authors	PY
Embedded Instruction (*n* = 15)	Neef, Walters, & Egel*	1984
	Venn, Wolery, Werts, Morris, DeCesare, & Cuffs	1993
	Grisham-Brown, Schuster, Hemmeter, & Collins	2000
	Horn, Lieber, Li, Sandall, & Schwartz (3 studies)	2000
	Daugherty, Grisham-Brown, & Hemmeter	2001
	Pretti-Frontczak & Bricker	2001
	Schepis, Reid, Ownbey, & Parsons	2001
	Johnston, Nelson, Evans, & Palazola*	2003
	Grisham-Brown, Ridgley, Pretti-Frontczak, Litt, & Nielson	2006
	Macy & Bricker	2007
	Grisham-Brown, Pretti-Frontczak, Hawkins, & Winchell (3 studies)	2009
Naturalistic Teaching (*n* = 13)	Halle, Baer, & Spradlin*	1981
	Warren, McQuarter, & Rogers-Warren	1984
	Cavallaro & Poulson*	1985
	Mudd & Wolery	1987
	Peck, Killen, & Baumgart (2 studies)	1989
	Fox & Hanline (2 studies)	1993
	McDonnell	1996
	Kohler, Strain, Hoyson, & Jamieson	1997
	Malmskog & McDonnell	1999
	Schepis, Ownbey, Parsons, & Reid*	2000
	Kohler, Anthony, Steighner, & Hoyson*	2001
Milieu Teaching (*n* = 4)	Yoder, Kaiser, Goldstein, Alpert, Mousetis, Kaczmarek & Fischer*	1995
	Kaczmarek, Hepting, & Dzubak*	1996
	McCathren	2000
	Olive, Cruz, Davis, Chan, Lang, O'Reilly, & Dickson*	2007
Transition-Based Teaching (*n* = 3)	Werts, Wolery, Holcombe-Ligon, Vassilaros & Billings	1992
	Wolery, Doyle, Gast, Ault, & Simpson	1993
	Wolery, Anthony, & Heckathorn	1998
Activity-Based Intervention (*n* = 2)	Losardo & Bricker	1994
	Apache	2005

Table 2-2. Continued

Approach	Authors	PY
Individualized Curriculum Sequencing Model (*n* = 1)	Bambara, Warren, Komisar	1988
Combined Approach (*n* = 2)	Culatta, Kovarsky, Theadore, Franklin, & Timler	2003
	McBride & Schwartz	2003
Other (*n* = 4)	Chiara, Schuster, Bell, & Wolery	1995
	Schepis, Reid, Behrman, & Sutton	1998
	Garfinkle & Schwartz	2002
	Kern, Wolery, & Aldridge	2007

Note. n refers to the number of studies for each approach. Total number of studies included in the Snyder et al. (2013) review is 44. PY = publication year.

Table 2-3. Descriptions of eco-behavioral measures with engagement component

Measure	Definition of Engagement	Engagement Code	Data Obtained
ESCAPE (Carta et al., 1985)		Appropriate behavior attend, manipulate, self-care, transition, gross motor, pretend, academic work, sign/recite, none, can't tell Inappropriate behavior off-task, inappropriate location, self-stimulation, none, can't tell Talk to teacher, to peer, undirected, none, can't tell	Percentage of intervals behaviors associated with each code observed
CASPER II (Brown et al., 1995)	Actively attending to or involved in an activity	Social behavior directed to adult Negative social behavior directed to adult Social behavior directed to peer Negative social behavior directed to peer No social behavior	Percentage of intervals behaviors associated with each code observed

Table 2-4. Descriptions of class-wide or group engagement measures

Measure	Definition of Engagement	Engagement Codes	Data Obtained
Planned Activity Check (Cataldo & Risley, 1973)	Participation in planned activities and appropriate uses of materials presented in the activity	Engagement Non-engagement	Percentage of children in classroom or group appropriately engaged in activities and with materials
Engagement Check (McWilliam, 1998)	Attention to or active participation in classroom activities as reflected by vocalizing, manipulating objects, looking, approaching, or affective expression	Engagement Non-engagement	Percentage of children in classroom or group appropriately engaged in activities and with materials

Table 2-5. Descriptions of child-level engagement measures

Measure	Definition of Engagement	Engagement Code	Data Obtained
E-QUAL III (McWilliam & de Kruif , 1998)	The amount of time children spend interacting with the environment at different levels of competence	Engagement levels • sophisticated engagement (levels: persistence, symbolic, encoded, constructive), • differentiated engagement (level: differentiated), • focused engagement (level: focused attention), • unsophisticated engagement (levels: undifferentiated, • casual attention) • non-engagement Engagement types • kid, grown-up, object, self	Percentages of intervals behaviors associated with each engagement code are observed
STARE (McWilliam, 2000)	The amount of time children spend interacting with the environment at different levels of competence	Engagement types • adult, peer, material Engagement levels • non-engaged • unsophisticated • average • advanced • sophisticated	Rating of the amount of time spent with adults, peers, and materials and rating of the complexity of child engagement
ICER (Kishida & Kemp, 2009)	The amount of time children spend interacting with their social and nonsocial environments at different levels of competence and in a developmentally and contextually appropriate manner	Engagement codes • active engagement • passive engagement • active non-engagement • passive non-engagement	Percentage of intervals behaviors associated with each engagement code are observed

Table 2-5. Continued

Measure	Definition of Engagement	Engagement Code	Data Obtained
EBOS-RVII (EIFEL Project, 2012)	The amount of time children spend interacting with their social and nonsocial environments at different levels of competence and in a developmentally and contextually appropriate manner	Engagement behaviors • sophisticated • social • combinatorial • differentiated • attentional • undifferentiated • non-engaged Engagement partners • adult, peer, object, self	Percentage of intervals in which behaviors associated with each engagement code are observed

Table 2-6. Measurement of engagement by studies

Citation	Activity Engagement Measured	Observational Procedure	Length of Data Collection Session	Nature of Observation	Evaluation of Engagement based on Activity Type
Appanaitis (2003)	Play	15-sec interval momentary time-sampling	30 minutes	Live	No
Bevill, Gast, Maguire, & Vail (2001)	Play	15-sec partial-interval coding	21 minutes	Video-based	No
Danko (2004)	Circle	10-sec interval momentary time-sampling	10-15 minutes	Live	No
Malmskog &McDonnell (1999)	Play	30-sec interval momentary time-sampling (2 sec at the end of the interval)	30 minutes	Live	No

Table 2-7. Engagement codes and definitions by studies

Citation	Behavior	Definition
Appanaitis (2003)	Persistence	Involves some problem solving and some challenge; often indicated by failed first attempt; involves either changing strategies or using the same strategy again to solve the problem or reach a goal.
	Symbolic	The use of conventional forms of behavior such as language, pretend play, sign language, drawings that allow the child to reflect on the past, talk about future, and construct new forms of expression through combinations of different symbols and signs.
	Encoded	The use of conventional forms of behavior that are context bound and that depend on referents or perceptually present stimuli as a basis for evoking the behaviors.
	Constructive	Manipulating the objects to create, make, or build something.
	Differentiated	The coordination and regulation of behavior that reflects elaboration and progress toward conventionalization.
	Focused attention	Includes watching or listening to features in the environment.
	Casual attention	Attending to a sequence of things within 3 sec as opposed to attending to only one object or person within 3 sec
	Undifferentiated	Child's interaction with the environment without differentiating her/his behavior, using simple low-level behaviors.
	Nonengaged	Unoccupied and none of the other behaviors are occurring.
Bevill, Gast, Maguire, & Vail (2001)	Engagement	Being in a planned play area, appropriately interacting with materials in the manner in which they were intended to be used, with eyes open and focused on materials or people in the activity area.
Danko (2004)	Active engagement	Involves some physical or verbal display of participation in some activity and the use of materials or the self to interact with the environment.
	Attentional engagement	Any behavior that is not overtly active in nature. This is generally a more passive form of participation in the activity.
	Nonengagement	Unoccupied and none of the other behaviors are occurring.

Table 2-7. Continued

Citation	Behavior	Definition
Malmskog &McDonnell (1999)	Actively engaged	Child is actively engaged in play activity; involved in verbal exchange related to play activity; or attending to instructor prompt; engaged in class management.
	Not actively engaged	Child displays aggressive-disruptive behaviors; is involved in sensory manipulation of materials; is moving around the classroom; has become distracted by other persons/events not involved in play activity; is watching other children who are interacting with play materials in an appropriate manner; is not actively engaged, is not actively engaged, but her/his behavior is not listed above.

Note. In Appanaitis (2003) study, nine engagement levels were grouped under five categories for analyses and reporting. These categories included sophisticated engagement (levels: persistence, symbolic, encoded, constructive), differentiated engagement (level: differentiated), focused engagement (level: focused attention), unsophisticated engagement (levels: casual attention, undifferentiated), and non-engagement (level: nonengagement).

CHAPTER 3
METHOD

The present study investigated corollary relationships between observed engagement behaviors of young children with disabilities during child-initiated, social-oriented and materials-oriented activities and their teachers' implementation of embedded instruction learning trials (EILTs). To explore these corollary relationships, changes in child engagement behaviors during child-initiated activities across experimental phases of a single-subject multiple-baseline across teachers study were examined. Then, changes in teachers' implementation of EILTs during two types of child-initiated activities were examined across experimental phases. Finally, corollary relationships between observed engagement behaviors of young children with disabilities and their teachers' implementation of EILTs during two types of child-initiated activities were explored. The present study used data collected as part of a larger study focused on examining relationships between preschool teachers' exposure to components of a professional development intervention and their frequent and accurate use of embedded instruction practices with preschool children with disabilities (Embedded Instruction for Early Learning Project [EIFEL Project]; Snyder et al., 2007).

The purpose of this chapter is to describe the methods used in the present study as situated within the EIFEL Project. A description of the context for the present study will be followed by the description of experimental design, participants, settings and materials, procedures for the Phase II feasibility study, and procedures for the present study. Methodological details of the EIFEL Project will be presented prior to those of the present study, when appropriate.

Context for the Present Study

The EIFEL Project involved three phases. In Phase I, the professional development intervention focused on embedded instruction, known as *Tools for Teachers*, was developed and validated. In Phase II, three single-subject experimental design studies (multiple-baseline across participants) were conducted at three different sites to examine the feasibility of implementing each component of the professional development intervention and to evaluate systematically relationships between each professional development intervention component and preschool teachers' frequent and accurate use of embedded instruction practices. The three feasibility studies were conducted with 4 preschool teachers and 1 "target" child with disabilities in each teacher's classroom at 2 of 3 study sites (i.e., Florida and Wisconsin) and with 5 preschool teachers and 1 "target" child with disabilities in each teacher's classroom at 1 of 3 study sites (i.e., Washington) for a total of 13 teachers and 13 children with disabilities across the sites. In Phase III, a randomized controlled potential efficacy group experimental trial was conducted to evaluate whether exposure to a professional development intervention was associated with preschool teachers' frequent and accurate use of embedded instruction practices and child learning outcomes. Across the three sites, 36 teachers and 106 children with disabilities participated in the potential efficacy study (Snyder et al., 2010).

When the single-subject experimental feasibility studies were conducted during Phase II of the EIFEL Project, relationships between each component of a professional development intervention (i.e., training, on-site coaching, self-coaching) and preschool teachers' frequent and accurate use of EILTs were examined. Teachers' implementation of EILTs was evaluated during child-initiated activities, teacher-directed activities, and routines or transitions. Children's engagement behaviors were not investigated. Video-recorded data collected during child-initiated activities as part of the single-subject experimental feasibility study conducted in Florida during Phase II of the EIFEL Project (hereafter referred to as Phase II feasibility study) were used to address the research questions in the present study.

The child engagement data for the present study were obtained by using the Engagement Behavior Observation System-Research Version II (EBOS-RVII; EIFEL Project, 2012). Use of this system permitted the investigator to code engagement behaviors for each target child during child-initiated activities using the videotapes gathered as part of the Phase II single-subject experimental feasibility study. Data on teachers' implementation of EILTs during child-initiated activities were extracted from the feasibility study database. Figure 3-1 illustrates how data for the present study were obtained from the Phase II feasibility study database.

Child engagement behavior and teacher implementation data were examined in the present study with reference to the experimental phases to which each teacher was exposed during the Phase II feasibility study. In addition, corollary relationships between child engagement behavior and teachers' implementation of EILTs were examined. A detailed description of how child engagement and teacher EILTs implementation data were obtained in the present study is provided under the *Procedures for the Present Study* subheading in this chapter.

Experimental Design

The Phase II feasibility study employed a multiple-baseline across participants (teachers) single-subject experimental research design (Baer et al., 1968) to investigate (a) functional relationships between teacher's exposure to components of the professional development intervention focused on embedded instruction and their frequent and accurate implementation of EILTs, and (b) relationships between preschool teachers' implementation of EILTs and children's learning as measured by them emitting a behavior specified as part of an EILT.

In single-subject experimental research studies, a functional relationship between an independent variable and a dependent variable is determined by examining three types of changes within and between experimental phases: level, variability, and trend (Wolery & Harris, 1982). *Level* refers to the relative value of the data pattern for the dependent variable. *Variability* is defined as the dissimilarity of scores in a given experimental phase. *Trend* refers to the direction in which the data pattern is progressing (Tawney & Gast, 1984; Wolery & Harris, 1982).

Changes in data within experimental phases may demonstrate threats to the internal validity of the research. For example, when there is variability in baseline data or baseline data patterns show changes in level and trend in therapeutic directions, implementation of the independent variable (i.e., intervention) is not recommended. If the independent variable is implemented under these or similar circumstances, the interpretation of experimental effects will be open to question and it will not be possible to draw strong conclusions based on the data (Wolery & Harris, 1982). Researchers visually inspect data to evaluate level, variability, and trend in baseline data before implementing an intervention and take action, when appropriate (e.g., extend baseline, identify factors contributing to variability or change in level or trend).

Changes in level, trend, and variability (in some cases) in therapeutic directions are desirable between experimental phases and they must be replicated across several experimental manipulations to demonstrate a functional relationship between the time series manipulation of the independent variable and the dependent measure. An increase in level, a decrease in variability, or a change in trend often is desirable (depending on the characteristics of the independent variable) after an appropriately stable baseline phase. To conclude that a functional relationship has been established, the researcher must (a) record no changes or very little changes within experimental phases, (b) observe a clear change in level, trend, or both level and trend when the intervention is introduced, and (c) replicate the changes between conditions during additional data series of the experiment (Wolery & Harris, 1982).

In general, to demonstrate experimental control with multiple-baseline single-subject experimental research designs, researchers first collect baseline data simultaneously across no less than three data series (e.g., across participants, behaviors, or settings). When investigators observe acceptable stability in level (indicated by no change or change in a contra-therapeutic direction), relatively small variability, and no trend or trend in a direction opposite of that predicted by the intervention in the baseline data series with a minimum of three data points, an intervention can be applied to the first baseline series. Introduction of the intervention in the first data series should coincide with changes in level and trend in a therapeutic direction and decreases in variability, while the uninterrupted baseline series remains unchanged or shows changes in level, variability, or trend in a contra-therapeutic direction. When a criterion-level of performance is observed in the first data series or the researcher judges that changes in level, trend, or variability are noteworthy in relation to the baseline phase, the intervention can be implemented in the second baseline series and the same process is repeated until each target receives the intervention (Kazdin, 1982; Tawney & Gast, 1984). In some instances, an intervention can be implemented when there is (a) a relatively small change in baseline level in a therapeutic direction, (b) some variability in baseline data, and (c) a relatively small trend in a therapeutic direction during baseline (Tawney & Gast, 1984).

In the case of the Phase II single-subject experimental feasibility study, following a baseline condition that was the same length for all four participants, the four teachers participated together in professional development workshops. The provision of the on-site coaching intervention was lagged across each participant following the workshop phase. Two trained project coaches conducted all coaching sessions. Self-coaching via a project-developed web site was the second intervention series that was lagged across participants. Phase change decisions were based on visual analysis of level, trend, and variability of data related to teachers' frequent and accurate implementation of EILTs that involved the target child's priority learning target behavior. Figure 3-2 illustrates experimental phases of the Phase II feasibility study.

The present study employed a non-experimental descriptive research design (Horn, Snyder, Coverdale, Louie, & Roberts, 2009; Lodico, Spaulding, &Voegtle, 2010; Mitchell & Jolley, 2007) to investigate corollary relationships between children's engagement behaviors and teachers' implementation of EILTs during child-initiated, social-oriented and materials-oriented activities across experimental phases of the professional development intervention. Descriptive research designs allow researchers to examine the relationships between variables without drawing causal conclusions.

Participants

Participants in the present study included four teacher-child dyads from the Phase II single-subject experimental feasibility study conducted in Florida. In this section, descriptions of procedures used to recruit teacher and child participants for the Phase II feasibility study are followed by the presentation of characteristics of each teacher-child dyad included in the present study.

Teacher Recruitment

Participating teachers were recruited from a public school system in north Florida where inclusive preschool practices were implemented in the early childhood special education program. To participate in the study, a teacher had to (a) be working in an inclusive preschool classroom that included young children with and without disabilities and at least one child with disabilities had to be enrolled with an individualized educational program (IEP), (b) be certified to teach in early childhood/early childhood special education classroom, and (c) have at least 2 years of teaching experience working with young children with disabilities in inclusive settings.

In addition, the teacher's classroom had to receive an overall environmental quality mean rating score of 4 (good) out of 7 on the Early Childhood Environment Rating Scale-Revised (ECERS-R; Harms, Clifford, & Cryer, 2005). To recruit teachers for the study, researchers contacted the preschool program administrator in one school district and received permission to meet with teachers in the preschool program. A member of the research team met with all preschool teachers in the preschool program to explain the purposes of the study and provided informed consent forms to the teachers who were interested in study participation. Those who indicated interest were asked to provide written informed consent in the presence of a research team member

(Appendix A). Subsequently, a 2 ½ hour observation was conducted in each teacher's classroom to complete the ECERS-R. The first four teachers who consented to study participation and whose classrooms received an overall environmental quality mean score of 4 on the ECERS-R were included in the study.

Child Recruitment

Subsequent to recruitment of participating teachers, a "target" child with disabilities in each teacher's classroom was recruited for participation (a total of 4 children). For this purpose, teachers were asked to nominate children from their classroom who met the study inclusion criteria. To be eligible for participation in the study, a child had to have an IEP and be between 3 through 5 years of age at the onset of the study. Each consented teacher was asked to send a letter describing the study in parent-friendly language and a consent form to the parents of each eligible child in her classroom (Appendix A). The first eligible child from each teacher's classroom whose parents returned a signed informed consent form participated in the study (four children total). In addition to obtaining parental consent, child assent to participate in the study was obtained from each child by a research team member (Appendix A). These four children were the child participants for the present study.

Characteristics of the Participants

Teacher-child dyad 1: Nancy-Devon. Nancy was a 55-year-old Caucasian preschool teacher with a master's degree in education. She had 15 years experience teaching children with disabilities and 23 years of teaching experience with young children. She held state certifications in mental disabilities, early childhood, and art education for K-12 and had been working in the same school for 15 years at the onset of the Phase II feasibility study (Table 3-1 for teacher demographic information).

Devon was a 40-month-old boy with an IEP. His race/ethnicity was reported as African-American. Devon had been enrolled in Nancy's classroom for 2 months when the Phase II feasibility study began. His total score on the ABILITIES Index (Simeonsson & Bailey, 1991) was 44, with a mean functional abilities rating of 2.3 (range 1 to 5). Devon showed mild to moderate delays in 5 of 9 areas (i.e., behavior, intellectual functioning, limbs, intentional communication, and tonicity) measured by the ABILITIES Index (Table 3-2 for child demographic information and ABILITIES Index scores).

Teacher-child dyad 2: Betsy-Arlene. Betsy was a 56-year-old Caucasian preschool teacher who indicated she had been working with young children with disabilities for 9 years. She had a bachelor's degree in elementary education and a master's degree in early childhood education. Overall, she had 34 years experience teaching young children and had been working in her current classroom for 4 months at the onset of the Phase II feasibility study.

Arlene was a 62-month-old girl with an IEP. Her race/ethnicity was reported to be Hispanic. Arlene had been enrolled in Betsy's classroom for 3 months at the beginning of the Phase II feasibility study. Arlene had a total score of 27 on the ABILITIES Index, with a mean functional abilities rating of 1.4 (range 1 to 3). She showed mild delays in 3 of 9 areas (i.e., behavior, intellectual functioning, and intentional communication) as measured by the ABILITIES Index.

Teacher-child dyad 3: Kim-Brian. Kim was a 47-year-old Asian-American preschool teacher with a bachelor's degree in early childhood education. She held appropriate certifications to teach children from birth to grade 6. Kim had 9 years experience teaching young children with disabilities and had been working in the same school for 2 years at the onset of the Phase II feasibility study.

Brian was a 53-month-old boy with an IEP. His race/ethnicity was reported to be Caucasian. Brian had been enrolled in Kim’s classroom for 4 months at the onset of the Phase II feasibility study. His total score on the ABILITIES Index was 54, with a mean functional abilities rating of 2.8 (range 1 to 5). Brian showed mild to severe delays in 5 of 9 areas (i.e., behavior, limbs, intentional communication, tonicity, and integrity of physical health) measured by the ABILITIES Index.

Teacher-child dyad 4: Diana-Jessica. Diana was a 45-year-old Caucasian preschool teacher with a bachelor’s degree in special education. At the onset of the Phase II feasibility study, she had 16 years experience teaching young children with disabilities and had been working in the same school for 12 years. She held a certification in mental disabilities (K-12) and was working toward her autism endorsement.

Jessica was a 65-month-old girl with an IEP. Her race/ethnicity was reported as Caucasian. Jessica had been enrolled in Diana’s classroom for 1.5 months at the onset of the Phase II feasibility study. Jessica’s total score on ABILITIES Index was 39, with a mean functional abilities rating of 1.9 (range 1 to 4). She showed mild to moderate delays in 4 of 9 areas (i.e., behavior, intellectual functioning, intentional communication, and integrity of physical health) measured by the ABILITIES Index.

Settings and Materials

This section provides information about the settings in which the Phase II single-subject experimental feasibility study occurred and materials used in the Phase II study as well as those used in the present study.

Settings. All four classrooms in which each participating teacher taught were full-day inclusive preschool classrooms located in one public elementary school. In addition to a lead teacher, each classroom had two assistant teachers available throughout the school day. All therapy services for children with disabilities across the four classrooms were implemented in a therapy room outside of the classrooms. Class sizes and the number of children with and without disabilities varied across the four classrooms.

Nancy's and Kim's classrooms (i.e., classrooms 1 and 4) both had 8 children with IEPs and 3 children without disabilities (i.e., 11 children total) at the beginning of the Phase II feasibility study. On the ECERS-R, Nancy's classroom received an average score of 4.6, while Kim's classroom received an average score of 4.2, both indicating a good global classroom environmental quality.

There were a total of 15 children in Betsy's and Diana's classrooms (i.e., classrooms 2 and 3) at the beginning of the Phase II feasibility study. Of those, 10 children in each classroom had IEPs. On the ECERS-R, Betsy's and Diana's classrooms received an average score of 4.5 and 4.8, respectively, indicating both had good global classroom environmental quality.

Materials. Throughout the Phase II feasibility study, teachers used the activities and materials that were available in their classrooms to deliver EILTs to the target children. No additional child-focused materials were brought into the classrooms by researchers for the teachers or children to use. All teachers received embedded instruction implementation and practice guides as part of the professional development intervention (Snyder, Hemmeter et al., 2009). In addition, they received teacher-focused materials to help support their implementation of embedded instruction in the classroom (e.g., activity schedules, data collection forms, learning target forms).

Materials used during the present study included classroom-, teacher- and child-related data obtained from the Phase II single-subject experimental feasibility study, videotapes of child-initiated activities collected during the Phase II feasibility study, the Activity Classification Coding System (ACCS; a duration recording system designed to classify an activity as social-oriented or materials-oriented), the Engagement Behavior Observation System-Research Version II (EBOS-RVII; an observational coding system developed to quantify child engagement behaviors), and the Noldus Observer® XT 10.5, a software to conduct behavioral observations and code activity type and engagement behaviors specified as part of the ACCS and EBOS-RVII.

Classroom-level data obtained from the Phase II single-subject experimental feasibility study database included ECERS-R scores and numbers of children with and without disabilities in each classroom. Teacher-level data extracted from the Phase II feasibility study database included teacher demographics and data on teacher's implementation of EILTs during the child-initiated activities included in the present study. Child-level data extracted from the Phase II feasibility study database included child demographics and ABILITIES Index scores. These data were used for descriptive purposes in the present study.

The ACCS was used to determine whether the child-initiated activities taken from the Phase II feasibility study videotapes for engagement coding in the present study were primarily social-oriented or materials-oriented. The EBOS-RVII was used in the present study to generate data related to child engagement behaviors during child-initiated, social-oriented and material-oriented activities. Both activity classification and child engagement codes were applied using Noldus Observer® XT 10.5 observational coding software. Engagement data generated in the present study along with the teacher EILTS implementation data extracted from the Phase II feasibility study database were used to address the research questions in the present study.

Noldus Observer® XT 10.5 is a computer software program that supports coding of observed behaviors during video-based or live observations. Coding is accomplished by clicking or tapping the corresponding button on a computer screen when a behavior aligned with a coding category occurs. The software can be used to record the duration or frequency of behaviors of interest. At the end of each observation, the software creates a log file. Depending on the coding system built in the Noldus Observer® XT 10.5 observational coding software, the log files include information on duration, frequency, percentage, or rate of the behaviors observed as well as information about time stamps, environmental variables, notes made by the observer/coder, and other relevant data collected by the researcher. These data can be used to conduct further analyses on behaviors of interests. In the present study, Noldus Observer® XT 10.5 observational coding software was used to conduct behavioral observations for categorizing activities and quantifying child engagement behaviors. For each of these observation systems, a separate Noldus Observer® XT 10.5 project file was created and these files were used during coding.

Procedures for the Phase II Feasibility Study

This section describes procedures used to conduct the Phase II single-subject experimental feasibility study. The section begins with a description of procedures used to (a) collect classroom-, teacher-, and child-level descriptive data; (b) obtain learning targets from teachers for each participating child, prior to implementation of the first experimental phase of the study; and (c) gather data on teacher's implementation of embedded instruction learning trials (EILTs). Next, information on the procedures that guided implementation of Phase II feasibility study is presented by experimental phases (i.e., baseline, training, post-training, on-site coaching, self-coaching, and maintenance).

Collecting descriptive data. Upon receiving consent from teachers and families of participating preschool children with disabilities along with the child assent, trained examiners observed in teachers' classrooms for 2 ½ hours and completed the ECERS-R (Harms et al., 2005). The ECERS-R is designed to evaluate the global quality of preschool classrooms. To evaluate the quality of a classroom, a trained observer conducts a 2 ½-hour observation (at minimum) in the classroom during ongoing activities. The ECERS-R contains 43 items and 470 quality indicators divided into seven subscales that measure (a) space and furnishings (8 items and 82 indicators), (b) personal care routines (6 items and 77 indicators), (c) language-reasoning (4 items and 39 indicators), (d) activities (10 items and 101 indicators), (f) interactions (5 items and 53 indicators), (g) program structure (4 items and 45 indicators), and (e) parents and staff (6 items and 73 indicators). Each item is rated on a 7-point scale, with the odd number descriptors anchored as *inadequate* (1), *minimal* (3), *good*, (5), and *excellent* (7). A total score for the entire classroom is obtained by averaging the individual item scores and ranges from 1 to 7. Higher mean scores for the total and each subscale represent better global classroom quality.

Clifford, Reszka, and Rossbach (2010) reported two types of score reliability data for the ECERS-R: inter-observer and internal consistency. The field test was conducted in 21 preschool classrooms during the summer of 1997. With respect to inter-observer score reliability, the percentage of agreement across all 470 indicators was 86.1%, with no indicator having percentage agreement below 70% (Harms et al., 2005). At the item level, the percentage of agreement was 48% for exact agreement and 71% for agreement within one point. The Pearson product moment correlation coefficient, Spearman rank-order correlation coefficient, and interclass correlation coefficient for the total score were also calculated and they were .92, .87, and .92, respectively (Harms et al., 1998). The internal consistency score reliability of the ECERS-R was evaluated at the subscale and total scale levels (Harms, et al., 2005). While the total scale internal consistency score reliability was .92, the internal consistency score reliability for the subscales ranged from .71 to .88.

In addition, teachers completed a demographic information form. The demographic form was a 20-item instrument that requested information from the teachers about their background (e.g., gender, age, race/ethnicity), work experience, and classroom. Information gathered from this form was used to describe participating teachers and their classrooms (i.e., study settings).

The ABILITIES Index (Simeonsson & Bailey, 1991) was used to characterize the functional abilities of participating children in their classroom. The ABILITIES Index is a 19-item summated rating scale designed to profile the functional abilities and limitations of children across nine domains. These domains are (a) audition, (b) behavior and social skills, (c) intellectual functioning, (d) limbs (use of hands, arms, and legs), (e) intentional communication, (f) tonicity (muscle tone), (g) integrity of physical health, (h) eyes (vision), and (i) structural status (shape, body form, and structure). Each ability domain indicator is scored on a 6-point scale ranging from *normal functioning* (1) to *extreme limitation of functioning* (6). Bailey and his colleagues (1993) investigated the score reliability of the index in a study involving 254 children, 213 parents, and 133 teachers and reported inter-rater agreement of 67.2% for exact agreement and 86.2% for agreement within one rating point. Weighted kappa coefficients yielded a score of .60, while intra-class correlation coefficients ranged from .60 to .73.

Identifying learning targets. Prior to the first baseline data collection, teachers were asked to provide instructional objectives that specified for four target behaviors they were currently working on with the child. These learning targets were used to identify when EILTs occurred during classroom activities, routines, and transitions and whether the learning trials implemented were procedurally correct with respect to antecedent, behavior, and consequence components as well as to evaluate children's learning in relation to the target behavior specified in the learning target.

The learning targets could be taken from the target child's IEP goals or objectives, modified from the target child's IEP goals or objectives, or created by the teacher based on her perspectives about their educational relevance for the target child. Project staff encouraged teachers to select a relevant target from social-emotional, language, cognitive/literacy, and motor/adaptive domains, if appropriate for the child. Project staff was instructed to refer the teachers to the district format for behavioral objectives if they asked question about how to write a behavioral objective. Teachers were not provided any additional information on how to write a behavioral objective during this stage. Teachers were asked to provide four learning targets for the target child three other times during the Phase II feasibility study: before workshop training, before the on-site coaching phase, and before the self-coaching phase.

Embedded Instruction Observation System – Research Version I. The Embedded Instruction Observation System – Research Version I (EIOS-RVI; EIFEL Project, 2008a) was used as one of the dependent variable measures in the Phase II feasibility study. Data obtained from the EIOS-RVI were graphed to conduct visual analyses of level, trend, and variability within and across the experimental study phases and to inform decisions about the experimental study phase changes.

The EIOS-RVI is a continuous event, observational coding system that is designed to quantify the frequency and accuracy of EILTs that a teacher implements with a target child during child-initiated, teacher-directed, and routine or transition activities in the preschool classroom. A learning trial includes an antecedent, target behavior (or behavior approximation), consequence, and error correction (if appropriate).

An antecedent is described as an event that sets the occasion for a child behavior. Antecedents can be delivered by an adult, peer, or through environmental arrangements. Child behaviors are observable actions (i.e., spoken, gestural, physical) performed by a target child after the presentation of an antecedent. The EIOS-RVI allows researchers to determine whether the child behavior was a correct or incorrect behavior (as defined by the behavior specified in the learning target), or if the child had no response. A consequence is described as an event that immediately follows a child's target behavior. Consequences can be also delivered by an adult, peer, or through environmental arrangements. An error correction is a procedure or a group of procedures that is applied immediately following incorrect child responding to obtain or approximate correct responding.

The EIOS-RVI was developed to record whether (a) antecedents, error corrections, and consequences are implemented as planned by the teacher, (b) the child's target behavior is emitted, (c) the child's EILTs are implemented logically according to planned preschool activities and materials, and (d) EILTs are procedurally correct and complete.

The EIOS-RVI codes also permit researchers to quantify (a) the total number of EILTs implemented (frequency), (b) the number of EILTs with procedurally correct teacher implementation (accuracy; including antecedent, consequence, and error correction) and (c) the number of procedurally correct EILTs with a correct child behavior. In the case of error corrections, the EIOS-RVI measures whether the target child behavior occurs after the error correction and a consequence is provided following the target child behavior.

Snyder and her colleagues (2009) collected inter-observer percentage agreement data in the Phase II feasibility study for approximately 33% of the EIOS-RVI videotaped sessions during baseline, workshop, and each of the coaching phases. Overall, the mean inter-observer percentage agreement for the total number of EILTs with procedurally correct teacher implementation and the number of procedurally correct EILTs with a correct child behavior was 83.1% (*SD* = 18.5) and 83.1% (*SD* = 17.9), respectively.

Baseline. During the baseline phase of the Phase II feasibility study, participating teachers were asked to do what they would normally do to provide instruction to children on their learning targets. No further information was provided about the professional development intervention or embedded instruction. This condition was used to evaluate pre-intervention performance of participants on dependent variables (i.e., frequency and accuracy of implementation of EILTs for teachers and performance on individualized learning target behaviors for children).

In the Phase II feasibility study, baseline data to evaluate teachers' implementation of EILTs and children's performance on their learning target behaviors were collected by videotaping teacher and child interactions for approximately 2 hours during classroom activities, routines, and transitions. The researchers used the Embedded Instruction Observation System-Research Version I (EIOS-RVI; EIFEL Project, 2008a) to quantify the frequency and accuracy of EILTs that a teacher implemented with a target child with a disability during child-initiated, teacher-directed, routine, and transition activities in the preschool classroom. Data on teachers' implementation of EILTs and children's performance on their learning target behaviors across all four types of activities for each data point were available before the present study was conducted. In the Phase II feasibility study, data on teachers' implementation of EILTs and children's performance on learning target behaviors were graphed for the four baseline sessions.

Workshop training phase. Once baseline data had been collected for all four teachers and children for four sessions to determine teachers' performance on implementing EILTs and children's performance on their learning target behaviors, researchers introduced the workshop phase. The principal investigator for the Phase II feasibility study at the FL site conducted the workshop training series. All four teachers attended the workshops at the same time. The workshop training sessions were implemented in a conference room at the school site. The workshops consisted of a series of four interrelated modules focused on embedded instruction. Seven workshops were conducted for 14 hours using four *Tools for Teachers* project-developed modules and were completed in 4 weeks. The modules included an overview of embedded instruction (2.5 hours) as well as practices associated with planning (4.8 hours), implementing (4.3 hours), and evaluating (4 hours) embedded instruction.

The modules were developed based on the three major components of embedded instruction (i.e., planning for embedded instruction, implementing embedded instruction, and evaluating embedded instruction). An overview module accompanied these three modules. The scope and sequence of the content and format of the modules was based on a comprehensive review of the empirical literature focused on naturalistic instructional approaches and embedded instruction (Snyder et al., 2013) and existing materials related to embedded instruction (e.g., Grisham-Brown, Hemmeter, & Pretti-Frontczak, 2005; Pretti-Frontczak & Bricker, 2004; Sandall, Hemmeter, Smith, & McLean, 2005; Snell, 2007; Wolery, 2005). Table 3-3 shows the embedded instruction content associated with each module.

The overview module focused on describing the key concepts associated with embedded-instruction practices. More in-depth explanation of these concepts was presented in the remaining three modules. By the end of the overview module, participating teachers were expected to (a) identify reasons for using embedded instruction, (b) define embedded instruction, (c) describe the three steps of the embedded instruction process, (d) understand relationship between embedded instruction and the general preschool curriculum, and (e) describe a complete EILT and understand the differences between complete and incomplete learning trials (EIFEL Project, 2008b).

The planning module focused on helping teachers learn to plan for EILTs to occur during ongoing activities, routines, and transitions of the preschool classrooms. In this module, preschool teachers primarily learned how to plan learning trials for a child's individual learning targets. When the planning module was completed, participating teachers were expected to (a) learn how to identify child learning targets that are appropriate for embedded instruction, (b) learn and practice breaking down IEP goals into intermediate objectives that lead to learning targets that are appropriate for embedded instruction, (c) select appropriate times and activities for embedding instruction, (d) complete an activity matrix to display children's learning targets in relation to planned EILTs provided during classroom activities, (e) select appropriate instructional procedures to use when implementing EILTs, and (f) develop instructional plans to support implementation of EILTs (EIFEL Project, 2008c).

The implementation module focused on instructional strategies for preschool teachers to use to implement embedded instruction within their classrooms during naturally occurring classroom activities, routines, and transitions. In this module, teachers were expected to learn (a) to use a variety of instructional procedures and identify the conditions under which each of these procedures might be used, (b) to identify and apply strategies for fading prompts, (c) to describe types of antecedents and consequences that might be used to deliver EILTs, (d) to define fidelity of implementation of EILTs and why it is important, and (e) to use matrices and the implementation checklists to prepare for and implement embedded instruction (EIFEL Project, 2008d).

Finally, the evaluation module focused on helping preschool teachers to learn how to evaluate (a) their implementation of embedded-instruction practices and (b) whether their implementation of EILTs helped preschool children with disabilities to make progress on their learning targets. In this module, teachers also learned to use data-based decision-making processes to modify their instruction or the learning targets they were working on with a child (EIFEL Project, 2008e). By the end of this module, teachers were expected to (a) identify strategies to determine whether EILTs are implemented as planned, (b) collect, analyze, and interpret child data to judge if their implementation of EILTs is associated with positive child outcomes (i.e., making progress on learning target behaviors), and (c) describe strategies to adjust their instruction based on teacher implementation and child outcome data (EIFEL Project, 2008e).

Each module had: (a) a workbook for teachers that contained PowerPoint® slides, case study materials, and other interactive activities completed by participating teachers during each workshop; (b) an implementation practice guide that included supportive application resources to be used by teachers following each workshop; (c) a trainer's guide for individuals who implemented the workshops; and (d) video clips that showed the implementation of embedded instruction within authentic preschool activities, routines, and transitions.

During the workshop training sessions, the trainer encouraged collective participation. A variety of active learning strategies were used to help preschool teachers learn the module content related to embedded instruction. These included the use of lecture, small group activities and discussions, large group discussions, video demonstrations, case study discussions, handouts, role-plays, and practice exercises. To establish coherence between workshop activities and classroom practices, teachers were provided opportunities to (a) practice skills and receive feedback from the trainers related to planning embedded instruction for children in their classrooms as part of workshop activities, and (b) apply skills related to planning, implementing, and evaluating embedded instruction in their classrooms between workshop sessions. In addition, the trainer incorporated teachers' classroom experiences as case examples related to planning, implementing and evaluating embedded instruction during the workshop discussions and activities. The trainer also helped participating teachers understand how embedded instruction is aligned with the preschool curriculum by connecting embedded-instruction practices to early childhood curricula and early learning foundations or standards (Snyder, Hemmeter et al., 2009).

During implementation of the workshop training series, data on teachers' implementation of EILTs and children's performance on learning target behaviors were collected and graphed for five sessions for all four teachers.

Post-training. Once the workshop training series was completed, a teacher was randomly selected to enter the on-site coaching phase. This teacher demonstrated decreasing trend with respect to her implementation of EILTs during the workshop training phase. The three remaining teachers were instructed to implement embedded-instruction practices as they had learned about in the workshops while working with the target child on his/her learning targets. During post-training and before on-site coaching was introduced to the three remaining participants, data on these teachers' implementation of EILTs and child learning of target behaviors were gathered as described previously.

On-site coaching phase. The first teacher who entered the on-site coaching phase received coaching once a week while the other three teachers continued in the post-training phase, implementing embedded instruction without coaching support. Once the first teacher reached the criterion level of performance (i.e., 80% accurate implementation of EILTs for at least 3 sessions), she moved to the self-coaching phase and the second teacher began the on-site coaching condition if her data showed either relative stability or a decelerating trend in relation to embedded instruction implementation. The same process was repeated until each teacher received on-site coaching (Snyder, Hemmeter et al., 2009). The four teachers in the Phase II feasibility study received 11, 14, 12, and 8 on-site coaching sessions, respectively to reach the criterion level of performance and to enter the self-coaching condition.

Coaching was provided by two expert coaches who had training in early childhood or early childhood special education and experience working with young children with disabilities. Each coach was randomly assigned two teachers to coach. Both coaches were female and had doctoral degrees in early childhood special education. Their experience in working with young children with disabilities ranged from 12 to 14 years at the onset of the Phase II feasibility study.

On-site coaching included a face-to-face classroom observation each week and follow-up debriefing session with performance feedback about targeted embedded-instruction practices. Debriefing sessions were conducted live or through e-mail when live debriefing was not able to occur due to logistical constraints. Across the four teachers in the Phase II feasibility study, the average length of a face-to-face classroom observation and a live debriefing session was 71 minutes and 34 minutes, respectively. Debriefing via e-mail was used 3 times across all 45 coaching sessions.

The coaches used a systematic coaching protocol during the coaching sessions. The on-site coaching protocol included four major components: (a) goal setting and action planning, (b) observation in preschool classrooms, (c) debriefing with the teacher, and (d) delivery of systematic performance feedback (including supportive and corrective feedback) to teachers about their use of embedded-instruction practices with children with disabilities. The feedback protocol used during debriefing included six components: (1) open the feedback meeting, (2) provide supportive feedback, (3) provide corrective feedback, (4) provide targeted support, (5) discuss planned actions and needed resources, and (6) close the feedback meeting. Debriefing, including feedback, was conducted either face-to-face or via e-mail following weekly observation sessions and included the same components regardless of the format of delivery (EIFEL Project, 2008f).

The coaches used a variety of strategies during observation and debriefing to support teachers' implementation of embedded instruction. Strategies used during observation sessions included observation, modeling, problem-solving discussion, side-by-side gestural and verbal support, environmental arrangements, and other help in the classroom. Strategies used in the debriefing sessions included problem-solving discussion, verbal and graphic-based performance feedback, reflective conversation, goal setting, graphing data, video demonstration, role play, and offering resources and materials. Performance feedback was delivered weekly following observations either face-to-face or via e-mail.

During the on-site coaching phase, the same data collection procedures as described in the baseline condition were used. Data related to teachers' implementation of EILTs were examined for variability, level, and trend. Data on children's performance on learning target behaviors were also collected and graphed.

Self-coaching phase. Once the first teacher reached criterion-level performance (i.e., 80% or greater accurate implementation of learning trials for at least 3 sessions) during on-site coaching, she began the self-coaching phase. Two of the remaining teachers began the self-coaching phase when they reached the criterion level of performance on implementation of EILTs during the on-site coaching phase. Although the fourth teacher reached criterion to move from on-site to self-coaching, the school year ended 1 week after she began self-coaching. No data related to this teachers' implementation of EILTs were collected during her self-coaching phase. Once each teacher entered the self-coaching phase, she received a face-to-face, 1 hour training focused on an orientation to the self-coaching website and to self-coaching. This training included information about how to access and use the web site and to conduct self-coaching. A trained project staff member conducted the training session.

Following the self-coaching training, teachers in this phase were given access to the project Web site (www.embeddedinstruction.net) for self-coaching. The website included a password-protected section for the self-coaching phase. Using the resources and materials on the website or materials teachers upload to the website, participating preschool teachers self-monitor their planning, implementing, and evaluating of embedded-instruction practices. The self-coaching section of the website included a "tip of the week" related to embedded instruction (i.e., written by project staff and changed weekly during the feasibility study), videos that provided teachers with an orientation to the self-coaching website, the self-coaching process, and a graphing tool. The graphing tool was designed to support teachers in their planning for and evaluating the implementation of EILTs and to monitor child progress toward learning target behaviors. In addition, teachers received a weekly e-mail from the project that encouraged them to (a) visit the self-coaching section of the website, (b) complete the self-coaching process, and (c) view the "embedded instruction tip of the week" (Snyder, Hemmeter et al., 2009).

The four teachers in Phase II feasibility study spent 14, 7, 2, and 1 week(s), respectively in the self-coaching phase. Teacher 1 logged into the self-coaching website 18 times across 14 weeks (*M* = 1.3/week) and spent 35 minutes on average. Teacher 2 logged into the self-coaching website 7 times across 7 weeks (*M* = 1/week) and spent 26 minutes on average. Due to end of the school year, teachers 3 and 4 only spent 2 weeks and 1 week, respectively in the self-coaching condition. Teacher 3 logged into the self-coaching website 5 times across 2 weeks (*M* = 2.5/week) and spent 28 minutes on average. Teacher 4 logged into the self-coaching website 3 times across 1 week and spent 27 minutes on average.

During the self-coaching phase, the same data collection procedures as described in the baseline condition were used. Data related to teachers' implementation of EILTs were examined for variability, level, and trend. Data on children's performance on learning target behaviors were also collected and graphed.

Maintenance. Once the first teacher reached criterion-level performance (i.e., 80% accurate implementation of learning trials for at least 3 sessions) during self-coaching, she began a maintenance phase. The second teacher also began the maintenance phase when she reached the criterion level of performance on implementation of EILTs during the self-coaching phase. The study was concluded due to the end of school year before the two remaining teachers moved to the maintenance phase. Once a teacher entered the maintenance phase, she was asked to implement EILTs during naturally occurring classroom activities as they were taught to do during the previous phases of the study. The teachers were allowed to use the project-related materials on the website during the maintenance phase that were previously given to them during the self-coaching phase. No further information and assistance was provided to the teacher during the maintenance phase.

During the maintenance phase, the same data collection procedures as described in the baseline condition were used. Data related to teachers' implementation of EILTs and children's performance on learning target behaviors were collected four times in 6 weeks with the first teacher and two times in 2 weeks with the second teacher.

Procedures for the Present Study

Implementation of the present study was guided by the following procedures: (a) selection of a subset of videotapes from the Phase II feasibility study (i.e., child-initiated activities); (b) developing the ACCS to determine whether a child-initiated activity was social-oriented, materials-oriented, or characterized as other type of activity; (c) classifying child-initiated activities as primarily social-oriented or material-oriented, using the ACCS; (d) developing and piloting the EBOS-RVII; (e) quantifying child engagement behaviors that occurred during child-initiated social-oriented and materials-oriented activities identified during the previous step by conducting behavioral observations using EBOS- RVII codes and the Noldus Observer® XT 10.5 coding software; (f) conducting interrater reliability observations for the EBOS-RVII; (g) extracting data from the Phase II feasibility study database on teachers' implementation of EILTs during the child-initiated social-oriented and materials-oriented activities included in the present study; (h) graphing child engagement and teacher implementation data based on the experimental phase change patterns employed in the Phase II feasibility study; and (i) conducting data analyses.

Selection of Videotapes

As described earlier, in the Phase II feasibility study, data to evaluate preschool teachers' implementation of EILTs were collected by videotaping the teacher and target child in each classroom for approximately 2 hours per week during naturally occurring classroom activities, routines, and transitions and coding the videotapes using EIOS-RVI (EIFEL Project, 2008a). In the Phase II feasibility study, data collectors captured at least one entire (a) child-initiated activity (CIA), (b) teacher-directed activity (TDA), and (c) routine (RA) or transition (T) during each data collection session across all participants and study phases. These 2-hour videotapes were segmented by activity type (i.e., CIA, TDA, RA, and T) before behavioral observations using EIOS-RVI were conducted. When there was more than one activity videotaped for an activity type during a data collection point, each activity was numbered sequentially in the order they occurred during videotaping (e.g., CIA1, CIA2, CIA3 or TDA1, TDA2, TDA3) and coded separately.

In the extant literature, engagement behaviors of young children are usually examined during child-initiated activities that last 5-15 minutes (Appanaitis, 2004; Danko, 2044; Kishiha & Kemp, 2006, 2009; McWilliam & Ware, 1994). To identify sufficient number of activities to assess engagement behaviors of young children with disabilities, videotapes of child-initiated activities that were 4 minutes or longer were included in the present study. Videotapes of child-initiated activities shorter than 4 minutes were not used in the present study.

The entire Phase II feasibility study database included a total of 344 child-initiated activities. The student investigator viewed all 344 videotapes and identified that 269 of these child-initiated activities were 4 minutes or longer (78%). Decreasing the minimum length of activities from 5 minutes to 4 minutes increased the number of child-initiated activities included in the present study by 15 activities. Child-initiated activities that were 4 minutes or longer were selected and coded using the Activity Classification Coding System (ACCS) to determine if each met the defined criteria for being classified as social-oriented or materials-oriented activities.

Developing the Activity Classification Coding System

Upon selection of videotapes of child-initiated activities that were 4 minutes or longer from the Phase II feasibility study database, a behavioral observation system (i.e., Activity Classification Coding System [ACCS]) was developed to classify these child-initiated activities as social-oriented, materials-oriented, or characterized as other (other activity-1 and other activity-2). The ACCS is a duration recording system and includes four mutually exclusive behavior codes: social behavior, material behavior, other behavior, and can't observe (Table 3-4 for code descriptions).

To determine the activity category, an observer watched and coded the entire activity shown on the video clip based on the definitions and examples provided in the ACCS manual, using the Noldus Observer® XT 10.5 observational coding software. When one of the four behavior codes occurred during an observation, the observer activated the key for that behavior code in the Noldus Observer® XT 10.5 screen and continued to watch the video clip without pressing another key until the target child demonstrated a behavior associated with a different code. When this occurred, the observer activated the key for the new behavior code and repeated the process until the end of the video clip for an activity. When the video ended, the observer recorded the percentage of time each behavior code occurred during the observation. A set of pre-determined criteria was applied to the percentage of time each of four behavior codes occurred during an observation to classify an activity as social, materials, or other. For example, to be classified as a social-oriented activity, the total percentage of time social behavior with adult plus social behavior with peer occurs during an activity must be 60% or higher (Table 3-5 for the criteria for activity classification).

Classifying Child-initiated Activities

The student investigator for the present study viewed and coded each child-initiated activity that was 4 minutes or longer using the ACCS to determine the activity category classification for each child-initiated activity. Activities classified as primarily social-oriented and materials-oriented were used in the present study to examine child engagement behaviors and their relationships with teachers' implementation of EILTs. Activities classified as other activity-1 and other activity-2 were excluded from the present study.

As a result of the activity classification process, 191 out of 269 (71%) child-initiated activities met the defined criteria for either social-oriented or materials-oriented and were included in the present study. Child-initiated activities that were not categorized as either social-oriented or materials-oriented (*n* = 78; 29%) were excluded from the present study. Table 3-6 shows information about the classification of activities for each teacher-child dyad and Table 3-7 shows the number of activities across experimental phases by participant and activity type.

Two secondary coders were trained on the ACCS and conducted inter-rater reliability observations for 26% of the total number of child-initiated activities that were 4 minutes or longer and that were coded by the student investigator using the ACCS. Approximately one-fourth of the child-initiated activities were randomly selected across phases and participants. For example, if there were a total of 12 child-initiated activities during a baseline phase for a child, 4 of these were randomly selected to conduct inter-rater reliability observations. Secondary coder-1 was a first-year doctoral student in early childhood special education and secondary coder-2 was a second-year master's student in special education. Inter-observer agreement during training and coding of the videotapes for the present study was calculated by dividing the number of activities in which primary and secondary coders agreed on the activity classification to the total number of activities coded.

Each coder was required to complete the training procedures for the ACCS and to meet inter-observer agreement standards using practice videotapes before coding videotapes included in the present study. Training of secondary coders for the ACCS included (a) reviewing the definitions and examples of codes; (b) reviewing the criteria for activity classification; (c) completing practice coding with two, 5-minute videotapes developed for training purpose and determining the activity category; and (d) comparing practice codes to an expert standard and receiving supportive and corrective feedback. Following the training, each coder was given a set of five videotapes to code and determine the activity category. The videotapes included child-initiated activities developed for training purpose that were not part of the present study and that were 5-10 minutes in length. Each coder had to categorize at least 80% of the activities captured in five videotapes correctly (i.e., at least 4 of 5 activities) to code present study videotapes.

During training, both secondary coders reached the criterion level of performance (i.e., classifying correctly at least 80% of the activities captured in five videotapes) within the first set of 5 videos. Secondary coder-1 classified 4 of 5 activities (80%) correctly. Secondary coder-2 classified 5 of 5 activities (100%) correctly.

During the present study, secondary coders coded and categorized 70 of 264 activities (26%) for reliability across experimental phases and participants. These activities were selected randomly across phases and across participants. Of these, in 65 activities, coders agreed with the student researcher's classification of activity type. The overall inter-observer agreement percentage score was 93%. Inter-observer agreement data for activity classification for each teacher-child dyad are shown in Table 3-8.

Developing the Engagement Behavior Observation System-Research Version II

The Engagement Behavior Observation System-Research Version II (EBOS-RVII; EIFEL Project, 2012) is a partial interval (15-sec), behavior observation system designed to quantify two dimensions of child engagement behaviors: engagement category and engagement partner. In this system, engagement is defined as the amount of time children spend interacting with their social and nonsocial environments at different levels of competence and in a developmentally and contextually appropriate manner (McWilliam & Bailey, 1992; McWilliam et al., 1985). Engagement category codes on EBOS- RVII include (a) sophisticated, (b) social, (c) combinatorial, (d) differentiated, (e) attentional, (f) undifferentiated, and (g) nonengaged (Table 3-9 for the definitions). The engagement partner codes include (a) peer, (b) peer-content, (c) adult, (d) adult-content, (e) object, and (f) self. Challenging behavior is also coded if it occurs during an interval (Table 3-10 for the definitions). Definitions, examples, and decision rules related to engagement category codes, engagement partners, and challenging behaviors are included in the EBOS-RVII codebook (EIFEL Project, 2012). The full version of the EBOS- RVII codebook can be requested from the EIFEL Project.

The EBOS-RVII was developed by revising and refining the EBOS-RVI (EIFEL Project, 2010), which was adapted from the Engagement Quality Measurement System-III (E-Qual III; McWilliam & de Kruif, 1998). In the following section, the adaptation of the EQUAL-III to create the EBOS-RVI is described. This is followed by the description of revisions and refinements completed on the EBOS-RVI to develop the EBOS-RVII. Table 3-10 shows the comparison of E-Qual III, EBOS-RVI, and EBOS- RVII codes.

Adaption of E-Qual III to create EBOS-RVI. Two graduate students and a principal researcher from the EIFEL Project team developed the EBOS-RVI by adapting the E-Qual III. During the adaption process, the team refined definitions for some of the engagement codes in the E-QUAL III, revised the labels of engagement categories and engagement partners, created new engagement codes that were not addressed in the

E-QUAL III, combined some engagement codes included in the E-QUAL III, developed additional decision rules and exemplars for engagement behavior codes, revised coding procedures from momentary time sampling to partial interval, and developed a manual and training module to enhance utility of the measure and evaluation of inter-observer agreement. For example, the team divided the “differentiated behavior” code on the E-Qual III into two different codes on EBOS-RVI to discriminate a child’s non-verbal responses to adults’ or peers’ requests, questions, or directions from a child’s non-verbal initiations or actions. As shown in Table 3-11, the new codes were characterized as differentiated responding and differentiated action.

As part of the adaptation, the researchers combined undifferentiated and casual attention codes from E-Qual III into an “undifferentiated” code in EBOS-RVI, because behaviors described in both engagement behavior categories were very similar to one another and hard to differentiate reliably during pilot work on the EBOS-RVI. In addition, labels for two engagement behavior codes and one engagement partner code were changed so the new labels were more closely aligned with engagement behaviors observed. For example, the “symbolic behavior” code in E-Qual III was replaced with “representational” in EBOS-RVI, while “encoded behavior” was changed to “social.”

Rather than momentary time sampling (MTS) at the end of a 15-sec interval to select an engagement code associated with the most advanced engagement behavior observed during the pre-specified moment (E-Qual III), the EBOS-RVI uses partial interval recording (PIR). This involves recording the code associated with the most advanced engagement behavior observed at any point during an interval. The benefits and limitations of both MTS and PIR have been discussed in the literature (e.g., Green, McCoy, Burns, & Smith, 1982; Harrop & Daniels, 1986; Meany-Daboul, Roscoe, Bourret, & Ahearn, 2007; Powell, Martindale, & Kulp, 1975). Meany-Daboul et al.'s comparison of the two methods showed treatment analysis interpretations for MTS were slightly more likely to match continuous duration coding, while PIR interpretations were slightly more likely to match continuous frequency coding. Given the interest in examining frequency of engagement behaviors in relation to frequency of teachers' implementation of EILTs, PIR was chosen for the EBOS.

Prior to the present study, the EIFEL project team trained five coders to coding reliability criterion of 80% mean agreement across engagement behavior codes. Across the five coders and four training sessions, the mean inter-observer agreement was 83.2% (*SD* = 10.2) for engagement behavior, 86.8% (*SD* = 7.3) for engagement partner, and 97.5% (*SD* = 5.5) for challenging behavior. These five trained coders coded the videotapes gathered during the Phase III potential efficacy group experimental trial. Throughout the potential efficacy trial, a total of 397 sessions (i.e., 10-15 minute videotapes) and 140 reliability sessions (35%) were coded. The mean inter-observer agreement was 81.1% (*SD* = 7.8) for engagement behavior, 84.0% (*SD* = 7.7) for engagement partner, and 99.5% (*SD* = 1.4) for challenging behavior (Snyder et al., 2010).

Revision and refinement of EBOS-RVI to develop EBOS-RVII. For the purpose of the present study, EBOS-RVI was revised and refined by the student investigator and the principal investigator from the EIFEL project based on data collected and analyzed as part of the EIFEL Phase III potential efficacy study. The revised version of the system is known as the EBOS-RVII. During this process, definitions, clarifications, and exemplars for the engagement behavior and engagement partner codes were refined, a new engagement behavior code was created, labels for two engagement behavior codes were changed, two new engagement partner modifier codes were created, and the manual and training module were revised. Table 3-11 shows the comparison of E-Qual III, EBOS-RVI, and EBOS-RVII codes.

As part of the refinement process, the definition for the representational engagement behavior code in EBOS-RVI was revised and behaviors associated with the code were extended. As shown in Table 3-9, the new code was labeled "sophisticated" in the EBOS-RVII. The sophisticated engagement behavior code includes behaviors associated with the representational code (e.g., talking about stimuli that are not present in the immediate environment or talking about past or future events) as well as representational behaviors related to writing, drawing, or painting.

Minimal revisions were made to the definition of social engagement. For example, verbal behaviors that would be categorized as persistent in EBOS-RVI (e.g., a child's attempts to gain attention of a peer by calling her name twice) are included under the social engagement behavior code in the EBOS-RVII. In addition, two new engagement partner modifiers for the social engagement code (i.e., peer-content and adult-content) were created to capture social interactions between a target child and a peer or an adult that focus on pre-academic skills.

As shown in Table 3-9, a new engagement behavior code, "combinatorial" was operationally defined and added to the EBOS-RVII, while two engagement behavior codes included in the EBOS-RVI (i.e., persistent and constructive) were not included in the EBOS-RVII. Persistent and constructive engagement behavior codes were not included because behaviors under these categories tended to occur only during certain types of classroom activities. Although persistent and constructive engagement is not explicitly named in the EBOS-RVII, engagement behaviors that meet the definition for these EBOS-RVI codes are included under either the combinatorial or the social engagement behavior code on the EBOS-RVII.

The definition of the differentiated action code in EBOS-RVI was narrowed as several behaviors that required different levels of abilities were included under this engagement behavior code. As shown in Table 3-11, the new code with the revised definition was labeled “differentiated” in the EBOS- RVII. Some behaviors previously categorized under the “differentiated action” engagement behavior code on the EBOS-RVI were included under combinatorial engagement behavior code on the EBOS-RVII (e.g., a child plays with two or more objects by combining them).

Behaviors associated with the differentiated responding and focused attention codes in the EBOS-RVI were collapsed into one code as behaviors associated with the two codes were similar, and the new code was labeled “attentional” in EBOS- RVII, Also, additional clarifications were added to definitions for the undifferentiated engagement behavior code and the non-engaged code.

Quantifying Engagement Behaviors and Partners

Child-initiated activities categorized as social-oriented and materials-oriented were coded by the student investigator, using the EBOS-RVII (EIFEL Project, 2012) to quantify engagement behavior and engagement partners for each child participant across each experimental phase. EBOS-RVII codes are applied using a partial-interval (15 sec) coding system. In this system, an observer watches the target child’s engagement behaviors during each interval (15 sec), selects the most advanced engagement behavior code based on the behaviors the target child exhibits during the interval, codes the corresponding engagement partner for the engagement behavior category selected during the interval, and selects a challenging behavior code if challenging behavior is observed to occur during the interval. The same procedures are repeated until the last interval is coded for an observation session. At the end of each observation session, the number of intervals in which each engagement behavior code occurs are summed and divided by the total number of intervals in the session to obtain a percentage score.

In the present study, the Noldus Observer® XT 10.5 observational coding software program was used with the EBOS-RVII codes. The software automatically stops the video at the end of each interval to allow the observer to select the engagement behavior and partner codes as well as a challenging behavior code (if it occurs). When the codes for an interval are selected, the observer activates the play icon in the Observer® XT 10.5 screen and repeats the process for each 15-sec interval until the end of the videotape.

Summary data obtained using the EBOS-RVII is the percentage of intervals in which a specific engagement behavior or partner is coded during an activity (observation). After each child-initiated activity was coded, this percentage was calculated for each engagement behavior and partner. The percentages for a specific engagement behavior and partner were then averaged over the number of activities included in each experimental phase to calculate a mean percentage phase score. A mean percentage phase score for each engagement behavior and partner code was separately calculated for both social-oriented and materials-oriented activities, for only social-oriented activities, and for only materials-oriented activities.

Conducting Reliability Observations for EBOS- RVII

The student investigator in the present study was the primary coder for the EBOS-RVII. The secondary coder, who also conducted reliability observations for activity classification, was trained on the EBOS-RVII and conducted reliability sessions for 35% of the total number of activities included in the present study. This coder, (a second-year master's student in special education) was also trained on EBOS-RVI and was familiar with the system.

In the present study, written training procedures developed by the EIFEL project team for the EBOS-RVII were used to train coders and to establish coding reliability standards. The secondary coder was required to complete the training procedures specified in the EBOS-RVII manual and to meet inter-observer agreement standards using practice videotapes before coding videotapes included in the present study. Coder training included (a) reading the codebook for the EBOS-RVII; (b) reviewing the EBOS-RVII codes, code definitions, clarifications, examples, and non-examples; (c) completing two practice coding using videotapes developed for training purposes; and (d) comparing practice codes to an expert standard. During training, the coder received supportive and corrective feedback from the student investigator about the EBOS-RVII, including clarification about codes or discussion of established criteria for each code. Following training, the coder was given seven video clips to code. Each video clip captured a child-initiated activity, followed the child throughout the activity and was 5-10 minutes in length. The coder had to reach at least 80% agreement with the expert standard across the five video clips for engagement behavior, engagement partner, and challenging behavior to meet established coding reliability criterion.

To establish expert standards for the training videos, the student investigator and the principal investigator from the EIFEL project coded two practice and seven training video clips individually and compared their codes. Disagreements were resolved by reviewing the video clips simultaneously, discussing the observed child engagement behaviors, and reviewing the EBOS-RVII manual. Once disagreements were resolved, a final coding file was created in the Noldus Observer® XT 10.5. This final coding file was used to check the agreement between the expert standard and coding conducted by the secondary coder, and to calculate inter-observer agreement percentage scores as part of establishing coding reliability following training.

Inter-observer agreement for EBOS-RVII. Following training the secondary coder conducted reliability observation for 35% the total number of social-oriented and materials-oriented activities included in the present study. These activities were selected randomly across phases of the Phase II feasibility study and participants. For example, if there were 9 social-oriented and materials-oriented activities in a baseline phase for a child, 3 of these were randomly selected to conduct reliability observations. Inter-observer percentage agreement scores and kappa scores (Cohen, 1960) were calculated and reported by each participating teacher-child dyad. In addition, mean inter-observer occurrence agreement and occurrence plus nonoccurrence agreement were calculated and reported for each engagement behavior and partner code separately. Inter-observer percentage agreement score was calculated for each session using the following formula: [total number of intervals in which both coders selected the same engagement code/total number of intervals in an observation session] X 100. Occurrence agreement was calculated using the following formula: [total number of intervals both coders selected a coding category /total number of intervals the same coding category was selected by at least one of the coders] X 100. Occurrence plus nonoccurrence agreement was calculated using the following formula: [total number of occurrence agreement + total number of nonoccurrence agreement/total number of intervals] X 100.

Extracting Teacher Embedded Instruction Learning Trials Implementation Data

EIOS-RVI data for the child-initiated activities that met the criteria for social-oriented and materials-oriented activities were extracted from the EIOS-RVI database to examine the relationships between the percentage and rate of teachers' accurate use of EILTs and child engagement behaviors. Data on the frequency of total (number of procedurally correct plus procedurally incorrect EILTs) and procedurally correct EILTs implemented by each teacher during each child-initiated activity that met the criteria for social-oriented or materials-oriented activity and the length of each of these activities were extracted from the Phase II feasibility study database and entered into a Microsoft Excel spreadsheet. These frequency data were used to calculate the percentage correct score for each teacher's implementation of EILTs during each child-initiated activity. In addition, using the activity length data, a rate (per minute) score for correctly implemented EILTs during each child-initiated activity was calculated. Data by activity (session) were then used to calculate mean percentage correct and rate phase scores based on the total number of social-oriented and material-oriented activities included in each experimental phase.

Graphing Child Engagement and Teacher Embedded Instruction Implementation Data

The mean percentage phase scores for each child engagement behavior code were graphed in the same graph along with the mean percentage of teacher's correct implementation of EILTs. Graphs were created for social-oriented and materials-oriented activities together as well as separately (Figures 4-1, 4-3, 4-5, and 4-7). The same procedures were used to graph data on engagement partners (Figures 4-2, 4-4, 4-6, and 4-8). Data on the mean rate of correctly implemented EILTs were graphed separately by activity type for each teacher (Figure 4-9).

Conducting Data Analyses

Once the data were graphed, changes in child engagement behaviors and partners in relation to baseline levels were descriptively investigated. Next, changes in teacher's implementation of EILTs across experimental phases in relation to baseline were descriptively examined. Finally, the corollary relationship between changes in child engagement behaviors and partners and changes in teacher's implementation of EILTs across experimental phases were descriptively evaluated. Descriptive evaluations of the corollary relationships between the changes in child engagement behaviors and teacher's implementation of EILTs were supported with Spearman's rank-order correlation analyses (Spearman, 1904). A series of two rank-order correlation analyses were conducted. The first analysis focused on investigating the association between child engagement behaviors and teacher EILTs implementation across baseline, training, post-training, and on-site coaching (r_{oc}). The second analyses focused on examining association between the two variables across baseline, training, post-training, and self-coaching (r_{sc}). Child engagement and teacher implementation data from the maintenance phase were not included in the rank- order correlation analyses. The same data analytic procedures were used to examine the relationships between each engagement partner code and teachers' implementation of EILTs.

Table 3-1. Characteristics of teacher participants

Participant	Gender	Age (years)	Ethnicity	Teaching experience (years)	Highest degree obtained
Nancy	Female	55	Caucasian	23	Master's
Betsy	Female	56	Caucasian	34	Master's
Kim	Female	47	Asian-American	9	Bachelor's
Diana	Female	45	Caucasian	16	Bachelor's

Table 3-2. Characteristics of child participants

Participant	Gender	Age (month)	Ethnicity	AI score[a] (Mean)	Functional limitations[b]
Devon	Male	40	African-American	44 (2.3)	Behavior, intellectual functioning, limbs, intentional communication, and tonicity
Arlene	Female	62	Hispanic	27 (1.4)	Behavior, intellectual functioning, and intentional communication
Brian	Male	53	Caucasian	54 (2.8)	Behavior, limbs, intentional communication, tonicity, and integrity of physical health
Jessica	Female	65	Caucasian	39 (1.9)	Behavior, intellectual functioning, intentional communication, and integrity of physical health

Note. Possible score on ABILITIES Index ranges from 0 to 114. Response scale ranges from 1 = *no limitations* to 6 = *extreme limitations in function*.
[a] AI = ABILITIES Index.
[b] Functional limitations were identified by ABILITIES Index scores of 3 or more.

Table 3-3. Content of four embedded instruction for early learning *Tools for Teachers* modules

Overview Module
Introduction
Steps of embedded instruction
Key components of embedded instruction
Key components of child learning cycle
The five types of instructional procedures and key features
Relationship between instructional procedures and learning cycle
Phases of learning: acquisition, fluency, maintenance, and generalization
What we Teach
Curriculum alignment
Key features of learning targets for embedded instruction
Where we Teach
Identifying on-going activities, routines, and transitions for meaningful instruction
How we Teach
Antecedents-Behaviors-Consequences
Complete Learning Trials
Incomplete Learning Trials
How complete learning trials lead to learning
Using complete learning trials in the classroom
Massed and distributed trials
Planning Module
What we Teach
How to identify learning targets
Functional, generative, and measurable learning targets
How to break down IEP goals into learning targets
Bottom-up approach to identifying goals
Relationship between functional, generative, and measurable learning targets and embedded instruction
When we Teach
Making and using a classroom activity matrix
Concepts of distributed and massed learning trials
Using distributed learning trials to provide sufficient learning opportunities
Using massed learning trials to provide sufficient learning opportunities
Making and using an individual activity matrix
Making and using an activity matrix for a scheduled classroom activity
Using activity matrices to link learning targets to the general preschool curriculum
How we Teach
Instructional procedures

Table 3-3. Continued

Developing instructional plans
Selecting antecedents
Implementing Module
Targeted Curricular Modifications
Differences between universal and targeted curricular modifications
When to use targeted curricular modifications
How to use targeted curricular modifications
Naturalistic Instructional Procedures
Incidental teaching
When to use incidental teaching
How to use incidental teaching
Naturalistic time delay
When to use naturalistic time delay
How to use naturalistic time delay
Prompt/Prompt Fading
Different types of prompts
When to use different prompts
When to use least-to-most prompting
How to use least-to-most prompting
When to use most-to-least prompting
How to use most-to-least prompting
Importance of fading prompts
How to fade prompts
Selecting Instructional Procedures
Linking appropriate instructional procedures to child's learning target
Planned instructional procedures
Antecedents and Consequences
Logically occurring antecedents
Planned antecedents
Logically occurring consequences
Planned consequences
Planning antecedents and consequences
Fidelity of Implementation
Importance of implementation fidelity
Considerations for checking implementation fidelity
Using a fidelity checklist
Spontaneous Learning Opportunities
Recognizing and capitalizing on spontaneous learning opportunities

Table 3-3. Continued

Evaluating Module
Introduction
Key questions for evaluating embedded instruction
Importance of evaluating embedded instruction
Am I Doing It?
Importance of evaluating implementation of embedded instruction
Five steps of evaluating embedded instruction
Reviewing planned vs. implemented complete learning trials
Importance of collecting data on implementation
How often data on implementation should be collected
Methods of collecting data on implementation
Using graphs to compare planned vs. implemented complete learning trials
Methods for comparing planned vs. implemented complete learning trials
Importance of examining quality of implementation
How to make decisions about implementation of embedded instruction based on data
Is it Working?
Considerations for determining whether embedded instruction is working
Dimensions of child behavior
How dimensions of child behavior determine data collection
Methods of data collection for monitoring child progress
Determining child how often to collect data on child performance
Determining when to collect data on child performance
Determining where to collect data on child performance
Determining who will collect data on child performance
Collecting data on child performance and implementation at the same time
Displaying data on child performance
Summarizing data on child performance
Do I Need to Make Changes?
Interpreting data on implementation of embedded instruction and child performance
Using data on implementation and child performance to inform future decisions about embedded instruction practice

Table 3-4. Activity classification coding system codes and descriptions

Code	Description
Social Behavior	This code is selected when the target child and a peer or an adult are in the frame and interacting by playing with/manipulating the same material (or set of materials), sharing or exchanging materials, engaging in verbal or non-verbal communication exchanges, exhibiting joint attention to the same materials, or exhibiting turn-taking behaviors
Material Behavior	This code is selected when the target child is interacting with classroom materials without interacting with a peer or adult
Other Behavior	This code is selected when the target child is not interacting with peers, adults, or classroom materials
Can't Observe	This code is selected when the target child is out of video frame or when target child is in the video frame but what he/she is doing is not visible

Table 3-5. Criteria for classifying activities in the Activity Classification Coding System

Category	Criteria
Social-oriented activity	a. Total percentage of social behavior code activated during the coded child-initiated activity must be 60% or higher OR b. Total percentage of social behavior code activated during the coded child-initiated activity must be at least 50% and there must be at least a 15% difference between the percentage of social behavior code activated and the percentage of the second highest behavior code activated (i.e., material behavior or other behavior)
Materials-oriented activity	a. Total percentage of material behavior code activated during the coded child-initiated activity must be 60% or higher OR b. Total percentage of material behavior code activated during the coded child-initiated activity must be at least 50% and there must be a 15% difference between the percentage of material behavior code activated and the percentage of the second highest behavior code activated (i.e., material behavior or other behavior)
Other activity -1	a. Total percentage of other behavior code activated during the coded child-initiated activity must be at least 41%
Other activity -2	a. Activities that cannot be categorized as social-oriented, materials-oriented, or other activity-1 based on the criteria stated above should be categorized as other 2

Note. During coding for activity classification, behavior codes were activated based on the definitions provided in Table 3-4.

Table 3-6. Information about the child-initiated activities included in the present study

Variable	Dyad 1	Dyad 2	Dyad 3	Dyad 4	Total
Total # of CI activities	86	97	62	99	344
CI activities (4 min or longer)					
Frequency	55	82	50	82	269
Mean length	10 min	11 min	14 min	15 min	11 min
Mean # of intervals	40	44	56	60	44
Social and materials-oriented activities					
Frequency	45	61	30	55	191
Mean length	10 min	11 min	14 min	10 min	11 min
Mean # of intervals	40	44	56	40	44
Social-oriented activities					
Frequency	18	36	16	37	107
Mean length	9 min	10 min	15 min	10 min	11 min
Mean # of intervals	36	40	60	40	44
Materials-oriented activities					
Frequency	27	25	14	18	84
Mean length	11 min	13 min	13 min	9 min	11 min
Mean # of intervals	44	52	52	36	44

Note. CI = Child-initiated, min = minute.

Table 3-7. Number of activities across experimental phases by participant and activity type

Participant and Activity Type	Baseline	Training	Post-Training	On-site Coaching	Self-Coaching	Maintenance	Total
Child-Teacher Dyad 1							
Social- and Materials-oriented	8	11	NA	11	8	7	45
Social-oriented	4	2	NA	7	3	2	18
Material-oriented	4	9	NA	4	5	5	27
Child-Teacher Dyad 2							
Social- and Materials-oriented	6	10	18	18	8	1	61
Social-oriented	5	7	9	12	3	0	36
Material-oriented	1	3	9	6	5	1	25
Child-Teacher Dyad 3							
Social- and Materials-oriented	7	7	22	11	8	NA	55
Social-oriented	6	6	14	9	2	NA	37
Material-oriented	1	1	8	2	6	NA	18
Child-Teacher Dyad 4							
Social- and Materials-oriented	3	5	16	6	NA	NA	30
Social-oriented	1	3	8	4	NA	NA	16
Material-oriented	2	2	8	2	NA	NA	14

Note. NA is used when an experimental phase was not implemented for a teacher-child dyad during the Phase II feasibility study.

Table 3-8. Percent agreement data for activity classification

	Activity			Agreement (A) and Disagreement (D)		
Participant	# by Primary Coder	# by Secondary Coders	% for Reliability	A	D	%
Dyad 1	55	14	26	12	2	86
Dyad 2	82	22	27	20	2	91
Dyad 3	50	13	26	13	0	100
Dyad 4	82	21	26	20	1	95
Overall	269	70	26	65	5	93

Table 3-9. EBOS-RVII engagement behavior codes and descriptions

Engagement Behavior Code	Description
Sophisticated (SE)	The target child shows symbolic use of objects or language[a] (verbal or sign language)
Social (SO)	The target child shows use of conventional language[b] (verbal or sign), which is context-bound and dependent on stimuli present in the immediate environment, to initiate or respond to an adult or peer
Combinatorial (CE)	The target child combines two or more objects performing at least two sequential actions with the objects
Differentiated (DE)	The target child shows functional use of object(s), verbal or motor imitation, object exchange or retrieval, use of non-conventional vocalizations or gestures, or self-talk about stimuli in the environment
Attentional (AE)	The target child shows sustained listening to or watching of people or objects in the environment or follows a direction without a verbal response
Undifferentiated (UE)	The target child shows repetitive behavior that does not change in response to distinct features of environmental stimuli or feedback
Nonengaged (N)	Category code used when the target child's observed behavior(s) during a 15-sec interval do not meet the definitions for any other engagement category OR the target child exhibits challenging behavior for the entire 15-sec interval

Note. Operational definitions and examples of behaviors are available in the EBOS-RVII manual.
[a] For a child's use of verbal or sign language to be coded sophisticated, (a) it has to focus on stimuli that are not present in the immediate environment, past events, or future events, or (b) it must be used within the context of a pretend play scenario.
[b] For a child's use of verbal or sign language to be coded social, the child must initiate interactions with or respond to an interaction initiated by an adult or peer about stimuli present in the immediate environment.

Table 3-10. EBOS-RVII engagement partner and challenging behavior codes and abbreviated descriptions

Code	Description
Engagement Partner	
Peer (P)	This code is used when the target child is engaged with a peer or group of peers
Peer-Content (PC)	This code is used when the target child is engaged with a peer or group of peers in a social interaction that focuses on pre-academic skills
Adult (A)	This code is used when the target child is engaged with an adult or group of adults in the classroom (e.g., teacher, therapist, paraprofessionals, parents, or coach)
Adult-Content (AC)	This code is used when the target child is engaged with an adult or group of adults in a social interaction that focuses on pre-academic skills
Object (O)	This code is used when the target child is engaged with an object or group of objects (e.g., toy, classroom materials, utensil)
Self (S)	This code is used when the target child is engaged but not with adults or peers
Challenging Behavior	
Low Intensity	Challenging behaviors that distract a target child, peers, or a teacher from activities, routines, or instruction (e.g., not following adults directions, talking to a peer when not permitted, taking a toy from a peer without physical harm) and do not result in physical harm to people or property
High Intensity	Challenging behaviors that disrupt the flow of classroom activities, routines, or instruction (e.g., verbal threats, aggression, profanity) and may result in physical or emotional harm that requires adult intervention

Note. Operational definitions and examples of behaviors are available in the EBOS-RVII manual.

Table 3-11. Comparison of E-QUAL III, EBOS-RVI, and EBOS-RVII codes

E-QUAL III (McWilliam & de Kruif, 1998)	EBOS-RVI (EIFEL Project, 2010)	EBOS-RVII (EIFEL Project 2012)
	Engagement Behavior Category	
Persistent	Persistent	Sophisticated
Symbolic	Representational	Social
Encoded	Social	Combinatorial
Constructive	Constructive	Differentiated
Differentiated	Differentiated responding	Attentional
Focused	Differentiated action	Undifferentiated
Undifferentiated	Focused attention	Nonengaged
Casual attention	Undifferentiated	
Nonengaged	Nonengaged	
	Engagement Partner	
Kid	Peer	Peer
Grown-up	Adult	Peer-Content
Object	Object	Adult
Self, body parts	Self	Adult-Content
		Object
		Self

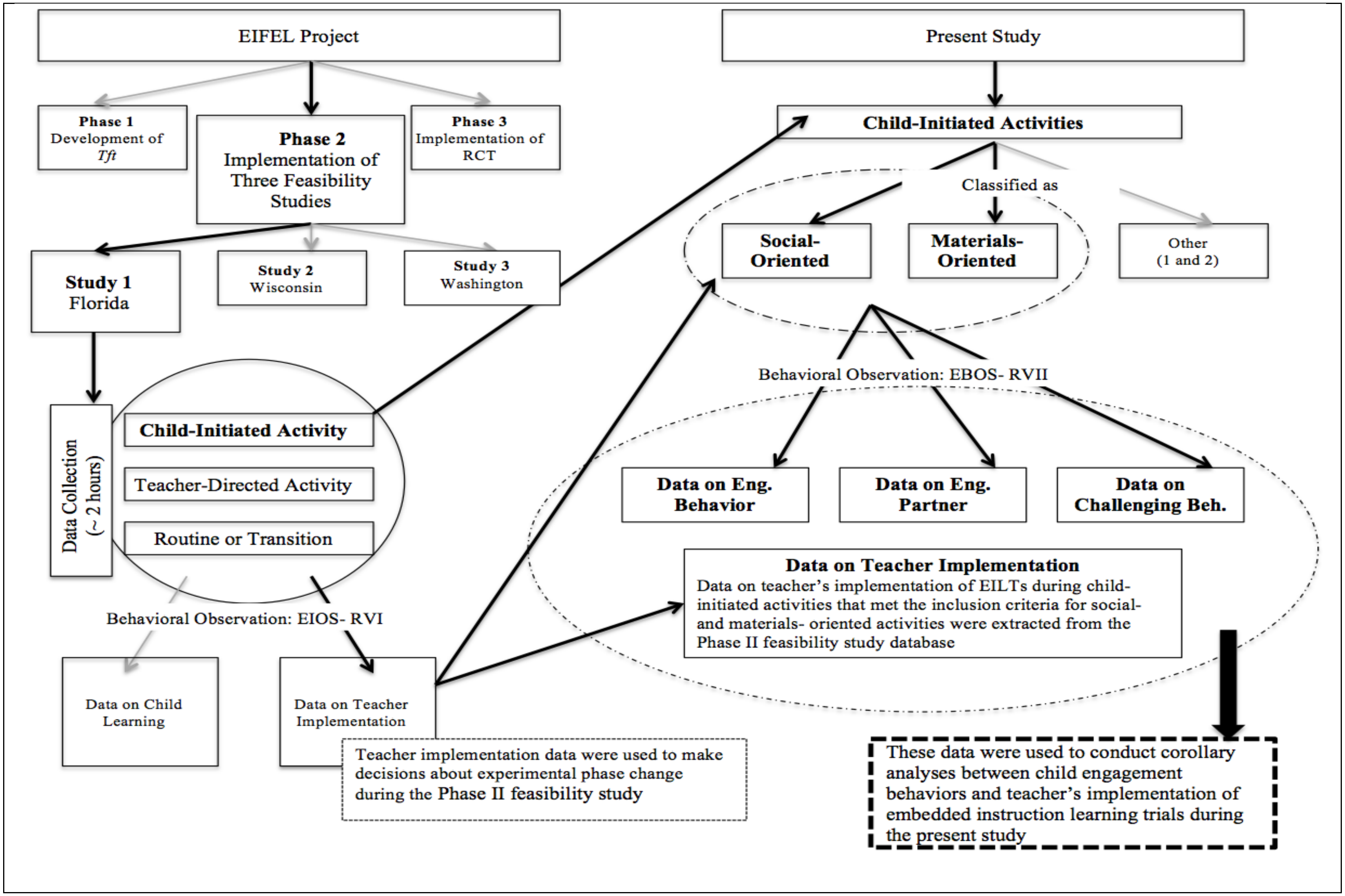

Figure 3-1. Illustration of how data for the present study were obtained from the Phase II feasibility study database.

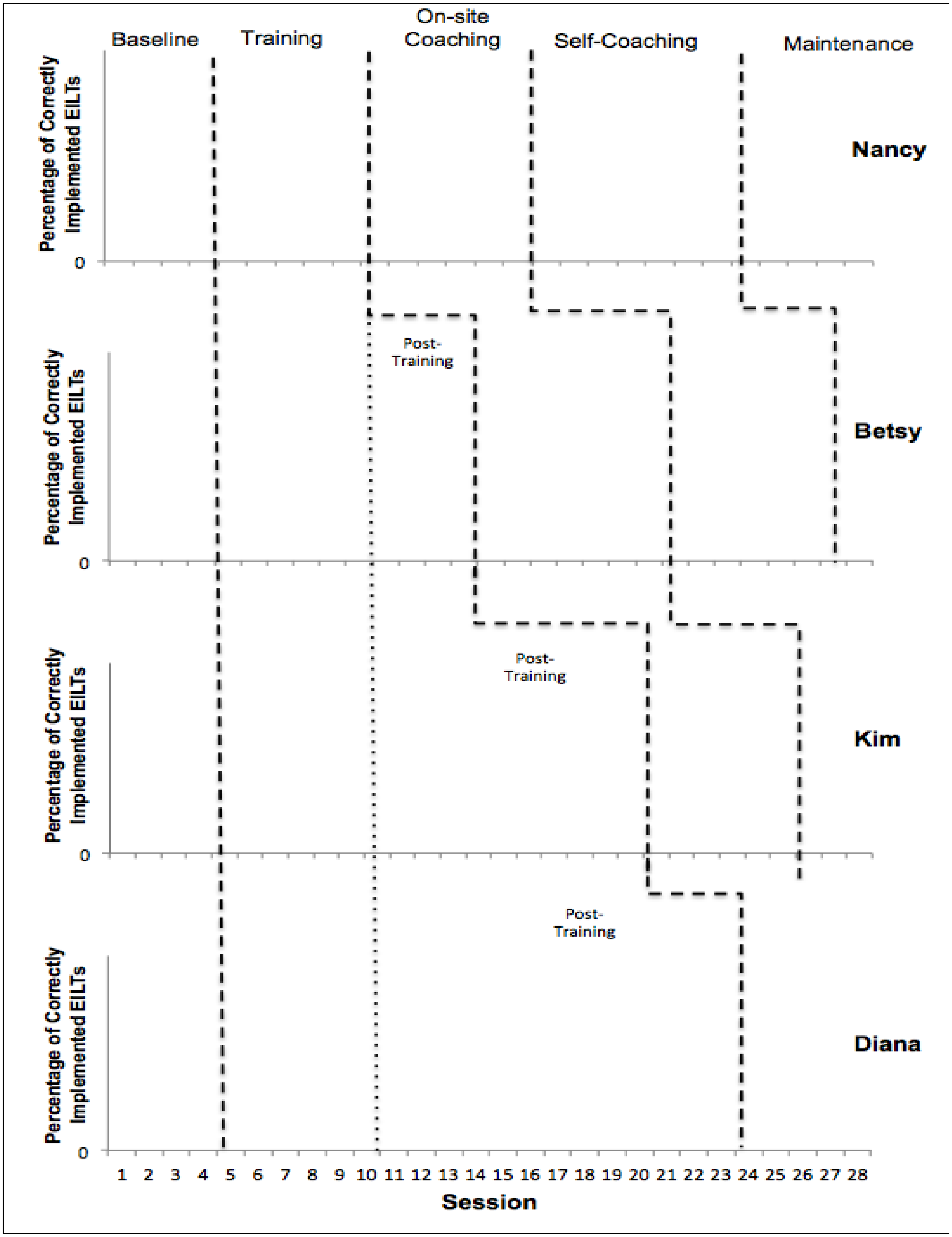

Figure 3-2. Experimental phases of the Phase II feasibility study

CHAPTER 4
RESULTS

The purpose of the present study was to examine corollary relationships between child engagement behaviors and preschool teachers' implementation of embedded instruction learning trials (EILTs) during child-initiated, social-oriented and materials-oriented activities. These relationships were examined across experimental phases of a single-subject experimental study conducted as part of a larger study focused on examining the impact of a professional development intervention on preschool teachers' implementation of embedded instruction. In the present study, three research questions were addressed:

1. What changes occurred in observed child engagement behaviors during social-oriented and materials-oriented child-initiated activities across experimental phases?
2. Did teachers' frequent and accurate use of embedded instruction learning trials change during social-oriented and materials-oriented child-initiated activities across experimental phases?
3. Were there corollary relationships between child engagement behaviors and teacher implementation of embedded instruction learning trials during social-oriented and materials-oriented child-initiated activities across experimental phases?

As described in Chapter 3, data for the present study were obtained by (a) using videotapes collected as part of the single-subject experimental study and coding children's engagement behaviors during child-initiated activities that met the inclusion criteria for social-oriented and materials-oriented activities, and (b) extracting data on teachers' implementation of EILTs during these activities from the single-subject experimental study database. Children's engagement behaviors were coded using the Engagement Behavior Observation System-Research Version II (EBOS-RVII, EIFEL Project, 2012). Teachers' implementation of EILTs was quantified using the Embedded Instruction Observation System-Research Version I (EIFEL Project, 2008a).

Results are presented in four sections. The first section focuses on the reliability of observations conducted to evaluate child engagement behavior and engagement partner. Inter-observer agreement scores for EBOS-RVII engagement behavior, engagement partner, and challenging behavior codes are reported for each code separately as well as at the individual teacher-child dyad level. In the next three sections, results are described with respect to each research question.

Inter-observer Agreement for Engagement Coding

A secondary coder was trained on the EBOS-RVII to conduct reliability observations for 35% of the total number of social-oriented and materials-oriented activities included in the present study (66 of 191 activities). The videotaped activities used for secondary coding were randomly selected by experimental phase, participant, and activity type.

During training on the EBOS-RVII, the secondary coder reached the criterion level of performance (i.e., at least 80% agreement with the expert standard across five video clips) in seven sessions. Across the seven training sessions, mean inter-observer percentage agreement was 84% (range = 71% - 89%).

For coding of study videotapes, mean inter-observer percentage agreement and kappa scores were calculated and reported overall and for each participating teacher-child dyad. Overall, the mean inter-observer agreement percentage score for engagement behaviors was 85% (72% - 100%) and the mean kappa score was .74 (range = .45 - 1.00) across all sessions and dyads. Overall, the mean inter-observer agreement percentage score for engagement partners was 81% (64% - 100%) and the mean kappa score was .70 (range = .40 - 1.00) across all sessions and dyads. Table 4-1 shows the inter-observer agreement percentage and kappa scores for each child-teacher dyad. Mean occurrence and occurrence plus nonoccurrence agreements for each EBOS-RVII code are shown in Table 4-2.

Research Question 1: Changes in Observed Child Engagement

This section describes the results of the present study with respect to observed child engagement behaviors and partners as well as challenging behaviors. Results are presented for each child under three subsections: engagement behaviors, engagement partners, and challenging behaviors. In the engagement behaviors and partners subsections, results for each engagement behavior and partner code are presented separately and by activity type.

The EBOS-RVII is a partial-interval (15 sec) behavior observation system. The engagement behavior category code associated with the most advanced engagement behavior observed at any point during an interval is selected and the corresponding engagement partner for the engagement behavior category selected during the interval is also recorded. Percent-interval data reported for each engagement behavior code reflects the most advanced engagement behavior that occurred during an interval. Percentage data reported for each engagement partner are based on the engagement behavior code selected during the interval. The hierarchical nature of EBOS-RVII behavior codes and use of partial-interval coding means the child might have demonstrated less advanced engagement behaviors and might be engaged with other engagement partners corresponding with these less advanced engagement behaviors during an interval. These less advanced engagement behaviors and different engagement partners are not captured by EBOS-RVII, and, therefore, are not reflected in the data reported.

Child engagement data were quantified for each coded child-initiated, social-oriented or materials-oriented activity as the percentage of intervals in which a specific engagement behavior occurred. These data were averaged over the total number of both social-oriented and materials-oriented activities, the total number of activities classified as social-oriented, and total number of activities classified as materials-oriented within each experimental phase to calculate a mean percentage of intervals score for each engagement code by type of activity. Percentage interval data reported for challenging behaviors are based on the number of intervals in which challenging behavior was observed divided the total number of intervals in an observation. Mean percentage score changes in engagement behavior, engagement partner, and challenging behavior across experimental phases were evaluated relative to baseline levels.

Child 1: Devon - Engagement Behaviors

Sophisticated engagement. The mean percentage of intervals Devon exhibited sophisticated engagement behaviors during both social-oriented and materials-oriented activities was less than 1.5% across study phases, except for maintenance. During maintenance, sophisticated engagement occurred for 8% of coded intervals (Table 4-3). Similarly, during social-oriented activities, Devon did not demonstrate any sophisticated engagement behaviors across phases of the study, except during maintenance (*M* = 14%; Table 4-4). As shown in Table 4-5, in materials-oriented activities, Devon demonstrated sophisticated engagement behaviors during the following phases: on-site coaching (*M* = 3%), self-coaching (*M* = 1%), and maintenance (*M* = 6%).

The percentage of intervals in which Devon exhibited sophisticated engagement behaviors during maintenance was somewhat higher for social-oriented versus materials-oriented activities (*M* social = 8% versus *M* material = 6%). In addition, he exhibited low levels of sophisticated engagement behaviors in materials-oriented activities during the on-site and self-coaching phases compared to no sophisticated engagement behaviors during these phases in social-oriented activities.

Social engagement. Across both social-oriented and materials-oriented activities, compared to baseline (*M* = 10%), Devon's social engagement increased slightly during training (6% increase, *M* = 16%), and substantially during on-site coaching (38% increase, *M* = 48%), self-coaching (24% increase, *M* = 34%), and maintenance (19% increase, *M* = 29%; Table 4-3).

Compared to baseline (*M* = 12%), the mean percentage of intervals Devon demonstrated social engagement behaviors during activities classified as social increased significantly across experimental phases: training (31% increase, *M* = 43%), on-site coaching (46% increase, *M* = 58%), self-coaching (42% increase, *M* = 54%), and maintenance (27% increase, *M* = 39%; Table 4-4).

Across activities classified as materials-oriented, Devon demonstrated social engagement behaviors, on average, for 9% and 10% of the baseline and training intervals, respectively. Compared to baseline, the percentage of intervals in which he exhibited social engagement behaviors during materials-oriented activities increased considerably during on-site coaching (21% increase, *M* = 30%), self-coaching (13% increase, *M* = 22%), and maintenance (15% increase, *M* = 24%; Table 4-5).

Devon's social engagement during baseline was comparable across social-oriented and materials-oriented activities and it showed an ascending trend across the phases of the study during both activity types. However, social engagement during on-site coaching and self-coaching was higher for social-oriented activities, when compared to materials-oriented activities.

Combinatorial engagement. Across both social-oriented and materials-oriented activities, Devon showed moderately high levels of combinatorial engagement behaviors during baseline (*M* = 48% of intervals) and training (*M* = 53% of intervals) phases. Compared to baseline, Devon's combinatorial engagement decreased by 27% during on-site coaching (*M* = 21% of intervals) and by 12% during self-coaching (*M* = 36% of intervals). During maintenance, the percentage of intervals in which he exhibited combinatorial engagement behaviors increased to his baseline level (*M* = 47%; Table 4-3).

Devon's level of combinatorial engagement was moderately high across baseline (*M* = 47% of intervals) and training (*M* = 42% of intervals) phases during activities classified as social. Compared to baseline, the percentage of intervals in which Devon was engaged in combinatorial behaviors decreased considerably during on-site coaching (31% decrease, *M* = 16%), self-coaching (30% decrease, *M* = 17%), and maintenance (14% decrease; *M* = 33%; Table 4-4).

Similarly, across activities classified as materials-oriented, Devon exhibited relatively high levels of combinatorial engagement during baseline (*M* = 49% of intervals) and training (*M* = 56% of intervals). Compared to baseline, the percentage of intervals in which Devon was engaged in combinatorial behaviors decreased noticeably during on-site coaching (19% decrease, *M* = 30%) and a little during self-coaching (2% decrease, *M* = 47%). During maintenance, his level of combinatorial engagement increased by 4%, when compared to baseline (*M* = 49%; Table 4-5).

Devon's level of combinatorial engagement during baseline and training phases was moderately high and comparable across activity types. Across subsequent phases of the study, Devon's combinatorial engagement showed a generally descending trend during social-oriented activities. Across materials-oriented activities, the initial decrease in combinatorial engagement during on-site coaching was followed by increases during self-coaching and maintenance. Devon's level of combinatorial engagement during these last two phases was very similar to his baseline and training levels.

Differentiated engagement. Across both social-oriented and materials-oriented activities, the mean percentage of intervals Devon exhibited differentiated engagement behaviors decreased somewhat across phases of the study. When compared to baseline (*M* = 29%), his level of differentiated engagement decreased by 3% (*M* = 26%) during training, 2% (*M* = 27%) during on-site coaching, 6% (*M* = 23%) during self-coaching, and 16% (*M* = 13%) during maintenance (Table 4-3).

Across activities classified as social, Devon's level of differentiated engagement was higher during baseline (*M* = 21%) than his level of differentiated engagement during subsequent phases, except during on-site coaching (*M* = 22%). The mean percentages of intervals Devon was engaged in differentiated behaviors was 14% of intervals during training, 16% of intervals during self-coaching, and 11% of intervals during maintenance (Table 4-4).

Similarly, across activities classified as materials-oriented, Devon's level of differentiated engagement was higher during baseline (*M* = 36%) than his level of differentiated engagement during subsequent phases, except during on-site coaching (*M* = 37%). The mean percentage of intervals Devon was engaged in differentiated behaviors was 28% during training, 26% during self-coaching, and 14% during maintenance (Table 4-5).

Changes in Devon's differentiated engagement behaviors across phases of the study followed a similar pattern for social-oriented versus materials-oriented activities. Compared to baseline, a decrease in Devon's differentiated engagement was observed during training. This was followed by an increase above the baseline level during on-site coaching and decreases below baseline levels during the two subsequent phases. Although the pattern of change across phases was similar, the mean percentage of intervals in which Devon exhibited differentiated engagement behaviors across study phases was always higher for materials-oriented activities when compared to social-oriented activities.

Attentional engagement. Across both social-oriented and materials-oriented activities, Devon exhibited attentional engagement behaviors for 12% of the intervals, on average, during baseline. The mean percentage of intervals he was engaged in attentional behaviors decreased by 9% during training (*M* = 3%) and remained under 4% until the end of the study (Table 4-3).

Across activities classified as social, Devon exhibited attentional engagement behaviors for 20% of intervals, on average, during baseline. The mean percentage of intervals in which attentional engagement occurred decreased by 19% during training (*M* = 1%) and remained under 6% of the intervals during subsequent phases of the study (Table 4-4).

During activities classified as materials-oriented, Devon exhibited attentional engagement behaviors for less than 5% of intervals, on average, across phases of the study. He did not exhibit any attentional behaviors during the on-site coaching phase of the study (Table 4-5).

The percentage of intervals in which Devon exhibited attentional engagement behaviors during baseline was notably higher for social- versus materials-oriented activities (*M* social = 20% versus *M* material = 4%). With the implementation of training, Devon's attentional engagement for social-oriented activities decreased to 1% of the intervals and remained comparable to his levels of attentional engagement for materials-oriented activities across phases of the study.

Undifferentiated engagement. During both social-oriented and materials-oriented activities, activities categorized as social, and activities categorized as materials-oriented, the mean percentages of intervals in which Devon exhibited undifferentiated engagement behaviors were less than 2% across all phases of the study (Tables 4-3, 4-4, and 4-5). Differences in the mean percentages of intervals in which he exhibited undifferentiated engagement behaviors across study phases during social-oriented versus materials-oriented activities were small and negligible.

Non-engagement. Similar to undifferentiated engagement, the mean percentages of intervals in which Devon was non-engaged were less than 2% across phases of the study during both social-oriented and materials-oriented activities (Table 4-3), activities classified as social-oriented (Table 4-4), and activities classified as materials-oriented (Table 4-5). Differences in mean percentages of intervals in which he was non-engaged across study phases during social-oriented versus materials-oriented activities were very small and negligible.

Child 1: Devon - Engagement Partners

Peer. Across both social-oriented and materials-oriented activities included in the present study, Devon's engagement with peers varied across experimental phases. When compared to baseline (*M* = 10%), the mean percentage of intervals Devon was engaged with peers decreased by 3% during training (*M* = 7%) and 5% during self-coaching (*M* = 5%) and increased for by 2% during on-site coaching (*M* = 12%) and 5% during maintenance (*M* = 15%). With respect to social interactions with peers focused on pre-academic skills, Devon was engaged with peers for less than 2% of the intervals across phases of the study, on average (Table 4-6).

Devon's levels of engagement with peers during activities classified as social also varied across phases of the study. Compared to baseline (*M* = 10%), the mean percentage of intervals Devon was engaged with peers increased by 5% during training (*M* =15%) and 13% during maintenance (*M* = 23%), and decreased by 4% during on-site coaching (*M* = 6%) and 9% during self-coaching (*M* = 1%). With respect to social interactions with peers focused on pre-academic skills, Devon was engaged with peers, on average, for less than 3% of the intervals across phases of the study (Table 4-7).

Across activities classified as materials-oriented, the mean percentage of intervals Devon was engaged with peers was 9% during baseline. When compared to baseline, his engagement with peers decreased by 3% during training (*M* = 6% of the intervals) and 2% during self-coaching (*M* = 7% of the intervals) and increased by 14% during on-site coaching (*M* = 23 % of the intervals) and 3% during maintenance (*M* = 12% of the intervals). With respect to social interactions with peers focused on pre-academic skills, Devon was engaged with peers for less than 2% of the intervals, on average, across phases of the study (Table 4-8).

Devon's level of engagement with peers during baseline was comparable across social-oriented and materials-oriented activities and it showed a variation across the phases of the study and across both activity types. While his levels of engagement with peers during on-site coaching and self-coaching were lower than his levels of engagement with peers during baseline across social-oriented activities, his level of peer engagement during materials-oriented activities for on-site coaching was higher than his level of peer engagement during baseline. Across study phases and activity types, the mean percentage of intervals Devon was engaged with peers that focused on pre-academic skills was less than 3% and difference between activity types were small and negligible.

Adult. Devon's engagement with an adult showed an ascending trend across phases of the study during both social-oriented and materials- oriented activities. Compared to baseline (*M* = 6%), the mean percentage of intervals Devon engaged with adults during both social-oriented and materials-oriented activities increased by 5% during training (*M* = 11%), 30% during on-site coaching (*M* = 36%), 26% during self-coaching (*M* = 32%), and 17% during maintenance. A similar trend was observed in Devon's social interactions with adults focused on pre-academic skills across the study phases. He was engaged with adults for less than 1% of the intervals during baseline, 4% during training, 14% during on-site coaching (i.e., 13% increase over baseline performance), 11% during self-coaching (10% increase over baseline performance), and 5% during maintenance (Table 4-6).

During activities classified as social, the mean percentage of intervals Devon was engaged with adults also showed an ascending trend across phases of the study. Compared to baseline (*M* = 9%), the mean percentage of intervals Devon was engaged with adults increased by 21% during training (*M* = 30%), 44% during on-site coaching (*M* = 53%), 48% during self-coaching (*M* = 57%), and 19% during maintenance (*M* = 28%). His level of social interaction with adults focused on pre-academic skills also showed an ascending trend across study phases. He exhibited engagement with adults for 1% of the intervals during baseline, 14% of intervals during training, 23% of intervals during on-site coaching (22% increase over baseline performance), 25% of intervals during self-coaching (24% increase over baseline performance), and 7% of intervals during maintenance (Table 4-7).

During activities classified as materials-oriented, the mean percentage of intervals Devon was engaged with adults increased across phases of the study. Compared to baseline (*M* = 3%), the mean percentage of intervals Devon engaged with adults increased by 3% during training (*M* = 6%), 4% during on-site coaching (*M* = 7%), 14% during self-coaching (*M* = 17%), and 18% during maintenance (*M* = 21%). He exhibited minimal levels of adult engagement focused on pre-academic skills during training (*M* = 1%), during self-coaching (*M* = 3%), and during maintenance (*M* = 5%). No adult engagement with a pre-academic skill focus was observed during baseline and on-site coaching phases for materials-oriented activities (Table 4-8).

Devon's engagement with adults increased across phases of the study for both activity types. His engagement with adults across study phases during social-oriented activities was higher than during materials-oriented activities. With respect to social interactions with adults focused on pre-academic skills, the mean percentages of intervals he was engaged with adults across phases of the study were higher during social-oriented activities when compared to materials-oriented activities.

Object. During both social-oriented and materials-oriented activities, Devon's object engagement showed a descending trend across phases of the study. Compared to baseline (*M* = 83%), the mean percentage of intervals Devon was engaged with objects decreased by 3% during training (*M* = 80%), 33% during on-site coaching (*M* = 50%), 25% during self-coaching (*M* = 58%), and 23% during maintenance (*M* = 60%; Table 4-6).

During social-oriented activities, Devon's object engagement decreased substantially following the baseline phase**.** Compared to baseline (*M* = 81%), the mean percentage of intervals Devon was engaged with objects decreased by 26% during training (*M* = 55%), 43% during on-site coaching (*M* = 38%), 47% during self-coaching (*M* = 34%), and 35% during maintenance (*M* = 46%; Table 4-7).

During materials-oriented activities, although decreases from baseline were observed in Devon's object engagement during on-site coaching and during the subsequent phases, his levels of object engagement remained high. Compared to baseline and training (*M* = 85%), the mean percentage of intervals Devon engaged with objects decreased by 15% during on-site coaching (*M* = 70%), 12% during self-coaching (*M* = 73%), and 20% during maintenance (*M* = 65%; Table 4-8).

Devon's engagement with objects showed a descending trend across the phases of the study during both activity types. However, decreases in object engagement during materials-oriented activities were considerably smaller than during social-oriented activities across all experimental phases.

Self. Devon demonstrated self-engagement behaviors only during the maintenance phase (14% of the coded intervals during social-oriented and materials-oriented activities and 20% of the coded intervals during materials-oriented activities). He did not demonstrate any self-engagement behaviors during activities classified as social-oriented (Tables 4-6, 4-7, and 4-8).

Child 1: Devon - Challenging Behaviors

During both social-oriented and materials-oriented activities, activities classified as social, and activities classified as materials-oriented, the mean percentages of intervals in which Devon exhibited challenging behaviors were less than 2% across all phases of the study and challenging behavior did not increase or decrease significantly relative to baseline.

Child 2: Arlene - Engagement Behaviors

Sophisticated engagement. Across both social-oriented and materials-oriented activities, Arlene did not exhibit any sophisticated engagement behaviors during baseline. During training and post-training, she demonstrated sophisticated engagement behaviors, on average, for 5% of coded intervals. A 2% increase from post-training in sophisticated engagement was observed during on-site coaching (*M* =

7%). During self-coaching, Arlene exhibited sophisticated engagement behaviors for 3% of intervals, on average, and this behavior remained stable during the one maintenance activity coded (Table 4-9).

Arlene did not exhibit any sophisticated engagement behaviors during baseline for activities classified as social. During training, the mean percentage of intervals she exhibited sophisticated engagement behaviors was 7% and this percentage remained stable until the self-coaching phases in which she demonstrated sophisticated engagement behaviors for 1% of the coded intervals (Table 4-10).

Across activities classified as materials-oriented, Arlene did not exhibit any sophisticated engagement behaviors during baseline and training. During post-training, the mean percentage of intervals she was engaged in sophisticated behaviors was 4%. During on-site coaching, she demonstrated sophisticated engagement, on average, for 7% of the intervals. This was followed by 5% of the intervals, on average, during self-coaching. In one coded materials-oriented activity during maintenance, she demonstrated sophisticated engagement behaviors for 3% of the intervals (Table 4-11).

Arlene did not exhibit any sophisticated engagement behaviors during baseline across activity types. Although her level of sophisticated engagement during on-site coaching and self-coaching was above her baseline level, the mean percentages of intervals in which she exhibited sophisticated engagement behaviors were 7% or less across study phases and activity types.

Social engagement. Across both social-oriented and materials-oriented activities, compared baseline (*M* = 7%), Arlene's social engagement increased considerably during training (20% increase, *M* = 27%), post-training (22% increase, *M* =

29%), on-site coaching (19% increase, *M* = 26%), and self-coaching (11% increase, *M* = 18%). In one coded materials-oriented activity during maintenance, she demonstrated social engagement behaviors for 20% of the intervals coded (Table 4-9).

Compared to the baseline phase (*M* = 9%), the mean percentage of intervals Arlene demonstrated social engagement behaviors during activities classified as social increased significantly across training (24% increase, *M* = 33%), post-training (24% increase, *M* = 33%), and on-site coaching (24% increase, *M* = 33%). During self-coaching, Arlene exhibited social engagement behaviors for 11% of the intervals coded, on average, which was 2% higher than her baseline level (Table 4-10).

Across activities classified as materials-oriented, Arlene did not demonstrate any social engagement behaviors during one coded baseline activity. The mean percentage of intervals she exhibited social engagement behaviors across materials-oriented activities was 13% during training and on-site coaching, 26% during post-training, and 22% during self-coaching. In one coded maintenance activity, Arlene exhibited social engagement behaviors for 20% of the intervals (Table 4-11).

Arlene's level of social engagement during baseline was somewhat higher for social- versus materials-oriented activities (*M* social = 9% versus *M* material = 0%). A substantial increase was observed in social engagement in the training phase across activity types. Improvements in social engagement during on-site coaching was higher across social-oriented activities, when compared to materials-oriented activities, while improvement in social engagement during self-coaching was higher across materials-oriented activities when compared to social-oriented activities.

Combinatorial engagement. Across both social-oriented and materials-oriented activities, Arlene showed moderately high levels of combinatorial engagement behaviors during baseline (*M* = 48%). Compared to baseline, Arlene's combinatorial engagement decreased by 19% during training (*M* = 29%), 11% during post-training (*M* = 37%), 17% during on-site coaching (*M* = 31% of intervals) and 1% during self-coaching (*M* = 47%). In one maintenance activity coded, the percentage of intervals she exhibited combinatorial engagement behaviors was 44% (Table 4-9).

Arlene's level of combinatorial engagement was also moderately high during baseline (*M* = 52% of intervals) across activities classified as social. Compared to baseline, the percentage of intervals Arlene was engaged in combinatorial behaviors decreased considerably during training (23% decrease, *M* = 29%), post-training (13% decrease, *M* = 39%), and on-site coaching (27% decrease, *M* = 25%). During self-coaching, she demonstrated combinatorial engagement behaviors for 52% of the intervals coded. This was 1% above her baseline level (Table 4-10).

Across activities classified as materials-oriented, Arlene exhibited combinatorial engagement behaviors for 24% of the intervals during the one baseline activity coded. Compared to baseline, the percentage of intervals Arlene was engaged in combinatorial behaviors increased somewhat during training (6% increase, *M* = 30%), post-training (10% increase, *M* = 34%), on-site coaching (20% increase, *M* = 44%), and self-coaching (19% increase, *M* = 43%). In the one maintenance activity coded, the percentage of intervals she exhibited combinatorial engagement behaviors was 44% (Table 4-11).

Arlene's combinatorial engagement showed a generally descending trend during social-oriented activities (except during the self-coaching phase) and an ascending trend during materials-oriented activities. During the self-coaching phase in social-oriented activities, the mean percentage of intervals she was engaged in combinatorial engagement behaviors was 1% higher than her baseline level.

Differentiated engagement. During both social-oriented and materials-oriented activities, the mean percentage of intervals Arlene exhibited differentiated engagement behaviors showed a descending trend across phases of the study. When compared to baseline (*M* = 37%), her level of differentiated engagement decreased by 6% during training (*M* = 26%), 12% during post-training (*M* = 25%), 7% during on-site coaching (*M* = 27%), and 13% (*M* = 24%) during self-coaching. In the one maintenance activity coded, the percentage of intervals she exhibited differentiated engagement behaviors was 26% (Table 4-9).

Across activities classified as social, Arlene's level of differentiated engagement decreased during subsequent phases when compared to baseline (*M* = 33%). The mean percentages of intervals Arlene was engaged in differentiated behaviors was 29% during training (4% decrease), 18% during post-training (25% decrease), 30% during on-site coaching (3% decrease), and 32% during self-coaching (1% decrease; Table 4-10).

Similarly, during activities classified as materials-oriented, Arlene's level of differentiated engagement showed a descending trend across phases of the study. In the one baseline activity coded, she was engaged in differentiated behaviors for 57% of the coded intervals. The mean percentage of intervals she exhibited differentiated engagement behaviors decreased by 20% during training (*M* = 37%), 26% during post-training (*M* = 31%), 25% during on-site coaching (*M* = 32%), and 37% during self-coaching (*M* = 20%). In the one maintenance activity coded, the percentage of intervals in which she exhibited differentiated engagement behaviors was 26% (Table 4-11).

Arlene's differentiated engagement behaviors across phases of the study showed a descending trend for both activity types. However, her levels of differentiated engagement across study phases were higher during materials-oriented when compared to social-oriented activities.

Attentional engagement. Arlene demonstrated attentional engagement behaviors at minimal levels throughout phases of the study across both social-oriented and materials-oriented activities. The mean percentage of intervals she exhibited attentional engagement behaviors ranged between 2% and 4% across the study phases (Table 4-9).

Similarly, during activities classified as social, the mean percentage of attentional engagement intervals ranged between 0% and 3% across phases of the study. She did not show any attentional engagement behavior during training and self-coaching (Table 4-10).

Arlene did not demonstrate any attentional engagement behaviors in the one materials-oriented baseline activity coded. The mean percentage of intervals she was engaged in attentional behaviors during training was 13%. Following training, Arlene's attentional engagement showed a descending trend. The mean percentage of intervals in which she exhibited attentional engagement was 4% during post-training, 3% during on-site coaching, and 6% during self-coaching. She was engaged in attentional behaviors for 3% of the intervals in the one maintenance activity coded (Table 4-11).

The mean percentage of intervals in which Arlene exhibited attentional engagement behaviors during baseline was higher for social-oriented versus materials-oriented activities (*M* social = 2% versus *M* material = 0%). Across social-oriented activities, following baseline, Arlene's attentional engagement remained low and stable during subsequent phases of the study. On the other hand, during materials-oriented activities, Arlene's level of attentional engagement increased somewhat during training when compared to baseline. During post-training, her attentional engagement decreased slightly and it remained stable until the end of the study.

Undifferentiated engagement. During both social-oriented and materials-oriented activities, activities categorized as social, and activities categorized as materials-oriented, the mean percentages of intervals Arlene exhibited undifferentiated engagement behaviors were less than 2% across all phases of the study (Tables 4-9, 4-10, and 4-11). Differences in the mean percentages of intervals she exhibited undifferentiated engagement behaviors across study phases during social-oriented versus materials-oriented activities were very small and negligible.

Non-engagement. During both social-oriented and materials-oriented activities, the mean percentage of intervals Arlene was non-engaged were 6% during baseline and 2% or less during subsequent phases of the study (Table 4-9). Similarly, across activities classified as social, Arlene was non-engaged for 4% of the intervals during baseline and 1% of the intervals or less during subsequent phases (Table 4-10). During the one materials-oriented baseline activity coded, Arlene was not engaged for 19% of the intervals. During subsequent phases, the mean percentage of intervals in which she was non-engaged was 1% of the intervals or less (Table 4-11). Differences in the mean percentages of intervals Arlene was not engaged across study phases during social- versus materials-oriented activities were small and negligible.

Child 2: Arlene - Engagement Partners

Peer. Across both social-oriented and materials-oriented activities included in the present study, Arlene's engagement with peers showed an ascending trend across phases of the study. Compared to baseline (*M* = 5%), the mean percentage of intervals Arlene was engaged with peers increased by 7% during training and self-coaching (*M* = 12%), 8% during post-training (*M* = 13%), and 2% during on-site coaching (*M* = 7%). In the one maintenance activity coded, she was engaged with peers for 6% of the intervals. With respect to social interactions with peers focused on pre-academic skills, Arlene was engaged with peers for less than 3% of the intervals, on average, across phases of the study (Table 4-12).

Arlene's levels of engagement with peers during activities classified as social also showed an ascending trend across phases of the study (excluding the self-coaching phase). Compared to baseline (*M* = 6%), the mean percentage of intervals Arlene was engaged with peers increased by 8% during training and post-training (*M* =14%), and 1% during on-site coaching (*M* = 7%). During self-coaching, her level of peer engagement was 4% of the intervals, which was 2% below her baseline level. With respect to social interactions with peers focused on pre-academic skills, Arlene was engaged with peers for less than 3% of the intervals, on average, across phases of the study (Table 4-13).

Across activities classified as materials-oriented, Arlene was engaged with peers for 0% and 6%, respectively, in one baseline and one maintenance activity coded. Compared to baseline, the percentage of intervals she was engaged with peers increased by 8% during training, 13% during post-training, 6% during on-site coaching, and 17% during self-coaching. With respect to social interactions with peers focused on pre-academic skills, Arlene did not exhibit any peer engagement across phases of the study (Table 4-14).

In general, Arlene's engagement with peers showed an ascending trend across phases of the study for both activity types. Her level of peer engagement during on-site coaching was higher for social-oriented versus materials-oriented activities (*M* social = 7% versus *M* material = 6%), while it was higher for materials- versus social-oriented activities (*M* material = 17% versus *M* social = 4%) during self-coaching.

Adult. Arlene's engagement with an adult showed an ascending trend across phases of the study during both social-oriented and materials-oriented activities. Compared to baseline (*M* = 4%), the mean percentage of intervals Arlene engaged with adults during both social-oriented and materials-oriented activities increased by 18% during training (*M* = 22%), 17% during post-training (*M* = 21%), 24% during on-site coaching (*M* = 28%), and 7% during self-coaching (*M* = 11%). In the one maintenance activity coded, she was engaged with adults for 22% of the intervals. A similar trend was observed in Arlene's social interactions with adults focused on pre-academic skills across the study phases. She was engaged with adults for 1% of the intervals during baseline, 5% during training, 8% during post-training and on-site coaching (i.e., 7%

increase over baseline level), and 1% during self-coaching. In the one maintenance activity coded, she was engaged with adults for 9% of the intervals (Table 4-12).

During activities classified as social, the mean percentage of intervals Arlene was engaged with adults also showed an ascending trend across phases of the study. Compared to baseline (M = 5%), the mean percentage of intervals Arlene was engaged with adults increased by 23% during training (M = 28%), 20% during post-training (M = 25%), 30% during on-site coaching (M = 35%), and 7% during self-coaching (M = 12%). Her level of social interaction with adults focused on pre-academic skills also showed an ascending trend across study phases (excluding the self-coaching phase). She was engaged with adults for 2% of the intervals during baseline, 7% during training, 10% during post-training, 12% during on-site coaching (10% increase over baseline level), and 1% during self-coaching (1% decrease below baseline level; Table 4-13).

During activities classified as materials-oriented, the mean percentage of intervals Arlene was engaged with adults increased across phases of the study. During the one baseline activity coded, Arlene was not engaged with adults. Compared to baseline, the mean percentage of intervals Arlene was engaged with adults increased by 8% during training, 16% during post-training, 15% during on-site coaching, and 10% during self-coaching. In the one maintenance activity coded, she was engaged with adults for 22% of the intervals. She exhibited minimal levels of adult engagement focused on pre-academic skills during post-training (M = 7%) and on-site coaching (M = 1%). In the one maintenance activity coded, she was engaged with adults for 9% of the intervals. No adult engagement with a pre-academic skill focus was observed during baseline, training, and self-coaching phases (Table 4-14).

Arlene's engagement with adults increased across phases of the study for both activity types and her engagement with adults during social-oriented activities was higher than during materials-oriented activities across study phases. With respect to social interactions with adults focused on pre-academic skills, the mean percentages of intervals Arlene was engaged with adults across phases of the study were higher during social-oriented activities when compared to materials-oriented activities.

Object. During both social-oriented and materials-oriented activities, Arlene's engagement with objects showed a descending trend across phases of the study. Compared to baseline (*M* = 84%), the mean percentage of intervals Arlene was engaged with objects decreased by 21% during training and on-site coaching (*M* = 63%), 19% during post-training (*M* = 65%), and 11% during self-coaching (*M* = 73%). In the one maintenance activity coded, Arlene was engaged with objects for 70% of the intervals (Table 4-12).

During social-oriented activities, Arlene's object engagement decreased substantially following the baseline phase**.** Compared to baseline (*M* = 85%), the mean percentage of intervals Arlene was engaged with objects decreased by 28% during training (*M* = 57%), 24% during post-training (*M* = 61%), 29% during on-site coaching (*M* = 56%), and 3% during self-coaching (*M* = 82%; Table 4-13).

During materials-oriented activities, Arlene's engagement with objects also showed a descending trend. However, between-phase changes were very small. In the one baseline activity coded, Arlene was engaged with objects for 81% of the intervals. Compared to baseline, the mean percentage of intervals Arlene was engaged with objects decreased by 4% during training (*M* = 77%), 12% during post-training (*M* =

69%), 3% during on-site coaching (*M* = 78%), and 13% during self-coaching (*M* = 68%). In the one maintenance activity coded, Arlene was engaged with objects for 70% of the intervals (Table 4-14).

Arlene's engagement with objects showed a descending trend across the phases of the study during both activity types. However, decreases in object engagement across phases of the study during materials-oriented activities were considerably smaller than those occurred during social-oriented activities.

Self. During both social-oriented and materials-oriented activities, and materials-oriented activities, Arlene demonstrated self-engagement behaviors only during the post-training phase for 1% or less of the intervals coded. She did not demonstrate any self-engagement behaviors during activities classified as social (Tables 4-12, 4-13, and 4-14).

Child 2: Arlene - Challenging Behaviors

During both social-oriented and materials-oriented activities and activities classified as social, the mean percentages of intervals in which Arlene demonstrated challenging behaviors were less than 1% across all phases of the study. She did not exhibit any challenging behaviors across the phases of the study during activities classified as materials-oriented.

Child 3: Brian - Engagement Behaviors

Sophisticated engagement. Across both social-oriented and materials-oriented activities and activities classified as social, the mean percentage of intervals Brian exhibited sophisticated engagement behaviors was 4% during baseline and 2% or less during the subsequent phases of the study (Tables 4-15 and 4-16). During activities classified as materials-oriented, Brian's sophisticated engagement was 3% of the intervals or less, on average, across phases of the study (Table 4-17).

Brian exhibited very minimal levels of sophisticated engagement across phases of the study during both activity types. However, his levels of sophisticated engagement across phases of the study appeared to be slightly higher for social-oriented activities when compared to materials-oriented activities.

Social engagement. The mean percentage of intervals Brian exhibited social engagement behaviors during both social-oriented and materials-oriented activities varied across experimental phases. During baseline, he exhibited social engagement behaviors for 38% of the intervals, which increased by 15% during training (*M* = 53%) and decreased by 15% during post-training (*M* = 38%). With the implementation of on-site coaching, the mean percentage of intervals Brian demonstrated social engagement behaviors increased by 17% (*M* = 53%; 15% increase over baseline level). During self-coaching, Brian's social engagement decreased by 30% (*M* = 23%), which was 15% lower than his mean baseline level (Table 4-15).

The mean percentage of intervals Brian exhibited social engagement behaviors also varied across phases during activities classified as social. During baseline, he was engaged in social behaviors for 40% of the intervals, followed by an 18% increase during training (*M* = 58%). A 12% decrease in the mean percentage of intervals occurred between training and post-training (*M* = 46%). During on-site coaching, the percentage of intervals he exhibited social engagement increased by 15% (*M* = 61%; 21% increase over baseline level). Brian's level of social engagement during self-coaching (*M* = 37%) was 3% below his baseline level (Table 4-16).

The mean percentage of intervals Brian exhibited social engagement during activities classified as materials-oriented showed a descending trend across phases of the study. In the one baseline and the one training activity coded, he was engaged in social behaviors for 28% and 26% of the intervals, respectively. During post-training, a 3% decrease was observed in the mean percentage of intervals (*M* = 23%). A 4% decrease in the mean percentage of intervals occurred during on-site coaching (*M* = 19%; 9% below baseline level). Brian had the lowest level of social engagement (*M* = 18%) during self-coaching, which was 10% below his baseline level (Table 4-17).

In general, Brian's social engagement showed an ascending trend across phases of the study during social-oriented activities and a descending trend during materials-oriented activities. His levels of social engagement across study phases were higher during social-oriented activities, when compared to materials-oriented activities.

Combinatorial engagement. Across both social-oriented and materials-oriented activities, Brian's combinatorial engagement showed an ascending trend across phases of the study. Compared to baseline (*M* = 16%), Brian's combinatorial engagement increased by 10% during post-training (*M* = 26%), 8% during on-site coaching (*M* = 24% of intervals), and 28% during self-coaching (*M* = 44%). During training phase, the mean percentage of intervals he exhibited combinatorial engagement behaviors was 4% (Table 4-15).

Across activities classified as social, Brian's combinatorial engagement decreased from baseline (*M* = 17%) to training (*M* = 4%) and increased during the subsequent phases of the study. He was engaged in combinatorial behaviors for 14% of the intervals during post-training, 18% of the intervals during on-site coaching (1%

increase over baseline level), and 32% of the intervals during self-coaching (15% increase over baseline level; Table 4-16).

Brian exhibited combinatorial engagement behaviors for 11% and 3% of the intervals, respectively, during the one materials-oriented baseline and one materials-oriented training activity coded. The mean percentage of intervals he demonstrated combinatorial engagement behaviors was 46% during post-training, and 48% during on-site coaching and self-coaching (37% above baseline level; Table 4-17).

Brian's combinatorial engagement showed a generally ascending trend during social-oriented activities and also during materials-oriented activities. Brian's levels of combinatorial engagement during on-site coaching and self-coaching phases were somewhat higher for materials-oriented activities when compared to activities classified as social.

Differentiated engagement. During both social-oriented and materials-oriented activities, the mean percentage of intervals Brian exhibited differentiated engagement behaviors showed a descending trend across phases of the study. When compared to baseline (*M* = 26%), his level of differentiated engagement decreased by 1% during training (*M* = 25%), 3% during post-training (*M* = 23%), 12% during on-site coaching (*M* = 14%), and 3% during self-coaching (*M* = 26%; Table 4-15).

The percentage of intervals Brian exhibited differentiated engagement behaviors during activities classified as social was somewhat stable across baseline (*M* = 21%), training (*M* = 20%), and post-training (*M* = 23%). When compared to baseline, his level of differentiated engagement decreased by 8% during on-site coaching (*M* = 13%) and 5% during self-coaching (*M* = 16%; Table 4-16).

Brian exhibited differentiated engagement behaviors for 56% and 55% of the intervals, respectively, during the one materials-oriented baseline and one materials-oriented training activity coded. The mean percentage of intervals in which he demonstrated differentiated engagement behaviors was 24% during post-training, 18% during on-site coaching (38% below baseline level), and 25% during self-coaching (31% below baseline level; Table 4-17).

Brian's differentiated engagement behaviors across phases of the study showed a descending trend for both activity types. In addition, Brian's levels of differentiated engagement across study phases were higher during materials-oriented when compared to social-oriented activities.

Attentional engagement. During both social-oriented and materials-oriented activities, Brian's attentional engagement showed a descending trend across phases of the study. The mean percentage of intervals he was engaged in attentional behaviors was 13% during baseline, 11% during training, 10% during post-training, 7% during on-site coaching (6% below baseline level), and 6% during self-coaching (7% below baseline level; Table 4-15).

The percentage of intervals Brian was engaged in attentional behaviors during activities classified as social was stable across baseline (*M* = 14%), training (*M* = 12%), and post-training (*M* = 13%). Compared to baseline, his level of attentional engagement decreased by 8% during on-site coaching (*M* = 6%) and 1% during self-coaching (*M* = 13%; Table 4-16).

During materials-oriented activities, Brian exhibited attentional engagement behaviors for 6% of the intervals or less across phases of the study, with the exception of on-site coaching where 14% of the intervals were coded as attentional engagement (Table 4-17).

Although between-phase changes were small, Brian's attentional engagement showed a descending trend during social-oriented activities. During materials-oriented activities, his attentional engagement during on-site coaching was higher than his attentional engagement during other phases.

Undifferentiated engagement. During both social-oriented and materials-oriented activities, activities classified as social, and activities classified as materials-oriented, the mean percentages of intervals Brian exhibited undifferentiated engagement behaviors were 4% or less across phases of the study (Tables 4-15, 4-16, and 4-17). Although the percentages of intervals in which Brian demonstrated undifferentiated engagement behaviors across phases of the study and activity types were very small, he demonstrated more undifferentiated engagement behaviors during social-oriented activities, when compared to materials-oriented activities.

Non-engagement. During both social-oriented and materials-oriented activities, activities classified as social, and activities classified as materials-oriented, the mean percentages of intervals in which Brian was non-engaged was 3% or less across phases of the study (Tables 4-15, 4-16, and 4-17). Although the percentages of intervals of non-engagement across phases of the study and activity types were very small, he was non-engaged more often during social-oriented activities when compared to materials-oriented activities.

Child 3: Brian - Engagement Partners

Peer. Across both social-oriented and materials-oriented activities included in the present study, Brian's engagement with peers showed an ascending trend across phases of the study. Compared to baseline (*M* = 4%), the mean percentage of intervals Brian was engaged with peers increased by 26% during training (*M* = 30%), 6% during post-training (*M* = 10%), 4% during on-site coaching (*M* = 8%), and 8% during self-coaching (*M* = 12%). With respect to social interactions with peers focused on pre-academic skills, on average, Brian was engaged with peers for 7% of the intervals during training, 2% during post-training, and less than 1% during on-site coaching. No social interaction focused on pre-academic skills was observed during baseline and self-coaching (Table 4-18).

Brian's levels of engagement with peers during activities classified as social showed an ascending across phases of the study. Compared to baseline (*M* = 4%), the mean percentage of intervals Brian was engaged with peers increased by 27% during training (*M* = 31%), 8% during post-training (*M* = 12%), 3% during on-site coaching (*M* = 7%), and 17% during self-coaching (*M* = 21%). With respect to social interactions with peers focused on pre-academic skills, on average, Brian was engaged with peers for 8% of the intervals during training, 1% of intervals during post-training, and less than 1% of intervals during on-site coaching. No social interaction focused on pre-academic skills was observed during baseline and self-coaching (Table 4-19).

Across activities classified as materials-oriented, Brian was engaged with peers for 6% and 26%, respectively, in the one materials-oriented baseline and the one materials-oriented training activity coded. The percentage of intervals he was engaged with peers was 6% during post-training, 10% during on-site coaching (4% above baseline level), and 9% during self-coaching (3% above baseline level). With respect to social interactions with peers focused on pre-academic skills, Brian was engaged with peers for 3% of the intervals, on average, during post-training. No social interaction focused on pre-academic skills was observed during any other phases of the study (Table 4-20).

In general, Brian's engagement with peers showed an ascending trend across phases of the study for both activity types. His level of peer engagement during self-coaching was higher for social-oriented versus materials-oriented activities (*M* social = 21% versus *M* material = 9%), while it was higher for materials-oriented versus social-oriented activities (*M* material = 10% versus *M* social = 7%) during on-site coaching.

Adult. Brian's engagement with an adult varied across phases of the study during both social-oriented and materials- oriented activities. Compared to baseline (*M* = 46%), the mean percentage of intervals Brian engaged with adults during both social-oriented and materials-oriented activities increased by 3% during on-site coaching (*M* = 49%) and decreased by 17% during training (*M* = 29%), 13% during post-training (*M* = 33%), and 32% during self-coaching (*M* = 14%). With respect to social interactions with adults focused on pre-academic skills, on average, Brian was engaged with adults for 22% of the intervals during baseline, 15% during training, 12% during post-training and on-site coaching, and 5% during self-coaching (Table 4-18).

During activities classified as social, the mean percentage of intervals Brian was engaged with adults also varied across phases of the study. Compared to baseline (*M* = 49%), the mean percentage of intervals Brian was engaged with adults increased by 8% during on-site coaching and decreased by 16% during training (*M* = 33%), 8% during post-training (*M* = 41%), and 23% during self-coaching (*M* = 26%). His level of social interaction with adults focused on pre-academic skills showed a descending trend across study phases. He exhibited engagement with adults for 25% of the intervals during baseline, 18% during training, 16% during post-training, 13% during on-site coaching (12% decrease below baseline level), and 17% during self-coaching (8% decrease below baseline level; Table 4-19).

During activities classified as materials-oriented, the mean percentage of intervals Brian was engaged with adults showed a descending trend across phases of the study. Brian was engaged with adults for 28% and 6%, respectively, in the one materials-oriented baseline and the one materials-oriented training activity coded. The mean percentage of intervals Brian was engaged with adults was 19% during post-training, 12% during on-site coaching, and 10% during self-coaching. He exhibited adult engagement focused on pre-academic skills for 4% of the intervals during post-training, 6% during on-site coaching, and 1% during self-coaching. In the one baseline activity coded, he was engaged with adults for 6% of the intervals. No adult engagement with a pre-academic skill focus was observed during training (Table 4-20).

Brian's engagement with adults varied across phases of the study during social-oriented activities, while his engagement with adults showed a descending trend during materials-oriented activities. In addition, his engagement with adults across study phases during social-oriented activities was higher than during materials-oriented activities.

With respect to social interaction with adults that focused on pre-academic skills, the mean percentages of intervals Brian was engaged with adults across phases of the study were higher during social-oriented activities, when compared to materials-oriented activities. Moreover, the mean percentage of intervals he was engaged with adults that focused on pre-academic skills decreased across phases of the study during social-oriented activities.

Object. During both social-oriented and materials-oriented activities, Brian's engagement with objects varied across phases of the study. Compared to baseline (*M* = 47%), the mean percentage of intervals Brian was engaged with objects decreased by 11% during training (*M* = 36%), 5% during on-site coaching (*M* = 42%), and increased by 9% during post-training (*M* = 56%) and 22% during self-coaching (*M* = 69%; Table 4-18).

During social-oriented activities, Brian's object engagement varied across phases of the study. Compared to baseline (*M* = 44%), the mean percentage of intervals Brian was engaged with objects decreased by 13% during training (*M* = 31%) and 10% during on-site coaching (*M* = 34%), and increased by 1% during post-training (*M* = 45%) and 7% during self-coaching (*M* = 51%; Table 4-19).

During materials-oriented activities, Brian's engagement with objects also showed an ascending trend. However, between-phase changes were very small. In the one materials-oriented baseline and the one materials-oriented training activity coded, Brian was engaged with objects for 67% and 61% of the intervals, respectively. Compared to baseline, the mean percentage of intervals Brian was engaged with objects increased by 8% during post-training and self-coaching (*M* = 75%), and 10% during on-site coaching (*M* = 77%; Table 4-20).

Brian's engagement with objects varied across phases of the study during social-oriented activities and showed an ascending trend across phases of the study during materials-oriented activities. His engagement with objects during materials oriented activities was relatively higher than during social-oriented activities across phases of the study.

Self. During both social-oriented and materials-oriented activities, and social-oriented activities only, Brian demonstrated self-engagement behaviors only during the baseline phase for less than 1% of the intervals coded. He did not demonstrate any self-engagement behaviors during activities classified as materials-oriented (Tables 4-18, 4-19, and 4-20).

Child 3: Brian - Challenging Behaviors

During both social-oriented and materials-oriented activities, activities classified as social, and activities classified as materials-oriented, the mean percentages of intervals in which Brian demonstrated challenging behaviors were less than 2% across all phases of the study.

Child 4: Jessica - Engagement Behaviors

Sophisticated engagement. Across both social-oriented and materials-oriented activities, the mean percentage of intervals Jessica exhibited sophisticated engagement behaviors was 1% during baseline and post-training, 5% during training, and 3% during on-site coaching (Table 4-21). During social-oriented activities, the mean percentage of intervals Jessica exhibited sophisticated engagement behavior was 6% of the intervals or less across phases of the study (Table 4-22). The mean percentage of intervals Jessica exhibited sophisticated engagement behaviors was 3% of the intervals or less across phases of the study during activities classified as materials-oriented (Table 4-23).

Jessica exhibited very minimal levels of sophisticated engagement across phases of the study for both activity types. However, her levels of sophisticated engagement across phases of the study appeared to be slightly higher for social-oriented activities when compared to materials-oriented activities.

Social engagement. The mean percentage of intervals Jessica exhibited social engagement behaviors during both social-oriented and materials-oriented activities showed an ascending trend across experimental phases. During baseline, she exhibited social engagement behaviors for 16% of the intervals, which increased by 16% during training (*M* = 32%), 20% during post-training (*M* = 36%), and 25% during on-site coaching (*M* = 41%; Table 4-21).

The mean percentage of intervals Jessica exhibited social engagement behaviors also showed an ascending trend across phases during activities classified as social. During the one social-oriented baseline activity coded, she was engaged in social behaviors for 28% of the intervals. Compared to baseline, the mean percentage of intervals Jessica demonstrated social engagement behaviors increased by 5% during training (*M* = 33%), 22% during post-training (*M* = 50%), and 27% during on-site coaching (*M* = 55%; Table 4-22).

The mean percentage of intervals Jessica exhibited social engagement during activities classified as materials-oriented showed an ascending trend across phases of the study. Compared to baseline (*M* = 9%), the mean percentage of intervals Jessica demonstrated social engagement behaviors increased by 22% during training (*M* = 31%), 13% during post-training (*M* = 22%), and 4% during on-site coaching (*M* = 13%; Table 4-23).

In general, Jessica's social engagement showed an ascending trend across phases of the study during social-oriented activities and during materials-oriented activities. Her levels of social engagement across study phases were higher during social-oriented activities when compared to materials-oriented activities.

Combinatorial engagement. During both social-oriented and materials-oriented activities, Jessica's combinatorial engagement showed an ascending trend across phases of the study. Compared to baseline (*M* = 16%), Jessica's combinatorial engagement increased by 17% during training (*M* = 33%), and 12% during post-training and on-site coaching (*M* = 28%; Table 4-21).

During social-oriented activities, Jessica's combinatorial engagement also showed an ascending trend across phases of the study. In the one social-oriented baseline activity coded, Jessica was engaged in combinatorial behaviors for 5% of the intervals. Compared to baseline, Jessica's combinatorial engagement increased by 13% during training and on-site coaching (*M* = 18%), and 19% during post-training (*M* = 24%; Table 4-22).

During materials-oriented activities, Jessica's combinatorial engagement showed an ascending trend across phases of the study. Compared to baseline (*M* = 21%), Jessica's combinatorial engagement increased by 35% during training (*M* = 56%), 11% during post-training (*M* = 32%), and 25% during on-site coaching (*M* = 46%; Table 4-23).

Jessica's combinatorial engagement showed a generally ascending trend during social-oriented activities and also materials-oriented activities. Jessica's levels of combinatorial engagement across phases of the study were somewhat higher for materials-oriented activities when compared to activities classified as social.

Differentiated engagement. During both social-oriented and materials-oriented activities, the mean percentage of intervals Jessica exhibited differentiated engagement behaviors showed a descending trend across phases of the study. When compared to baseline (*M* = 61%), her level of differentiated engagement decreased by 35% during training (*M* = 26%), 29% during post-training (*M* = 32%), and 45% during on-site coaching (*M* = 16%; Table 4-21).

Similarly, during social-oriented activities, the mean percentage of intervals Jessica exhibited differentiated engagement behaviors showed a descending trend across phases of the study. In one social-oriented baseline activity coded, Jessica was engaged in differentiated behaviors for 58% of the intervals. Compared to baseline, Jessica's combinatorial engagement decreased by 20% during training (*M* = 38%), 37% during post-training (*M* = 21%), and 40% during on-site coaching (*M* = 18%; Table 4-22).

During materials-oriented activities, the mean percentage of intervals in which Jessica exhibited differentiated engagement behaviors also showed a descending trend across phases of the study. When compared to baseline (*M* = 62%), her level of differentiated engagement decreased by 52% during training (*M* = 8%), 20% during post-training (*M* = 42%), and 50% during on-site coaching (*M* = 12%; Table 4-23).

Jessica's differentiated engagement behaviors across phases of the study showed a descending trend for both activity types. During the baseline phase, her level of differentiated engagement was comparable across activity types. Jessica's differentiated engagement during on-site coaching was higher for social-oriented activities when compared to materials-oriented activities (*M* social = 18% versus *M* material = 12%).

Attentional engagement. Across both social-oriented and materials-oriented activities, the mean percentage of intervals Jessica was engaged in attentional behaviors was 3% or less during the first three phases of the study (i.e., baseline, training, and post-training). During on-site coaching, the mean percentage of intervals she exhibited attentional engagement behaviors was 10% (Table 4-21).

Across activities classified as social, Jessica demonstrated attentional engagement behaviors for 7% of the intervals during the one social-oriented baseline activity coded. Across subsequent phases, the mean percentage of intervals she was engaged in attentional engagement was 3% or less (Table 4-22).

Across activities classified as materials-oriented, the mean percentage of intervals Jessica was engaged in attentional behaviors was 2% or less during the first three phases of study (i.e., baseline, training, and post-training). During on-site coaching, the mean percentage of intervals was 26% (Table 4-23).

Jessica exhibited low levels of attentional engagement across study phases and activity types, in general. Her differentiated engagement during on-site coaching was higher for materials-oriented activities when compared to social-oriented activities (*M* social = 3% versus *M* material = 26%).

Undifferentiated engagement. During both social-oriented and materials-oriented activities, activities classified as social, and activities classified as materials-oriented, the mean percentages of intervals Jessica exhibited undifferentiated engagement behaviors were 2% or less across phases of the study (Tables 4-21, 4-22, and 4-23).

Non-engagement. During both social-oriented and materials-oriented activities, activities classified as social, and activities classified as materials-oriented, the mean percentages of intervals in which Jessica was non-engaged were 3% or less across phases of the study (Tables 4-21, 4-22, and 4-23).

Child 4: Jessica - Engagement Partners

Peer. Across both social-oriented and materials-oriented activities, Jessica's engagement with peers showed an ascending trend across phases. Compared to baseline (*M* = 3%), the mean percentage of intervals Jessica was engaged with peers increased by 10% during training (*M* = 13%), 5% during post-training (*M* = 8%), and 4% during on-site coaching. Jessica did not exhibited social interactions with peers focused on pre-academic skills (Table 4-24).

Jessica's levels of engagement with peers during activities classified as social-oriented showed an ascending across phases. In the one social-oriented baseline activity, she was engaged with peers for 3% of the coded intervals. Compared to baseline, the mean percentage of intervals Jessica was engaged with peers increased by 10% during training (*M* = 13%), 7% during post-training (*M* = 10%), and 4% during on-site coaching (*M* = 7%). Jessica did not exhibit social interactions with peers focused on pre-academic skills during social-oriented activities (Table 4-25).

Similarly, Jessica's levels of engagement with peers during activities classified as materials-oriented showed an ascending trend across phases of the study. Compared to baseline (*M* = 3%), the mean percentage of intervals Jessica was engaged with peers increased by 10% during training (*M* = 13%), 2% during post-training (*M* = 5%), and 3%

during on-site coaching (*M* = 6%). Jessica did not exhibited social interactions with peers focused on pre-academic skills during materials-oriented activities (Table 4-26).

In general, Jessica's engagement with peers showed an ascending trend across phases of the study for both activity types. Her level of peer engagement during baseline was comparable across the activity types. In addition, Jessica's engagement with peers during on-site coaching was higher for social-oriented versus materials-oriented activities (*M* social = 7% versus *M* material = 6%).

Adult. Jessica's engagement with an adult showed an ascending trend across phases of the study during both social-oriented and materials- oriented activities. Compared to baseline (*M* = 17%), the mean percentage of intervals Jessica engaged with adults during both social-oriented and materials-oriented activities increased by 7% during training (*M* = 24%), 16% during post-training (*M* = 33%), and 23% during on-site coaching (*M* = 40%). With respect to social interactions with adults focused on pre-academic skills, on average, Jessica was engaged with adults for 1% of the intervals during baseline, 5% during training, 10% during post-training, and 12% during on-site coaching (Table 4-24).

During activities classified as social-oriented, the mean percentage of intervals Jessica was engaged with adults also increased across phases of the study. In one social-oriented baseline activity, she was engaged with adults for 30% of the intervals. Compared to baseline, the mean percentage of intervals Jessica was engaged with adults increased by 16% during post-training and 26% during on-site coaching, and decreased by 2% during training. Similarly, her level of social interaction with adults focused on pre-academic skills showed an ascending trend across study phases. In the one social-oriented baseline activity coded, she was engaged with adults for 3% of the intervals. On average, she exhibited engagement with adults that focused on pre-academic skills for 4% of the intervals during training, 18% during post-training, and 16% during on-site coaching (Table 4-25).

During activities classified as materials-oriented, the mean percentage of intervals Jessica was engaged with adults increased during the first two phases following baseline (i.e., training and post-training) and decreased during the last phase (on-site coaching). She was engaged with adults for 10% of the intervals during baseline, 18% during training, 19% during post-training, and 7% during on-site coaching (3% below baseline level). She did not exhibit adult engagement focused on pre-academic skills during baseline. The mean percentage of intervals she was engaged with adults that focused on pre-academic skills was 6% of the intervals during training, and 2% of the intervals post-training and during on-site coaching (Table 4-26).

Jessica's engagement with adults showed an ascending trend across phases of the study during social-oriented activities. In materials-oriented activities, her level of adult engagement increased during the first two phases of the study and decreased below baseline levels during on-site coaching. In addition, Jessica's engagement with adults during social-oriented activities was higher than during materials-oriented activities across study phases.

With respect to social interaction with adults that focused on pre-academic skills, the mean percentages of intervals Jessica was engaged with adults across phases of the study showed an ascending trend for both activity types. However, her engagement with adults was higher during social-oriented activities when compared to materials-oriented activities.

Object. During both social-oriented and materials-oriented activities, Jessica's engagement with objects showed a descending trend across phases of the study. Compared to baseline (*M* = 77%), the mean percentage of intervals Jessica was engaged with objects decreased by 16% during training (*M* = 61%), 19% during post training (*M* = 58%), and 25% during on-site coaching (*M* = 52%; Table 4-24).

During social-oriented activities, Jessica's object engagement also showed a descending trend across phases of the study. In the one social-oriented baseline activity coded, she was engaged with objects for 67% of the intervals. Compared to baseline, the mean percentage of intervals Jessica was engaged with objects decreased by 12% during training (*M* = 55%), 24% during post training (*M* = 43%), and 31% during on-site coaching (*M* = 36%; Table 4-25).

During activities classified as materials-oriented, the mean percentage of intervals Jessica was engaged with objects decreased during the first two phases following baseline (i.e., training and post-training) and increased above the baseline level during the last phase (on-site coaching). She was engaged with adults for 82% of the intervals during baseline, 69% during training, 73% during after training, and 84% during on-site coaching (2% above baseline level; Table 4-26).

Jessica's engagement with objects showed a descending trend across phases of the study during social-oriented activities. In materials-oriented activities, her level of object engagement decreased during the first two phases of the study and increased above the baseline level during on-site coaching. In addition, Jessica's engagement with objects during materials-oriented activities was considerably higher than during social-oriented activities across study phases.

Self. During both social-oriented and materials-oriented activities, social-oriented activities, or materials-oriented activities, Jessica did not exhibit self-engagement behaviors (Tables 4-24, 4-25, and 4-26).

Child 4: Jessica - Challenging Behaviors

During both social-oriented and materials-oriented activities, activities classified as social, and activities classified as materials-oriented, the mean percentages of intervals in which Jessica demonstrated challenging behaviors were less than 2% across all phases of the study.

Research Question 2: Teachers' Implementation of Embedded Instruction Learning Trials

This section reports results for teachers' implementation of EILTs during child-initiated activities that met the inclusion criteria for social-oriented and materials-oriented activities. Results are presented for each teacher individually by activity type. For each teacher, two types of data are presented: percentage of teacher's correct implementation of EILTs and rate (per minute) of teachers' correct implementation of EILTs.

Teacher implementation data for each child-initiated activity were averaged over the total number of both social-oriented and materials-oriented activities, total number of social-oriented activities, and total number of materials-oriented activities within an experimental phase to calculate a mean percentage and rate score for correct teacher implementation of EILTs. Mean percentage score changes in teachers' EILTs implementation were evaluated relative to baseline levels.

Teacher 1: Nancy

During both social-oriented and materials-oriented child-initiated activities, compared to baseline (*M* = 44%), the percentage of EILTs Nancy implemented correctly increased by 6% during training *(M* = 50%), 11% during on-site coaching (*M* = 55%), and 25% during self-coaching (*M* = 69%) and decreased by 8% during maintenance (*M* = 36%). Across both social-oriented and materials-oriented activities, the mean rate per minute of correctly implemented EILTs increased by .3 trial during on-site coaching (*M* = .6) and .1 trial during self-coaching (*M* = .4), and decreased by .2 trial during maintenance (*M* = .1), when compared to baseline and training (*M* = .3; Table 4-27 and Figure 4-1).

During activities classified as social, compared to baseline (*M* = 55%), the percentage of EILTs Nancy implemented correctly increased by 16% during training (*M* =71%), 18% during on-site coaching (*M* = 73%), and 38% during self-coaching (*M* = 93%). During maintenance, her correct implementation was 0%. Compared to baseline (*M* = .4), the mean rate per minute of correctly implemented EILTs during social-oriented activities increased by .5 trial during training and on-site coaching (*M* = .9) and .2 during self-coaching (*M* = .6). The mean rate of correct implementation was 0 trials during maintenance (Table 4-28 and Figure 4-1).

During activities classified as materials-oriented, the percentage of EILTs Nancy implemented correctly varied across the phases of the study. Compared to baseline (*M* = 33%), the mean percentage of EILTs Nancy implemented correctly increased by 12% during training (*M* = 45%), 7% during self-coaching (*M* = 40%), and 9% during maintenance (*M* = 42%), and decreased by 3% during on-site coaching. With respect to the mean rate per minute of correctly implemented EILTs, Nancy's rate decreased by .1

trial during on-site coaching (*M* = <.1) and maintenance (*M* = 1), and remained the same during training (*M* = .2) and self-coaching (*M* = .2), when compared to baseline (*M* = .2; Table 4-29 and Figure 4-1).

Nancy's percentage of correct implementation showed an ascending trend across phases of the study (excluding maintenance) during social-oriented activities, while it varied across phases during materials-oriented activities. Across on-site coaching and self-coaching during social-oriented activities, Nancy's percentage of correct implementation was two times higher than those reported during materials-oriented activities for the same phases. Nancy's mean rate of correctly implemented EILTs across study phases and activity types showed a similar pattern of change.

Teacher 2: Betsy

During both social-oriented and materials-oriented child-initiated activities, compared to baseline (*M* = 20%), the percentage of EILTs Betsy implemented decreased by 20% during training (*M* = 0%) and 3% during post-training (*M* = 17%) and increased by 33% during on-site coaching *(M* = 53%) and 40% during self-coaching (*M* = 60%). In the one maintenance activity coded, her percentage of correct implementation of EILTs was 67%. Across both social-oriented and materials-oriented activities, the mean rate per minute of correctly implemented EILTs by Betsy was .2 trial during baseline, no trials during training, <.1 trial during post-training, .3 trial during on-site coaching, and .3 trial during self-coaching. In one maintenance activity coded, her rate per minute of correct implementation of EILTs was .5 trial (Table 4-30 and Figure 4-1).

During activities classified as social, compared to baseline (*M* = 24%), the percentage of EILTs Nancy implemented correctly decreased by 24% during training (*M*

= 0%) and 15% during post-training (*M* = 9%), and increased by 30% during on-site coaching (*M* = 54%) and 18% during self-coaching (*M* = 42%). In addition, compared to baseline (*M* = .3), the mean rate per minute of correctly implemented EILTs during social-oriented activities remained the same during on-site coaching (*M* = .3) and self-coaching (*M* = .3), and decreased by .3 trial during training (*M* = 0) and .2 trial during post-training (*M* = <.1; Table 4-31 and Figure 4-1).

During activities classified as materials-oriented, the percentage of EILTs Nancy implemented correctly showed an ascending trend across the phases of the study. In the one materials-oriented baseline activity, her correct implementation was 0%. Similarly, during training, she did not implement any trials correctly (*M* = 0%). The mean percentage of EILTs Nancy implemented correctly was 24% during post-training, 50% during on-site coaching, and 79% during self-coaching. In the one materials-oriented maintenance activity, her correct implementation was 67%. Similarly, her rate per minute of correct implementation was 0 trial during one baseline activity. The mean rate of correct implementation was 0 trial during training, < .1 trial during post-training, .3 trial during on-site, and .4 trial during self-coaching. In the one maintenance activity, her rate per minute of correct implementation of EILTs was .5 trial (Table 4-32 and Figure 4-1).

Across activity types, Betsy’s percentage of correct implementation during on-site coaching and self-coaching phases were above her levels of correct implementation during the baseline phase. Across activity types, the percentage of correct implementation during on-site coaching was comparable. However, the percentage of correct implementation during self-coaching was higher for materials-oriented activities versus social-oriented activities. Betsy’s mean rates of correct implementation during on-site coaching and self-coaching phases were comparable across activity types.

Teacher 3: Kim

During both social-oriented and materials-oriented child-initiated activities, compared to baseline (*M* = 39%), the percentage of EILTs Kim implemented correctly increased by 15% during training (*M* = 54%), 10% during post-training, and 26% during on-site coaching and self-coaching phases (*M* = 65%). Kim’s mean rate per minute of correctly implemented EILTs showed a generally descending trend. She implemented a mean rate of .6 trial during baseline. Compared to baseline, her mean rate of correctly implemented EILTs decreased by .2 trial during training (*M* = .4), .4 trial during post-training (*M* = .2), and .2 trial during self-coaching (*M* = .4). During on-site coaching, her mean rate of correctly implemented EILTs increased by .2 trial (*M* =.8), when compared to baseline (Table 4-33 and Figure 4-1).

During activities classified as social, compared to baseline (*M* = 45%), the percentage of EILTs Kim implemented correctly increased by 18% during training and on-site coaching (*M* = 63%), 4% during post-training (*M* = 49%), and 36% during self-coaching. Kim’s mean rate per minute of correctly implemented EILTs showed a generally descending trend during social-oriented activities. She implemented a mean rate of .8 trial during baseline. Compared to baseline, her mean rate of correctly implemented EILTs decreased by .4 trial during training (*M* = .4), .6 trial during post-training (*M* = .2), and .4 trials during self-coaching (*M* = .4). During on-site coaching, her mean rate of correctly implemented EILTs increased by .1 trial (*M* = .9), when compared to baseline (Table 4-34 and Figure 4-1).

Across activities classified as materials-oriented, Kim did not implement any EILTs correctly during baseline and training phases. Her mean percentage of correct implementation was 50% during post-training, 75% during on-site coaching, and 59% during self-coaching. Similarly, her rate per minute of correctly implemented EILTs was 0 trial during the one baseline activity and the one training activity coded. The mean rate of correct implementation was .1 trial during post-training and on-site coaching, and .4 trial during self-coaching (Table 4-35 and Figure 4-1).

Across activity types, Kim's percentage of correct implementation showed an ascending trend throughout phases of the study. Across activity types, the mean percentage of correct implementation during baseline and training phases were higher for social-oriented activities when compared to materials-oriented activities. Mean percentage of correct implementation during on-site coaching was higher for social-oriented activities versus materials-oriented activities, while mean percentage of correct implementation during self-coaching was higher for materials-oriented activities versus social-oriented activities. The mean rate per minute of correctly implemented EILTs during on-site coaching was higher than during baseline across activity types. However, the mean rate of correctly implemented EILTs during self-coaching was higher than during baseline for materials-oriented activities only.

Teacher 4: Diana

During both social-oriented and materials-oriented child-initiated activities, compared to baseline (*M* = 51%), the percentage of EILTs Diana implemented correctly increased by 6% during training *(M* = 57%), 8% during post-training *(M* = 59%), and 20% during on-site coaching (*M* = 71%). Diana's mean rate per minute of correctly implemented EILTs was .3 trial across baseline, training, and post-training and it increased to .4 trial during on-site coaching (Table 4-36 and Figure 4-1).

In the one social-oriented baseline activity coded, Diana's percentage of correct implementation was 53%. Compared to baseline, the percentage of EILTs correctly implemented decreased by 3% during training (*M* = 50%) and increased by 24% during post-training (*M* = 77%) and 29% during on-site coaching (*M* = 82%). In the one baseline activity coded, Diana's rate per minute of correctly implemented EILTs was .5 trial. Her mean rate of implemented EILTs was .3 trial during training, .4 trial during post-training, and .6 trial during on-site coaching (Table 4-37 and Figure 4-1).

During materials-oriented activities, compared to baseline (*M* = 50%), the percentage of EILTs Diana implemented correctly increased by 17% during training *(M* = 67%), decreased by 8% during post-training *(M* = 42%), and remained the same during on-site coaching (*M* = 50%). Diana's mean rate per minute of implemented EILTs was .1 trial during baseline, .3 trial during training, .2 trial during post-training, and .1 trial during on-site coaching (Table 4-38 and Figure 4-1).

Diana's percentage of correct implementation showed an ascending trend throughout phases of the study during social-oriented activities and varied across the phases during materials-oriented activities. Across materials-oriented activities, her percentage of correct implementation during on-site coaching was the same as her level of correct implementation during baseline.

Research Question 3: Corollary Relationships Between Child Engagement Behaviors and Teacher Implementation of Embedded Instruction Learning Trials

In this section, results are presented for the corollary relationships between changes in engagement behaviors and partners of participating children and their teacher's implementation of EILTs. To evaluate corollary relationships, two sets of analyses were conducted. First, changes in child engagement behaviors and teachers' implementation of EILTs were examined by comparing baseline mean percentage scores to mean percentage scores in on-site coaching and self-coaching. Second, Spearman's rank-order correlation analyses were conducted by using mean percentage scores for child engagement behaviors and teachers' implementation of EILTs across (a) baseline, training, post-training, and on-site coaching (r_{oc}); and (b) baseline, training, post-training, and self-coaching (r_{sc}). Results are presented for each teacher-child dyad and by activity type.

Dyad 1: Nancy - Devon

During both social-oriented and materials-oriented child-initiated activities, the mean percentage and rate of EILTs implemented correctly by Nancy increased during on-site coaching and self-coaching phases, when compared to baseline. As shown in Figure 4-2, corresponding to changes in Nancy's correct implementation of EILTs, the mean percentage of intervals in which Devon exhibited social engagement behaviors increased above baseline levels during on-site and self-coaching phases. Devon's overall engagement with adults and his social interactions with adults that focused on pre-academic skills increased during on-site coaching and self-coaching phases in relation to Nancy's correct implementation of EILTs (Figure 4-3). In addition, when Nancy's correct implementation of EILTs increased, the mean percentage of intervals in which Devon demonstrated combinatorial and differentiated engagement behaviors and his engagement with objects decreased during on-site coaching and self-coaching, when compared to baseline. When Nancy implemented EILTs correctly during the training phase, Devon's attentional engagement decreased considerably and remained very stable at low levels across successive phases of the study. Devon exhibited sophisticated, undifferentiated, and non-engagement behaviors infrequently, as Nancy increased her correct implementation of EILTs across phases of the study.

Results of the rank-order correlation analyses showed changes in Nancy's correct implementation of EILTs across phases of the study during both social-oriented and materials-oriented activities were related to changes in Devon's social ($r_{oc} = r_{sc} = 1.00$), combinatorial ($r_{oc} = r_{sc} = -.50$), differentiated ($r_{oc} = -.50$; $r_{sc} = -1.00$), and attentional engagement ($r_{oc} = -1.00$; $r_{sc} = -.87$) behaviors as well as his engagement with adults ($r_{oc} = r_{sc} = 1.00$), his social interactions with adults that focused on pre-academic skills ($r_{oc} = r_{sc} = 1.00$), and his engagement with objects ($r_{oc} = r_{sc} = -1.00$). Corollary relationships were not examined for engagement behaviors that occurred infrequently (i.e., sophisticated, undifferentiated, and non-engaged) in relation to Nancy's implementation of EILTs.

For social-oriented activities, similar corollary relationships between the changes in Nancy's correct implementation of EILTs and Devon's social ($r_{oc} = r_{sc} = 1.00$) and combinatorial ($r_{oc} = r_{sc} = -1.00$) engagement behaviors as well as his engagement with adults ($r_{oc} = r_{sc} = 1.00$), his social interactions with adults that focused on pre-academic skills ($r_{oc} = r_{sc} = 1.00$), and his engagement with objects ($r_{oc} = r_{sc} = -1.00$) were found. There were not clear corollary relationships between the increases in Nancy's correct implementation and decreases in Devon's differentiated and attentional engagement behaviors during social-oriented activities.

For materials-oriented activities, Nancy's correct implementation varied across phases of the study. The pattern of change in Nancy's correct implementation across study phases appeared to be related to the changes in Devon's combinatorial (r_{oc} = 1.00; r_{sc} = .50) and differentiated (r_{oc} = -1.00; r_{sc} = -.50) engagement behaviors, indicating a corollary relationship. Changes in Devon's social and attentional engagement behaviors as well as his engagement with peers, adults, objects and self did not seem to be related to the changes in Nancy's correct implementation of EILTs.

Dyad 2: Betsy - Arlene

Across both social-oriented and materials-oriented child-initiated activities, Betsy implemented some EILTs correctly during baseline (20% correct) and no EILTs correctly during training. Following training, her correct implementation of EILTs during child-initiated activities began to increase. Compared to baseline, high levels of correct implementation were only observed when on-site coaching was implemented. The mean EILTs implementation percentage remained high during self-coaching and maintenance phases. Betsy's mean percentage of correct implementation was higher during self-coaching when compared to on-site coaching.

As shown in Figure 4-4, corresponding to increases in Betsy's correct implementation of EILTs during child-initiated social-oriented and materials-oriented activities across phases of the study, Arlene's social engagement behavior increased and her differentiated engagement behaviors decreased. Similar to increases in social engagement, Arlene's levels of engagement with adults increased slightly across phases of the study as Betsy's correct implementation of EILTs increased (Figure 4-5). As Betsy's correct implementation of EILTs increased across study phases, Arlene's level of combinatorial engagement varied, indicating no clear corollary relationship between the two variables. Sophisticated, attentional, undifferentiated, and non-engagement behaviors occurred very infrequently and remained stable across phases of the study with no clear relationships to Betsy's implementation of EILTs.

Results of the rank-order correlation analysis showed changes in Betsy's correct implementation of EILTs across phases of the study during social-oriented and materials-oriented activities were related to changes in Arlene's social ($r_{oc} = r_{sc} = .60$) and differentiated ($r_{oc} = r_{sc} = -.40$) engagement behaviors as well as her engagement with adults ($r_{oc} = .40$; $r_{sc} = .60$). Changes in Arlene's combinatorial engagement behaviors did not seem to be associated with changes in Betsy's correct implementation of EILTs. In addition, there were not corollary relationships between Betsy's correct implementation of EILTs across phases and Arlene's engagement behaviors that occurred infrequently (i.e., sophisticated, attentional, undifferentiated, and non-engaged).

During social-oriented activities, Betsy's correct implementation of EILTs showed similar patters of change as described above for both social-oriented and materials oriented activities. As shown in Figures 4-4 and 4-5, as Betsy's correct implementation increased, Arlene's social engagement behavior as well as her engagement with adults increased. Her levels of combinatorial and differentiated engagement behaviors as well as engagement with objects varied across phases of the study, while Betsy's correct implementation of EILTs increased. Sophisticated, attentional, undifferentiated, and non-engagement behaviors occurred infrequently and remained stable across phases of the study, as Betsy's correct implementation of EILTs increased. Results of the rank-order correlation analyses showed changes in Betsy's implementation of EILTs across phases of the study during social-oriented activities were related to changes in Arlene's social engagement behavior (r_{oc} = .50; r_{sc} = .74) as well as her engagement with adults (r_{oc} = .63; r_{sc} = .80). Changes in Arlene's combinatorial and differentiated engagement behaviors and her engagement with object and peers did not seem to be associated with changes in Betsy's correct implementation of EILTs.

During materials-oriented activities, Betsy did not implement any EILTs correctly during child-initiated activities coded in baseline and training phases and her correct implementation gradually increased starting in the post-training phase. As shown in Figure 4-4, corresponding to increases in Betsy's correct implementation of EILTs across study phases during materials-oriented activities, Arlene's combinatorial engagement behaviors increased and her differentiated engagement behavior decreased. Arlene's levels of social engagement behaviors varied across phases of the study, indicating no corollary relationships with changes in Betsy's correct implementation of EILTs. As Betsy's correct implementation of EILTs increased, Arlene's engagement with adults increased slightly. Results of the rank-order correlation analyses showed changes in Betsy's correct implementation of EILTs across phases of the study during materials-oriented activities were related to changes in Arlene's combinatorial (r_{oc} = r_{sc} = .95) and differentiated (r_{oc} = -.74; r_{sc} = -.95) engagement behaviors as well as her engagement with adults (r_{oc} = r_{sc} = .74). Changes in Arlene's social engagement behaviors did not seem to be associated with changes in Betsy's correct implementation of EILTs.

Dyad 3: Kim - Brian

During both social-oriented and materials-oriented activities, Kim's correct implementation of EILTs during child-initiated activities showed an ascending trend across phases of the study. As shown in Figure 4-6, corresponding to increases in

Kim’s correct implementation of EILTs, increases in Brian’s combinatorial engagement behaviors and decreases in his differentiated and attentional engagement behaviors were observed. Brian’s levels of social engagement varied across phases of the study, as Kim’s correct implementation of EILTs increased. Corresponding with increases in Kim’s implementation, Brian’s levels of engagement with peers showed a general increase (Figure 4-7). Brian’s engagement with adults varied across phases of the study and did not appear to be related to Kim’s correct implementation of EILTs. However, although Kim’s correct implementation increased across phases of the study, Brian’s level of social interactions with adults focused on pre-academic skills showed a descending trend. Brian exhibited sophisticated, undifferentiated, and non-engagement behaviors infrequently, as Kim increased her correct implementation of EILTs across phases of the study indicating no clear corollary relationships.

Results of the rank-order correlation analyses showed changes in Kim’s correct implementation of EILTs across phases of the study during social-oriented and materials-oriented activities were related to changes in Brian’s combinatorial ($r_{oc} = .40$; $r_{sc} = .60$), differentiated ($r_{oc} = -.80$; $r_{sc} = -.63$), and attentional ($r_{oc} = r_{sc} = -.80$) engagement behaviors as well as his engagement with peers ($r_{oc} = .40$; $r_{sc} = .80$) and social interactions with adults that focused on pre-academic skills ($r_{oc} = -.63$; $r_{sc} = -.80$). Changes in Brian’s social engagement behaviors did not seem to be associated with changes in Kim’s correct implementation of EILTs. No clear corollary relationships were found between changes in Kim’s correct implementation of EILTs and Brian’s sophisticated, undifferentiated, and non-engaged behaviors.

During social-oriented activities, Kim's correct implementation showed an ascending trend across phases of the study. As shown in Figure 4-6, corresponding to increases in Kim's correct implementation of EILTs during social-oriented activities, Brian's combinatorial engagement behaviors as well as his engagement with peers increased. Brian's levels of differentiated and attentional engagement behaviors as well as his engagement with adults that focused on pre-academic skills decreased across phases of the study, while Kim's correct implementation of EILTs increased. Sophisticated, undifferentiated, and non-engagement behaviors occurred infrequently and remained stable across phases of the study, as Kim's correct implementation of EILTs increased. Corollary relationships between Kim's correct implementation of EILTs and Brian levels of engagement with peer, adults, and objects were less evident during social-oriented activities.

Results of the rank-order correlation analyses showed changes in Kim's correct implementation of EILTs across phases of the study during social-oriented activities were related to changes in Brian's combinatorial ($r_{oc} = r_{sc} = .40$), differentiated ($r_{oc} = -.74$; $r_{sc} = -.80$), and attentional ($r_{oc} = -.95$; $r_{sc} = -.63$) engagement behaviors as well as his engagement with peers ($r_{oc} = .63$; $r_{sc} = .80$) and adults focused on pre-academic skills ($r_{oc} = -.63$; $r_{sc} = -.40$). Changes in Brian's social engagement behaviors and his engagement with adults and objects did not seem to be associated with changes in Kim's correct implementation.

During materials-oriented activities, Kim's correct implementation of EILTs increased dramatically during the last three phases of the study. As shown in Figures 4-6 and 4-7, corresponding to increases in Kim's correct EILTs implementation across study phases during materials-oriented activities, Brian's social and differentiated engagement behaviors decreased and his combinatorial engagement behaviors as well as his engagement with objects increased. As Kim's correct implementation increased, Brian's attentional engagement remained stable, indicating no corollary relationship. Results of the rank-order correlation analyses showed changes in Kim's implementation of EILTs across phases of the study during materials-oriented activities were related to changes in Brian's social ($r_{oc} = r_{sc} = -.95$), combinatorial ($r_{oc} = r_{sc} = .95$), and differentiated ($r_{oc} = -.95$; $r_{sc} = -.74$) engagement behaviors as well as his engagement with objects ($r_{oc} = .95$; $r_{sc} = .89$). Changes in Brian's attentional engagement behaviors and engagement with peers and adults did not seem to be associated with changes in Kim's correct implementation of EILTs.

Dyad 4: Diana - Jessica

During both social-oriented and materials-oriented child-initiated activities, Diana's correct implementation of EILTs showed an ascending trend across phases of the study. As shown in Figures 4-8 and 4-9, corresponding to increases in Diana's correct implementation of EILTs, increases in Jessica's social and combinatorial engagement behaviors as well as her engagement with adults (including social interactions that focused on pre-academic skills) were observed. In addition, as Diana's correct implementation increased, decreases in Jessica's differentiated engagement as well as her engagement with objects were observed. Jessica exhibited sophisticated, attentional, undifferentiated, and non-engagement behaviors infrequently, as Diana increased her correct implementation of EILTs across phases of the study. Results of the rank-order correlation analyses showed changes in Diana's implementation of EILTs across phases of the study during social-oriented and materials-oriented activities were related to changes in Jessica’s social (r_{oc} = 1.00), combinatorial (r_{oc} = .63), and differentiated (r_{oc} = -.80) engagement behaviors as well as her engagement with adults (r_{oc} = 1.00) and objects (r_{oc} = -1.00). Changes in Jessica’s level of engagement with peers did not seem to be associated with changes in Diana’s correct implementation of EILTs. Corollary relationships were not examined for engagement behaviors that occurred infrequently (i.e., sophisticated, attentional, undifferentiated, and non-engagement) in relation to Diana’s correct implementation of EILTs.

During social-oriented activities, Diana’s correct implementation of EILTs showed an ascending trend across phases of the study. As shown in Figures 4-8 and 4-9, changes in Jessica’s engagement behaviors and partners as Diana’s correct implementation increased were the same as those reported above for both social-oriented and materials-oriented activities. Rank-order correlation coefficients were similar to those reported for both social-oriented and materials-oriented activities.

During materials-oriented activities, Diana’s correct implementation of EILTs increased during training and decreased during post-training and on-site coaching. As shown in Figures 4-8 and 4-9, changes in Jessica’s combinatorial (r_{oc} = .63) and differentiated (r_{oc} = -.63) engagement behaviors corresponded with changes in Diana’s correct EILTs implementation. Changes in Jessica’s sophisticated, social, attentional, undifferentiated, and non-engagement behaviors as well as her engagement with peers, adults, and objects did not seem to be associated with changes in Diana’s correct implementation of EILTs.

Summary of Findings Across Dyads

Child Engagement Behavior

With respect to child engagement behaviors during both social-oriented and materials-oriented activities, although the percentages of intervals in which children engaged in sophisticated behaviors were very small, Arlene and Jessica increased their sophisticated engagement behaviors across the training and coaching phases of the study relative to their baseline levels. Compared to baseline, Brian's sophisticated engagement decreased with the introduction of training and remained below baseline across the subsequent phases of the study. Devon demonstrated few sophisticated engagement behaviors until maintenance phase where he was engaged in sophisticated behaviors for 8% of intervals on average.

During the training phase, the mean percentage of intervals in which all children engaged in social behaviors increased relative to baseline and these increases continued for 3 out of 4 children in subsequent phases. For Brian, the mean percentage of intervals in which he engaged in social behaviors remained stable during on-site coaching when compared to training, and decreased below baseline levels during self-coaching.

As opposed to increases in social engagement behaviors, during the training phase, there was a decrease in the mean percentage of intervals in which differentiated behaviors occurred relative to baseline for all four children and differentiated engagement showed a generally decreasing trend across subsequent experimental phases. In terms of combinatorial engagement, there were mixed findings. When compared to baseline, the mean percentage of intervals in which children engaged in combinatorial behaviors increased for Brian and Jessica, and decreased for Devon and Arlene during on-site coaching or self-coaching.

The mean percentage of intervals in which attentional behaviors occurred decreased in the training phase relative to baseline for Devon and Brian, and the decrease continued across the subsequent phases of the study. Arlene and Jessica demonstrated more attentional engagement behaviors during on-site coaching or self-coaching when compared to baseline. Changes in the mean percentage of intervals children were non-engaged or engaged in undifferentiated behaviors were minimal across all phases of the study.

Similar to the findings reported for both social-oriented and materials-oriented activities, sophisticated engagement behaviors were observed infrequently across study phases and children during social-oriented activities. The mean percentage of intervals Arlene and Jessica were engaged in sophisticated behaviors increased in the training phase relative to baseline and remained above baseline levels during on-site coaching. While Devon exhibited sophisticated engagement only during maintenance, Brian's sophisticated engagement during social-oriented activities decreased across phases of the study. The mean percentage of intervals children engaged in social behaviors increased in the training phase for all four children relative to baseline and remained above the baseline level across subsequent phases for three of the four children.

For combinatorial engagement during social-oriented activities, Devon's mean percentages during on-site coaching and self-coaching were below his baseline and training percentages. Arlene's engagement decreased considerably during training and remained below baseline percentages until the self-coaching phase where she exhibited combinatorial engagement behaviors slightly more than during baseline. The mean percentages of intervals Brian and Jessica were engaged in combinatorial behaviors during on-site coaching and self-coaching were higher than during baseline.

With respect to differentiated engagement, mean percentage of intervals engaged in differentiated engagement behaviors during social-oriented activities showed a descending trend for Brian and Jessica across phases of the study. For both children, levels of differentiated engagement during on-site coaching and self-coaching were below their baseline levels. Arlene's differentiated engagement during social-oriented activities decreased across the training and post-training phases, and an increase was observed during on-site and self-coaching phases. Nevertheless, the mean percentage of intervals in which she was engaged in differentiated behaviors during on-site coaching and self-coaching was below baseline levels. Devon's differentiated engagement was below his baseline levels during subsequent phases of the study, except during the on-site coaching phase when he demonstrated differentiated engagement behaviors slightly higher than baseline.

For 3 out of 4 children, attentional engagement generally showed a descending trend across phases of the study during social-oriented activities. Undifferentiated engagement behaviors and non-engagement were observed infrequently across phases and children, and therefore, between-phase changes in the mean percentage scores for undifferentiated engagement and non-engagement were negligible.

Similar to findings reported for both social-oriented and materials-oriented activities combined and social-oriented activities, sophisticated engagement behaviors occurred infrequently for all children across study phases during materials-oriented activities. Compared to baseline, the mean percentage of intervals children were engaged in sophisticated behaviors increased for Devon and Arlene during the training phase and remained above baseline levels during on-site coaching or self-coaching. Between-phase changes for Brian and Jessica were negligible.

The mean percentage of intervals engaged in social behaviors during materials-oriented activities increased for 3 out of 4 children with the introduction of training and remained higher than baseline percentages across subsequent phases of the study. Brian's social engagement showed a descending trend across phases of the study.

For 3 out of 4 children, the mean percentage of intervals engaged in combinatorial behaviors during materials-oriented activities for on-site coaching or self-coaching phases was higher than baseline percentages. The mean percentage of intervals in which Devon exhibited combinatorial engagement behaviors during on-site coaching and self-coaching phases was below his baseline mean percentage.

Differentiated engagement during materials-oriented activities showed a descending trend across phases of the study for 3 out of 4 children. Devon's differentiated engagement during the on-site coaching phase was slightly higher than his differentiated engagement during baseline.

In terms of attentional engagement during materials-oriented activities, Devon's engagement decreased across phases of the study. Arlene did not demonstrate any attentional engagement behavior during the only baseline activity coded. Her attentional engagement notably increased during the training phase. After training, Arlene's attentional engagement decreased considerably and remained stable across the remaining phases of the study. Brian's and Jessica's attentional engagement during on-site coaching was higher relative to baseline. Changes in undifferentiated engagement across phases of the study were very small and negligible across all four children during materials-oriented activities.

Arlene's and Jessica's non-engagement decreased during the training phase relative to baseline and remained very low during subsequent phases of the study. Between-phase changes in non-engagement were negligible for Devon and Brian.

Child Engagement Partner

With respect to engagement partners of participating children during both social-oriented and materials-oriented activities, the mean percentage of intervals engaged with peers during the on-site coaching phase was higher than the mean percentage of intervals engaged with peers during baseline for all four children. The mean percentage of intervals engaged with peers during the self-coaching phase was higher than baseline for 2 out of 3 children whose teachers received self-coaching. Devon was engaged with peers less during self-coaching when compared to baseline.

During the training phase, the mean percentage of intervals engaged with adults showed increases relative to baseline for 3 of 4 children and engagement with adults remained above baseline levels for all four children during the on-site coaching phase for 2 of 3 children during self-coaching. When compared to baseline, the mean percentage of intervals engaged with adults related to pre-academic skills increased for 3 out of 4 children during on-site coaching and for 1 of 3 children during self-coaching. Brian's social interaction with adults that focused on pre-academic skills showed a descending trend across the study phases. When compared to baseline, Arlene's engagement with adults related to pre-academic skills was higher during on-site coaching and lower during self-coaching.

With respect to engagement partners of participating children during social-oriented activities, when compared to baseline, the mean percentage of intervals engaged with peers was higher for 3 of 4 children during on-site coaching and 1 of 3 children during self-coaching. When compared to baseline, the mean percentage of intervals engaged with adults was higher for all children during on-site coaching and for 2 of 3 children during self-coaching. With respect to adult-engagement focused on pre-academic skills, 3 of 4 children during on-site coaching and 1 of 3 children during self-coaching had a mean percentage score higher than their baseline.

With respect to engagement partners of participating children during materials-oriented activities, when compared to baseline, the mean percentage of intervals engaged with peers was higher for all four children during on-site coaching and 2 of 3 children during self-coaching. When compared to baseline, the mean percentage of intervals engaged with adults was higher for 2 of 4 children during on-site coaching and for 2 of 3 children during self-coaching. Adult-engagement focused on pre-academic skills was observed infrequently across phases of the study and children. Mean percentage of intervals engaged with objects during baseline was higher than mean percentage of intervals engaged with objects during on-site coaching for 2 out of 4 children and during self-coaching for 2 out of 3 children. During materials-oriented activities, self-engagement was observed very infrequently across phases of the study and children.

Teachers' Implementation of Embedded Instruction Learning Trials

Data for both social-oriented and materials-oriented activities indicated that when compared to baseline, the mean percentage of correct implementation of EILTs increased for 3 out of the 4 teachers with the implementation of training and the increase on percentage of correct implementation continued during on-site coaching and self-coaching. Likewise, the mean rate per minute of correctly implemented EILTs increased for 3 out of 4 teachers during on-site coaching, when compared to baseline, and remained higher than baseline during self-coaching for 1 teacher. For Betsy, mean percentage of correct implementation only increased with the implementation of on-site coaching and the increase continued during self-coaching and maintenance. Her mean rate of correct implementation during baseline and on-site coaching was equal, and an increase in the mean rate was observed during self-coaching and maintenance. Between-phase changes in teacher's correct implementation of EILTs during social-oriented activities were similar to those reported for both social-oriented and materials-oriented activities.

For materials-oriented activities, the results with respect to teacher's correct implementation of EILTs were mixed. Nancy's correct implementation increased during the training phase, decreased below her baseline performance during the on-site coaching phase, and increased above baseline during self-coaching and maintenance. Betsy and Kim did not implement any EILTs correctly across baseline and training phases during materials-oriented activities. During post-training, Betsy's correct implementation increased slightly relative to baseline and Kim had a notable increase in EILTs implementation during materials-oriented activities. Betsy improved her correct implementation substantially relative to baseline during on-site coaching and self-coaching and maintained it during the only materials-oriented maintenance activity coded. Kim also increased her correct implementation during on-site coaching and self-coaching relative to post-training. For materials-oriented activities, Diana's correct implementation increased during training, decreased below her baseline levels during post-training, and increased to baseline performance levels during on-site coaching.

Corollary Relationships between Child Engagement and Teacher's Implementation of Embedded Instruction Learning Trials

Across social-oriented and materials-oriented activities, corollary relationships were identified between teacher's implementation of EILTs across study phases and four child engagement behaviors and three child engagement partners.

A corollary relationship was observed between teacher's correct implementation of EILTs and social and combinatorial engagement behaviors for three children, differentiated engagement behaviors for all four children, attentional engagement behaviors for two children, peer engagement for one child, adult engagement for three children, object engagement for two children, and social interactions with adults that focuses on pre-academic skills for two children.

Across activities classified as social-oriented, corollary relationships were identified between teacher's correct implementation of EILTs and four child engagement behaviors and three engagement partners. A corollary relationship was observed between teacher's correct implementation of EILTs and social and combinatorial engagement behaviors for three children, differentiated engagement behaviors for two children, attentional engagement behaviors for one child, peer engagement for one child, adult engagement for three children, object engagement for two children, and social interactions with adults that focus on pre-academic skills for two children.

During materials-oriented activities, corollary relationships were identified between teacher's correct implementation of EILTs and three child engagement behaviors and two engagement partners. A corollary relationship was observed between teacher’s correct implementation and social engagement behaviors for one child, combinatorial and differentiated engagement behaviors for all four children, adult engagement for one child, and object engagement for one child.

Table 4-1. Reliability for engagement coding by teacher-child dyad

Participant	Percent Agreement		Kappa	
	M	Range	M	Range
Engagement behavior				
Dyad 1	86	74-94	.74	.57-.86
Dyad 2	85	76-95	.76	.45-.91
Dyad 3	84	72-96	.72	.58-.91
Dyad 4	84	74-100	.73	.57-1.00
Overall	85	72-100	.74	.45-1.00
Engagement partner				
Dyad 1	81	68-94	.70	.51-.86
Dyad 2	80	66-89	.68	.40-.85
Dyad 3	80	64-96	.69	.51-.91
Dyad 4	81	65-100	.71	.54-1.00
Overall	81	64-100	.70	.40-1.00
Challenging Behavior				
Dyad 1	100	98-100	.89	.83-1.00
Dyad 2	99	97-100	.86	.77-1.00
Dyad 3	100	98-100	.94	.90-1.00
Dyad 4	99	96-100	.91	.77-1.00
Overall	100	99-100	.90	.77-1.00

Note. Percent agreement and kappa scores for engagement partner were calculated based on total number of intervals in which two coders agreed on engagement behaviors.

Table 4-2. Occurrence and non-occurrence agreement by engagement code

Code	Percent Occurrence Agreement		Percent Occurrence + Nonoccurrence Agreement	
	M	Range	M	Range
Engagement behavior				
Sophisticated	75	58-84	99	98-99
Social	88	83-92	93	91-93
Combinatorial	88	84-91	93	91-94
Differentiated	80	76-84	92	88-91
Attentional	76	67-78	98	96-99
Undifferentiated	33	0-57	100	99-100
Non-engaged	48	0-100	100	99-100
Engagement partner				
Peer	75	64-85	96	94-99
Peer-content	45	30-57	99	98-99
Adult	83	75-89	93	89-95
Adult-content	70	65-73	94	92-98
Object	88	76-95	94	89-95
Self	35	0-70	100	99-100
Challenging Behavior	73	0-100	98	96-100

Table 4-3. Devon's (child 1) percent interval data for both social-oriented and materials-oriented activities by experimental phase and engagement code

Phase		SOPH	SO	COMB	DIFF	ATT	UNDIF	NOEN
Baseline	M	0	10	48	29	12	<1	<1
(N = 8)	SD		9	21	15	14	1	1
	Range		0-22	16-74	5-49	0-40	0-3	0-2
Training	M	0	16	53	26	3	<1	1
(N = 11)	SD		16	15	17	3	1	1
	Range		0-59	38-86	0-49	0-11	0-3	0-3
On-site	M	1	48	21	27	1	0	0
Coaching	SD	2	28	15	21	3		
(N = 11)	Range	0-6	2-88	0-44	2-76	0-7		
Self-	M	<1	34	36	23	3	<1	1
coaching	SD	1	19	22	16	3	1	2
(N = 8)	Range	0-3	8-65	6-68	0-44	0-8	0-3	0-5
Maintenance	M	8	29	47	13	1	<1	<1
(N = 7)	SD	7	12	15	7	2	1	1
	Range	0-20	15-49	16-57	4-23	0-4	0-1	0-2
Total	M	2	28	40	24	4	<1	<1
(N = 45)	SD	4	23	21	17	7	1	1
	Range	0-20	0-88	0-86	0-76	0-40	0-3	0-5

Note. SOPH = Sophisticated, SO = Social, COMB = Combinatorial, DIFF = Differentiated, ATT = Attentional, UNDIF = Undifferentiated, NOEN = Nonengaged.

Table 4-4. Devon’s (child 1) percent interval data for social-oriented activities by experimental phase and engagement code

Phase		SOPH	SO	COMB	DIFF	ATT	UNDIF	NOEN
Baseline	M	0	12	47	21	20	0	0
(N = 4)	SD		11	20	11	17		
	Range		0-22	26-69	5-30	6-40		
Training	M	0	43	42	14	1	0	1
(N = 2)	SD		23	5	14	2		1
	Range		27-59	38-45	3-24	0-3		0-1
On-site	M	0	58	16	22	2	0	0
Coaching	SD		29	14	25	3		
(N = 7)	Range		2-88	0-36	2-76	0-7		
Self-	M	0	54	17	16	5	1	1
coaching	SD		12	16	14	4	2	2
(N = 3)	Range		41-65	6-35	0-27	0-8	0-3	0-3
Maintenance	M	14	39	33	11	0	0	1
(N = 2)	SD	8	14	25	6			1
	Range	8-20	30-49	16-51	7-16			0-2
Total	M	2	43	28	19	6	<1	
(N = 18)	SD	5	27	20	17	11	1	
	Range	0-20	0-88	0-69	0-76	0-40	0-3	0-3

Note. SOPH = Sophisticated, SO = Social, COMB = Combinatorial, DIFF = Differentiated, ATT = Attentional, UNDIF = Undifferentiated, NOEN = Nonengaged.

Table 4-5. Devon's (child 1) percent interval data for materials-oriented activities by experimental phase and engagement code

Phase		SOPH	SO	COMB	DIFF	ATT	UNDIF	NOEN
Baseline	M	0	9	49	36	4	1	1
(N = 4)	SD		7	26	15	5	2	1
	Range		2-19	16-74	19-49	0-10	0-3	0-2
Training	M	0	10	56	28	3	<1	<1
(N = 9)	SD		6	15	17	4	1	1
	Range		0-21	38-86	0-49	0-11	0-3	0-3
On-site	M	3	30	30	37	0	0	0
Coaching	SD	3	17	14	10			
(N = 4)	Range	0-6	18-54	17-44	25-50			
Self-	M	1	22	47	26	2	0	1
coaching	SD	1	11	17	17	2		2
(N = 5)	Range	0-3	8-38	22-68	6-44	0-5		0-5
Maintenance	M	6	24	53	14	1	<1	<1
(N = 5)	SD	5	10	5	8	2	1	1
	Range	0-12	15-42	45-57	4-23	0-4	0-1	0-1
Total	M	2	18	49	28	2	<1	<1
(N = 27)	SD	3	13	17	16	3	1	1
	Range	0-12	0-54	16-86	0-50	0-11	0-3	0-5

Note. SOPH. = Sophisticated, SO = Social, COMB = Combinatorial, DIFF = Differentiated, ATT = Attentional, UNDIF = Undifferentiated, NOEN = Nonengaged.

Table 4-6. Devon's (child 1) percent interval data for both social-oriented and materials-oriented activities by experimental phase and engagement partner code

Phase		Peer	Adult	Object	Self	Peer-Content	Adult-Content
Baseline	*M*	10	6	83	0	<1	<1
(N = 8)	*SD*	11	8	12		<1	1
	Range	0-32	0-25	64-94		0-1	0-3
Training	M	7	11	80	0	1	4
(N = 11)	SD	8	10	15		2	6
	Range	0-28	0-31	41-100		0-5	0-18
On-site	M	12	36	50	0	<1	14
Coaching	SD	15	33	26		1	18
(N = 11)	Range	0-50	4-88	13-82		0-2	0-39
Self-	M	5	32	58	0	0	11
coaching	SD	5	23	23			15
(N = 8)	Range	0-14	5-65	28-92			0-43
Maintenance	M	15	23	60	14	1	5
(N = 7)	SD	11	8	14	38	1	3
	Range	3-31	11-33	36-76	0-100	0-4	0-8
Total	M	10	22	66	2	<1	7
(N = 45)	SD	11	23	23	15	1	12
	Range	0-50	0-88	13-100	0-100	0-5	0-43

Table 4-7. Devon's (child 1) percent interval data for social-oriented activities by experimental phase and engagement partner code

Phase		Peer	Adult	Object	Self	Peer-Content	Adult-Content
Baseline	M	10	9	81	0	<1	1
(N = 4)	SD	15	11	14		1	1
	Range	0-32	0-25	64-94		0-1	0-3
Training	M	15	30	55	0	2	14
(N = 2)	SD	19	2	20		2	6
	Range	1-28	28-31	41-69		0-3	10-18
On-site	M	6	53	38	0	<1	23
Coaching	SD	7	30	24		1	18
(N = 7)	Range	0-18	5-88	13-80		0-2	0-39
Self-	M	1	57	34	0	0	25
coaching	SD	2	10	5			16
(N = 3)	Range	0-3	46-65	28-38			11-43
Maintenance	M	23	28	46	0	1	7
(N = 2)	SD	12	7	15		1	0
	Range	15-31	23-33	36-57		0-2	7
Total	M	9	39	50	0	<1	15
(N = 18)	SD	11	27	25		1	16
	Range	0-32	0-88	13-94		0-3	0-43

Table 4-8. Devon's (child 1) percent interval data for materials-oriented activities by experimental phase and engagement partner code

Phase		Peer	Adult	Object	Self	Peer-Content	Adult-Content
Baseline	M	9	3	85	0	0	0
(N = 4)	SD	8	4	12			
	Range	0-19	0-7	68-93			
Training	M	6	6	85	0	1	1
(N = 9)	SD	5	4	7		2	3
	Range	0-16	0-13	78-100		0-5	0-7
On-site	M	23	7	70	0	0	0
Coaching	SD	19	3	17			
(N = 4)	Range	6-50	4-12	46-82			
Self-	M	7	17	73	0	0	3
coaching	SD	6	12	14			3
(N = 5)	Range	0-14	5-34	63-92			0-6
Maintenance	M	12	21	65	20	1	5
(N = 5)	SD	10	8	10	45	2	4
	Range	3-27	11-30	53-76	0-100	0-4	0-8
Total	M	10	11	77	4	<1	2
(N = 27)	SD	11	9	14	19	1	3
	Range	0-50	0-34	46-100	0-100	0-5	0-8

Table 4-9. Arlene's (child 2) percent interval data for both social-oriented and materials-oriented activities by experimental phase and engagement code

Phase		SOPH	SO	COMB	DIFF	ATT	UNDIF	NOEN
Baseline	M	0	7	48	37	2	0	6
(N = 6)	SD		15	16	18	4		8
	Range		0-38	24-68	9-57	0-10		0-19
Training	M	5	27	29	31	4	1	<1
(N = 10)	SD	7	19	20	24	8	1	1
	Range	0-20	5-59	0-65	0-81	0-25	0-3	0-2
Post-training	M	5	29	37	25	3	<1	0
(N = 18)	SD	7	13	22	21	6	1	
	Range	0-18	8-49	0-83	3-76	0-19	0-3	
On-site	M	7	26	31	30	3	<1	<1
Coaching	SD	9	17	20	25	6	1	1
(N = 18)	Range	0-27	3-56	0-72	4-80	0-24	0-2	0-2
Self-	M	3	18	47	24	4	<1	<1
Coaching	SD	5	9	18	18	7	2	1
(N = 8)	Range	0-14	7-30	18-78	0-57	0-21	0-5	0-4
Maintenance	M	3	20	44	26	3	0	2
(N = 1)	SD							
	Range							
Total	M	5	24	36	29	3	<1	1
(N = 61)	SD	7	16	20	21	6	1	3
	Range	0-27	0-59	0-83	0-81	0-25	0-5	0-19

Note. SOPH = Sophisticated, SO = Social, COMB = Combinatorial, DIFF = Differentiated, ATT = Attentional, UNDIF = Undifferentiated, NOEN = Nonengaged.

Table 4-10. Arlene's (child 2) percent interval data for social-oriented activities by experimental phase and engagement code

Phase		SOPH	SO	COMB	DIFF	ATT	UNDIF	NOEN
Baseline	M	0	9	52	33	2	0	4
(N = 5)	SD		17	12	17	4		6
	Range		0-38	41-68	9-56	0-10		0-14
Training	M	7	33	29	29	0	1	0
(N = 7)	SD	7	20	21	17		1	
	Range	0-20	7-59	0-65	3-48		0-3	
Post-training	M	6	33	39	18	2	0	0
(N = 9)	SD	7	12	20	10	5		
	Range	0-18	18-49	0-72	5-40	0-14		
On-site	M	7	33	25	30	3	<1	<1
Coaching	SD	9	14	16	27	7	1	1
(N = 12)	Range	0-27	6-56	0-57	7-80	0-24	0-2	0-2
Self-	M	1	11	53	32	0	0	1
coaching	SD	1	6	25	23			2
(N = 3)	Range	0-2	7-18	29-78	11-57			0-4
Maintenance	M							
(N = 0)	SD							
	Range							
Total	M	5	28	35	27	2	<1	1
(N = 36)	SD	8	17	20	20	5	1	2
	Range	0-27	0-59	0-78	3-80	0-24	0-3	0-14

Note. SOPH = Sophisticated, SO = Social, COMB = Combinatorial, DIFF = Differentiated, ATT = Attentional, UNDIF = Undifferentiated, NOEN = Nonengaged.

Table 4-11. Arlene's (child 2) percent interval data for materials-oriented activities by experimental phase and engagement code

Phase		SOPH	SO	COMB	DIFF	ATT	UNDIF	NOEN
Baseline (N = 1)	M	0	0	24	57	0	0	19
	SD							
	Range							
Training (N = 3)	M	0	13	30	37	13	1	1
	SD		9	25	41	10	1	1
	Range		5-23	2-48	0-81	7-25	0-2	0-2
Post-training (N = 9)	M	4	26	34	31	4	1	0
	SD	6	13	24	27	7	1	
	Range	0-18	8-43	3-83	3-76	0-19	0-3	
On-site Coaching (N = 6)	M	7	13	44	32	3	0	0
	SD	10	13	23	22	4		
	Range	0-25	3-39	17-72	4-61	0-9		
Self-coaching (N = 5)	M	5	22	43	20	6	1	<1
	SD	6	9	14	14	8	2	1
	Range	0-14	8-30	18-52	0-31	0-21	0-5	0-2
Maintenance (N = 1)	M	3	20	44	26	3	0	2
	SD							
	Range							
Total (N = 25)	M	4	19	38	31	5	1	1
	SD	7	13	20	24	7	1	4
	Range	0-25	0-43	2-83	0-81	0-25	0-5	0-19

Note. SOPH = Sophisticated, SO = Social, COMB = Combinatorial, DIFF = Differentiated, ATT = Attentional, UNDIF = Undifferentiated, NOEN = Nonengaged.

Table 4-12. Arlene's (child 2) percent interval data for both social-oriented and materials-oriented activities by experimental phase and engagement partner code

Phase		Peer	Adult	Object	Self	Peer-Content	Adult-Content
Baseline	M	5	4	84	0	2	1
(N = 6)	SD	11	5	16		5	4
	Range	0-26	0-12	59-100		0-12	0-9
Training	M	12	22	63	0	0	5
(N = 10)	SD	11	20	19			9
	Range	0-38	2-71	26-81			0-24
Post-training	M	13	21	65	<1	<1	8
(N = 18)	SD	11	16	14	1	1	13
	Range	0-34	0-49	44-87	0-3	0-5	0-43
On-site	M	7	28	63	0	<1	8
Coaching	SD	7	19	18		1	13
(N = 18)	Range	0-23	0-60	38-97		0-2	0-44
Self-	M	12	11	73	0	0	1
coaching	SD	10	8	11			1
(N = 8)	Range	0-30	0-25	55-86			0-4
Maintenance	M	6	22	70	0	0	9
(N = 1)	SD						
	Range						
Total	M	10	20	67	<1	<1	6
(N = 61)	SD	10	17	17	1	2	11
	Range	0-38	0-71	26-100	0-3	0-12	0-44

Table 4-13. Arlene's (child 2) percent interval data for social-oriented activities by experimental phase and engagement partner code

Phase		Peer	Adult	Object	Self	Peer-Content	Adult-Content
Baseline	M	6	5	85	0	2	2
(N = 5)	SD	11	5	17		5	4
	Range	0-26	0-12	59-100		0-12	0-9
Training	M	14	28	57	0	0	7
(N = 7)	SD	13	21	20			10
	Range	0-38	7-71	26-79			0-24
Post-training	M	14	25	61	0	1	10
(N = 9)	SD	12	16	14		2	13
	Range	0-34	5-49	44-78		0-5	0-41
On-site	M	7	35	56	0	<1	12
Coaching	SD	7	19	15		1	15
(N = 12)	Range	0-16	3-60	38-86		0-2	0-44
Self-	M	4	12	82	0	0	1
coaching	SD	4	13	6			2
(N = 3)	Range	0-7	0-25	75-86			0-4
Maintenance	M						
(N = 0)	SD						
	Range						
Total	M	10	25	63	0	1	8
(N = 36)	SD	10	19	19		2	12
	Range	0-38	0-71	26-100		0-12	0-44

Table 4-14. Arlene’s (child 2) percent interval data for materials-oriented activities by experimental phase and engagement partner code

Phase		Peer	Adult	Object	Self	Peer-Content	Adult-Content
Baseline (N = 1)	M	0	0	81	0	0	0
	SD						
	Range						
Training (N = 3)	M	8	8	77	0	0	0
	SD	4	6	4			
	Range	5-12	2-15	73-81			
Post-training (N = 9)	M	13	16	69	1	0	7
	SD	10	16	13	1		14
	Range	0-32	0-43	55-87	0-3		0-43
On-site Coaching (N = 6)	M	6	15	78	0	0	1
	SD	8	9	13			2
	Range	0-23	0-25	61-97			0-5
Self-coaching (N = 5)	M	17	10	68	0	0	0
	SD	9	6	11			
	Range	8-30	0-14	55-82			
Maintenance (N = 1)	M	6	22	70	0	0	9
	SD						
	Range						
Total (N = 25)	M	11	13	73	<1	0	3
	SD	9	11	12	1		9
	Range	0-32	0-43	55-97	0-3		0-43

Table 4-15. Brian's (child 3) percent interval data for both social-oriented and materials-oriented activities by experimental phase and engagement code

Phase		SOPH	SO	COMB	DIFF	ATT	UNDIF	NOEN
Baseline	M	4	38	16	26	13	1	1
(N = 7)	SD	6	19	10	18	17	3	2
	Range	0-13	7-57	8-36	4-56	0-50	0-7	0-4
Training	M	1	53	4	25	11	4	1
(N = 7)	SD	2	16	4	15	4	3	2
	Range	0-5	26-69	0-11	11-55	6-17	0-7	0-3
Post-	M	2	38	26	23	10	<1	1
training	SD	4	18	22	17	6	1	2
(N = 22)	Range	0-15	8-71	0-74	2-73	0-21	0-2	0-7
On-site	M	<1	53	24	14	7	<1	1
Coaching	SD	1	21	15	10	6	1	2
(N = 11)	Range	0-3	7-81	6-49	0-33	0-20	0-3	0-5
Self-	M	0	23	44	23	6	1	2
coaching	SD		14	19	14	7	2	3
(N = 8)	Range		3-52	11-66	7-50	0-23	0-3	0-8
Total	M	1	41	24	22	10	1	1
(N = 55)	SD	3	20	20	15	8	2	2
	Range	0-15	3-81	0-74	0-73	0-50	0-7	0-8

Note. SOPH = Sophisticated, SO = Social, COMB = Combinatorial, DIFF = Differentiated, ATT = Attentional, UNDIF = Undifferentiated, NOEN = Nonengaged.

Table 4-16. Brian's (child 3) percent interval data for social-oriented activities by experimental phase and engagement code

Phase		SOPH	SO	COMB	DIFF	ATT	UNDIF	NOEN
Baseline	M	4	40	17	21	14	1	1
(N = 6)	SD	6	20	10	14	18	2	2
	Range	0-13	7-57	8-36	4-40	0-50	0-7	0-4
Training	M	1	58	4	20	12	3	1
(N = 6)	SD	2	11	4	7	4	2	2
	Range	0-5	42-69	0-11	11-30	6-17	0-7	0-3
Post-	M	2	46	14	23	13	1	1
training	SD	5	15	11	18	5	1	2
(N = 14)	Range	0-15	14-71	0-34	2-73	2-21	0-2	0-7
On-site	M	<1	61	18	13	6	<1	1
Coaching	SD	1	12	11	10	5	1	2
(N = 9)	Range	0-3	40-81	6-41	0-33	3-16	0-3	0-5
Self-	M	0	37	32	16	13	2	0
coaching	SD		20	15	6	14	2	
(N = 2)	Range		23-52	21-42	12-21	3-23	0-3	
Total	M	2	50	15	19	11	1	1
(N = 37)	SD	4	17	11	14	9	2	2
	Range	0-15	7-81	0-42	0-73	0-50	0-7	0-7

Note. SOPH = Sophisticated, SO = Social, COMB = Combinatorial, DIFF = Differentiated, ATT = Attentional, UNDIF = Undifferentiated, NOEN = Nonengaged.

Table 4-17. Brian's (child 3) percent interval data for materials-oriented activities by experimental phase and engagement code

Phase		SOPH	SO	COMB	DIFF	ATT	UNDIF	NOEN
Baseline (N = 1)	M	0	28	11	56	6	0	0
	SD							
	Range							
Training (N = 1)	M	3	26	3	55	6	7	0
	SD							
	Range							
Post-training (N = 8)	M	<1	23	46	24	6	0	0
	SD	1	11	22	17	5		
	Range	0-2	8-37	0-74	6-56	0-17		
On-site Coaching (N = 2)	M	0	19	48	18	14	0	0
	SD		16	1	5	8		
	Range		7-31	47-49	14-22	8-20		
Self-coaching (N = 6)	M	0	18	48	25	3	1	3
	SD		8	20	15	3	2	3
	Range		3-25	11-66	7-50	0-8	0-3	0-8
Total (N = 18)	M	<1	21	43	27	6	1	1
	SD	1	10	22	17	5	2	2
	Range	0-3	3-37	0-74	6-56	0-20	0-7	0-8

Note. SOPH = Sophisticated, SO = Social, COMB = Combinatorial, DIFF = Differentiated, ATT = Attentional, UNDIF = Undifferentiated, NOEN = Nonengaged.

Table 4-18. Brian's (child 3) percent interval data for both social-oriented and materials-oriented activities by experimental phase and engagement partner code

Phase		Peer	Adult	Object	Self	Peer-Content	Adult-Content
Baseline	M	4	46	47	<1	0	22
(N = 7)	SD	4	21	17	1		21
	Range	0-8	11-70	30-71	0-3		0-50
Training	M	30	29	36	0	7	15
(N = 7)	SD	17	23	13		13	15
	Range	14-61	6-62	24-61		0-36	0-33
Post-	M	10	33	56	0	2	12
training	SD	13	20	20		6	10
(N = 22)	Range	0-47	0-71	24-92		0-26	0-27
On-site	M	8	49	42	0	<1	12
Coaching	SD	8	24	21		1	8
(N = 11)	Range	0-29	0-75	19-90		0-3	0-26
Self-	M	12	14	69	0	0	5
coaching	SD	14	17	13			12
(N = 8)	Range	0-42	0-52	45-87			0-34
Total	M	12	35	51	<1	2	13
(N = 55)	SD	14	23	20	0	6	13
	Range	0-61	0-75	19-92	0-3	0-36	0-50

Table 4-19. Brian's (child 3) percent interval data for social-oriented activities by experimental phase and engagement partner code

Phase		Peer	Adult	Object	Self	Peer-Content	Adult-Content
Baseline	M	4	49	44	<1	0	25
(N = 6)	SD	4	22	16	1		22
	Range	0-8	11-70	30-71	0-3		0-50
Training	M	31	33	31	0	8	18
(N = 6)	SD	18	22	8		14	15
	Range	14-61	7-62	24-42		0-36	0-33
Post-	M	12	41	45	0	1	16
training	SD	14	19	14		2	9
(N = 14)	Range	0-47	5-71	24-73		0-7	0-27
On-site	M	7	57	34	0	<1	13
Coaching	SD	9	17	11		1	7
(N = 9)	Range	0-29	19-75	19-50		0-3	0-26
Self-	M	21	26	51	0	0	17
coaching	SD	30	37	9			24
(N = 2)	Range	0-42	0-52	45-58			0-34
Total	M	13	44	40	<1	2	17
(N = 37)	SD	16	21	14	<1	6	13
	Range	0-61	0-75	19-73	0-3	0-36	0-50

Table 4-20. Brian's (child 3) percent interval data for materials-oriented activities by experimental phase and engagement partner code

Phase		Peer	Adult	Object	Self	Peer-Content	Adult-Content
Baseline (N = 1)	M	6	28	67	0	0	6
	SD						
	Range						
Training (N = 1)	M	26	6	61	0	0	0
	SD						
	Range						
Post-training (N = 8)	M	6	19	75	0	3	4
	SD	11	14	11		9	7
	Range	0-32	0-33	60-92		0-26	0-16
On-site Coaching (N = 2)	M	10	12	77	0	0	6
	SD	3	17	19			9
	Range	7-12	0-24	63-90			0-12
Self-coaching (N = 6)	M	9	10	75	0	0	1
	SD	7	8	8			1
	Range	3-22	0-21	63-87			0-3
Total (N = 18)	M	8	15	74	0	1	3
	SD	9	12	10		6	5
	Range	0-32	0-33	60-92		0-26	0-16

Table 4-21. Jessica's (child 4) percent interval data for both social-oriented and materials-oriented activities by experimental phase and engagement code

Phase		SOPH	SO	COMB	DIFF	ATT	UNDIF	NOEN
Baseline	M	1	16	16	61	3	1	2
(N = 3)	SD	1	14	12	13	3	2	2
	Range	0-2	0-28	5-29	49-75	0-7	0-2	0-4
Training	M	5	32	33	26	2	1	<1
(N = 5)	SD	8	13	22	19	1	2	1
	Range	0-18	17-50	12-62	7-54	0-4	0-4	0-2
Post-	M	1	36	28	32	1	1	1
training	SD	2	20	16	20	2	2	1
(N = 16)	Range	0-8	10-83	6-52	3-70	0-7	0-9	0-3
On-site	M	3	41	28	16	10	1	0
Coaching	SD	6	25	17	10	20	2	
(N = 6)	Range	0-14	2-67	3-51	2-28	0-50	0-4	
Total	M	2	34	28	31	4	1	1
(N = 30)	SD	4	20	17	21	9	2	1
	Range	0-18	0-83	3-62	2-75	0-50	0-9	0-4

Note. SOPH = Sophisticated, SO = Social, COMB = Combinatorial, DIFF = Differentiated, ATT = Attentional, UNDIF = Undifferentiated, NOEN = Nonengaged.

Table 4-22. Jessica's (child 4) percent interval data for social-oriented activities by experimental phase and engagement code

Phase		SOPH	SO	COMB	DIFF	ATT	UNDIF	NOEN
Baseline (N =1)	M	2	28	5	58	7	0	0
	SD							
	Range							
Training (N = 3)	M	6	33	18	38	2	1	1
	SD	10	17	7	14	2	2	1
	Range	0-18	17-50	12-25	28-54	0-4	0-4	0-2
Post-training (N = 8)	M	1	50	24	21	2	0	1
	SD	2	16	17	16	3		1
	Range	0-4	36-83	6-50	3-46	0-7		0-3
On-site Coaching (N = 4)	M	4	55	18	18	3	1	0
	SD	7	14	11	9	3	2	
	Range	0-14	35-67	3-29	7-28	0-7	0-4	
Total (N = 16)	M	3	47	20	26	3	1	<1
	SD	5	17	14	17	3	1	1
	Range	0-18	17-83	3-50	3-58	0-7	0-4	0-3

Note. SOPH = Sophisticated, SO = Social, COMB = Combinatorial, DIFF = Differentiated, ATT = Attentional, UNDIF = Undifferentiated, NOEN = Nonengaged.

Table 4-23. Jessica's (child 4) percent interval data for materials-oriented activities by experimental phase and engagement code

Phase		SOPH	SO	COMB	DIFF	ATT	UNDIF	NOEN
Baseline	M	1	9	21	62	1	2	3
(N =2)	SD	2	13	11	19	2	<1	2
	Range	0-2	0-18	13-29	49-75	0-2	2-2	2-4
Training	M	3	31	56	8	2	0	0
(N = 2)	SD	1	9	8	2	0		
	Range	2-3	24-37	51-62	7-10	2		
Post-	M	1	22	32	42	1	2	<1
training	SD	3	12	15	19	2	3	1
(N = 8)	Range	0-8	10-46	17-52	14-70	0-5	0-9	0-3
On-site	M	0	13	46	12	26	0	0
Coaching	SD		15	7	14	34		
(N = 2)	Range		2-24	41-51	2-22	1-50		
Total	M	1	20	36	36	5	1	1
(N = 14)	SD	2	12	16	24	13	3	2
	Range	0-8	0-46	13-62	2-75	0-50	0-9	0-4

Note. SOPH = Sophisticated, SO = Social, COMB = Combinatorial, DIFF = Differentiated, ATT = Attentional, UNDIF = Undifferentiated, NOEN = Nonengaged.

Table 4-24. Jessica's (child 4) percent interval data for both social-oriented and materials-oriented activities by experimental phase and engagement partner code

Phase		Peer	Adult	Object	Self	Peer-Content	Adult-Content
Baseline	M	3	17	77	0	0	1
(N = 3)	SD	2	15	14			2
	Range	1-4	0-30	67-92			0-3
Training	M	13	24	61	1	0	5
(N = 5)	SD	6	11	17	1		4
	Range	4-20	13-37	43-79	0-2		0-9
Post-	M	8	33	58	<1	0	10
training	SD	12	23	21	1		16
(N = 16)	Range	0-48	0-83	17-83	0-3		0-62
On-site	M	7	40	52	0	0	12
Coaching	SD	3	28	27			14
(N = 6)	Range	2-10	0-66	28-93			0-34
Total	M	8	31	59	<1	0	9
(N = 30)	SD	9	22	21	1		14
	Range	0-48	0-83	17-93	0-3		0-62

Table 4-25. Jessica's (child 4) percent interval data for social-oriented activities by experimental phase and engagement partner code

Phase		Peer	Adult	Object	Self	Peer-Content	Adult-Content
Baseline	M	3	30	67	0	0	3
(N =1)	SD						
	Range						
Training	M	13	28	55	1	0	4
(N = 3)	SD	8	13	21	1		5
	Range	4-20	13-37	43-79	0-2		0-9
Post-	M	10	46	43	0	0	18
training	SD	16	22	16			21
(N = 8)	Range	0-48	10-83	17-64			0-62
On-site	M	7	56	36	0	0	16
Coaching	SD	3	15	11			15
(N = 4)	Range	3-10	34-66	28-53			0-34
Total	M	9	44	45	<1	0	14
(N = 16)	SD	12	20	17	1		17
	Range	0-48	10-83	17-79	0-2		0-62

Table 4-26. Jessica's (child 4) percent interval data for materials-oriented activities by experimental phase and engagement partner code

Phase		Peer	Adult	Object	Self	Peer-Content	Adult-Content
Baseline	M	3	10	82	0	0	0
(N =2)	SD	2	14	15			
	Range	1-4	0-20	71-92			
Training	M	13	18	69	0	0	6
(N = 2)	SD	4	6	9			1
	Range	10-15	14-22	63-76			6-7
Post-	M	5	19	73	<1	0	2
training	SD	4	14	11	1		4
(N = 8)	Range	0-11	0-43	51-83	0-3		0-9
On-site	M	6	7	84	0	0	2
Coaching	SD	6	9	13			3
(N = 2)	Range	2-10	0-13	75-93			0-4
Total	M	6	16	76	<1	0	2
(N = 14)	SD	5	12	11	1		3
	Range	0-15	0-43	51-93	0-3		0-9

Table 4-27. Nancy's (teacher 1) percentage and rate (per 1 minute) of correctly implemented EILTs by phase during both social-oriented and materials-oriented activities

Phase		%	Rate
Baseline	M	44	.3
(N = 8)	SD	35	.3
	Range	0-100	0-.9
Training	M	50	.3
(N = 11)	SD	47	.3
	Range	0-100	0-.9
On-site Coaching	M	55	.6
(N = 11)	SD	43	.7
	Range	0-100	0-1.8
Self-coaching	M	69	.4
(N = 8)	SD	47	.3
	Range	0-100	0-1.0
Maintenance	M	36	.1
(N = 7)	SD	48	.1
	Range	0-100	0-.2
Total	M	51	.3
(N = 45)	SD	43	.4
	Range	0-100	0-1.8

Table 4-28. Nancy's (teacher 1) percentage and rate (per 1 minute) of correctly implemented EILTs by phase during social-oriented activities

Phase		%	Rate
Baseline	M	55	.4
(N = 4)	SD	42	.4
	Range	0-100	0-.9
Training	M	71	.9
(N = 2)	SD	40	.1
	Range	43-100	
On-site Coaching	M	73	.9
(N = 7)	SD	35	.6
	Range	0-100	0-1.8
Self-coaching	M	93	.6
(N = 3)	SD	12	.3
	Range	80-100	.4-1.0
Maintenance	M	0	0
(N = 2	SD		
	Range		
Total	M	64	.7
(N = 18)	SD	39	.5
	Range	0-100	0-1.8

Table 4-29. Nancy's (teacher 1) percentage and rate (per 1 minute) of correctly implemented EILTs by phase during materials-oriented activities

Phase		%	Rate
Baseline	M	33	.2
(N = 4)	SD	27	.2
	Range	0-67	0-.4
Training	M	45	.2
(N = 9)	SD	49	.2
	Range	0-100	0-.4
On-site Coaching	M	30	<.1
(N = 4)	SD	45	.1
	Range	0-100	0-.1
Self-coaching	M	40	.2
(N = 5)	SD	55	.2
	Range	0-100	0-.4
Maintenance	M	42	.1
(N = 5)	SD	49	.1
	Range	0-100	0-.2
Total	M	41	.1
(N = 27)	SD	44	.1
	Range	0-100	0-.4

Table 4-30. Betsy's (teacher 2) percentage and rate (per 1 minute) of correctly implemented EILTs by phase during both social-oriented and materials-oriented activities

Phase		%	Rate
Baseline	M	20	.2
(N = 6)	SD	28	.3
	Range	0-67	0-.9
Training	M	0	0
(N = 10)	SD		
	Range		
Post-training	M	17	<.1
(N = 18)	SD	30	.1
	Range	0-100	0-.2
On-site Coaching	M	53	.3
(N = 18)	SD	38	.2
	Range	0-100	0-.8
Self-coaching	M	60	.3
(N = 8)	SD	30	.2
	Range	0-100	0-.7
Maintenance	M	67	.5
(N = 1)	SD		
	Range		
Total	M	32	.2
(N = 61)	SD	36	.2
	Range	0-100	0-.9

Table 4-31. Betsy's (teacher 2) percentage and rate (per 1 minute) of correctly implemented EILTs by phase during social-oriented activities

Phase		%	Rate
Baseline	M	24	.3
(N = 5)	SD	29	.4
	Range	0-67	0-.9
Training	M	0	0
(N = 7)	SD		
	Range		
Post-training	M	9	<.1
(N = 9)	SD	17	<.1
	Range	0-50	0-.1
On-site Coaching	M	54	.3
(N = 12)	SD	38	.2
	Range	0-100	0-.5
Self-coaching	M	42	.3
(N = 3)	SD	29	.3
	Range	0-67	0-.7
Maintenance	M		
(N = 0)	SD		
	Range		
Total	M	28	.2
(N = 36)	SD	34	.2
	Range	0-100	0-.9

Table 4-32. Betsy's (teacher 2) percentage and rate (per 1 minute) of correctly implemented EILTs by phase during materials-oriented activities

Phase		%	Rate
Baseline	M	0	0
(N = 1)	SD		
	Range		
Training	M	0	0
(N = 3)	SD		
	Range		
Post-training	M	24	<.1
(N = 9)	SD	38	.1
	Range	0-100	0-.2
On-site Coaching	M	50	.3
(N = 6)	SD	41	.3
	Range	0-90	0-.8
Self-coaching	M	79	.4
(N = 5)	SD	18	.2
	Range	57-100	.2-.6
Maintenance	M	67	.5
(N = 1)	SD		
	Range		
Total	M	37	.2
(N = 25)	SD	40	.2
	Range	0-100	0-.8

Table 4-33. Kim's (teacher 3) percentage and rate (per 1 minute) of correctly implemented EILTs by phase during both social-oriented and materials-oriented activities

Phase		%	Rate
Baseline	M	39	.6
(N = 7)	SD	25	.5
	Range	0-67	0-1.3
Training	M	54	.4
(N = 7)	SD	38	.3
	Range	0-100	0-.9
Post-training	M	49	.2
(N = 22)	SD	45	.2
	Range	0-100	0-.9
On-site Coaching	M	65	.8
(N = 11)	SD	38	.8
	Range	0-100	0-2.4
Self-coaching	M	65	.4
(N = 8)	SD	32	.5
	Range	0-100	0-1.4
Total	M	54	.4
(N = 55)	SD	39	.5
	Range	0-100	0-2.4

Table 4-34. Kim's (teacher 3) percentage and rate (per 1 minute) of correctly implemented EILTs by phase during social-oriented activities

Phase		%	Rate
Baseline	M	45	.8
(N = 6)	SD	20	.4
	Range	17-67	.1-1.3
Training	M	63	.4
(N = 6)	SD	32	.3
	Range	17-100	.1-.9
Post-training	M	49	.2
(N = 14)	SD	42	.3
	Range	0-100	0-.9
On-site Coaching	M	63	.9
(N = 9)	SD	40	.8
	Range	0-100	0-2.4
Self-coaching	M	81	.4
(N = 2)	SD	27	.4
	Range	63-100	.1-.7
Total	M	56	.5
(N = 37)	SD	36	.6
	Range	0-100	0-2.4

Table 4-35. Kim's (teacher 3) percentage and rate (per 1 minute) of correctly implemented EILTs by phase during materials-oriented activities

Phase		%	Rate
Baseline	M	0	0
(N = 1)	SD		
	Range		
		0	0
Training	M		
(N = 1)	SD		
	Range		
Post-training	M	50	.1
(N = 8)	SD	33	.2
	Range	0-100	0-.5
On-site Coaching	M	75	.1
(N = 2)	SD	35	0
	Range	50-100	.1-.2
Self-coaching	M	59	.4
(N = 6)	SD	34	.5
	Range	0-100	0-1.4
Total	M	50	.2
(N = 18)	SD	45	.4
	Range	0-100	0-1.4

Table 4-36. Diana’s (teacher 4) percentage and rate (per 1 minute) of correctly implemented EILTs by phase during both social-oriented and materials-oriented activities

Phase		%	Rate
Baseline	M	51	.3
(N = 3)	SD	50	.3
	Range	0-100	0-.5
Training	M	57	.3
(N = 5)	SD	32	.3
	Range	0-75	0-.6
Post-training	M	59	.3
(N = 16)	SD	44	.3
	Range	0-100	0-1.0
On-site Coaching	M	71	.4
(N = 6)	SD	37	.3
	Range	0-100	0-.9
Total	M	60	.3
(N = 30)	SD	40	.3
	Range	0-100	0-1.0

Table 4-37. Diana's (teacher 4) percentage and rate (per 1 minute) of correctly implemented EILTs by phase during social-oriented activities

Phase		%	Rate
Baseline	M	53	.5
(N = 1)	SD		
	Range		
Training	M	50	.3
(N = 3)	SD	43	.3
	Range	0-75	0-.6
Post-training	M	77	.4
(N = 8)	SD	34	.4
	Range	0-100	0-1.0
On-site Coaching	M	82	.6
(N = 4)	SD	14	.2
	Range	67-100	.4-.9
Total	M	72	.4
(N = 16)	SD	32	.3
	Range	0-100	0-1.0

Table 4-38. Diana's (teacher 4) percentage and rate (per 1 minute) of correctly implemented EILTs by phase during materials-oriented activities

Phase		%	Rate
Baseline	M	50	.1
(N = 2)	SD	71	.2
	Range	0-100	0-.3
Training	M	67	.3
(N = 2)	SD	0	.3
	Range	0	.1-.5
Post-training	M	42	.2
(N = 8)	SD	47	.2
	Range	0-100	0-.5
On-site Coaching	M	50	.1
(N = 2)	SD	71	.1
	Range	0-100	0-.1
Total	M	48	.2
(N = 14)	SD	45	.2
	Range	0-100	0-.5

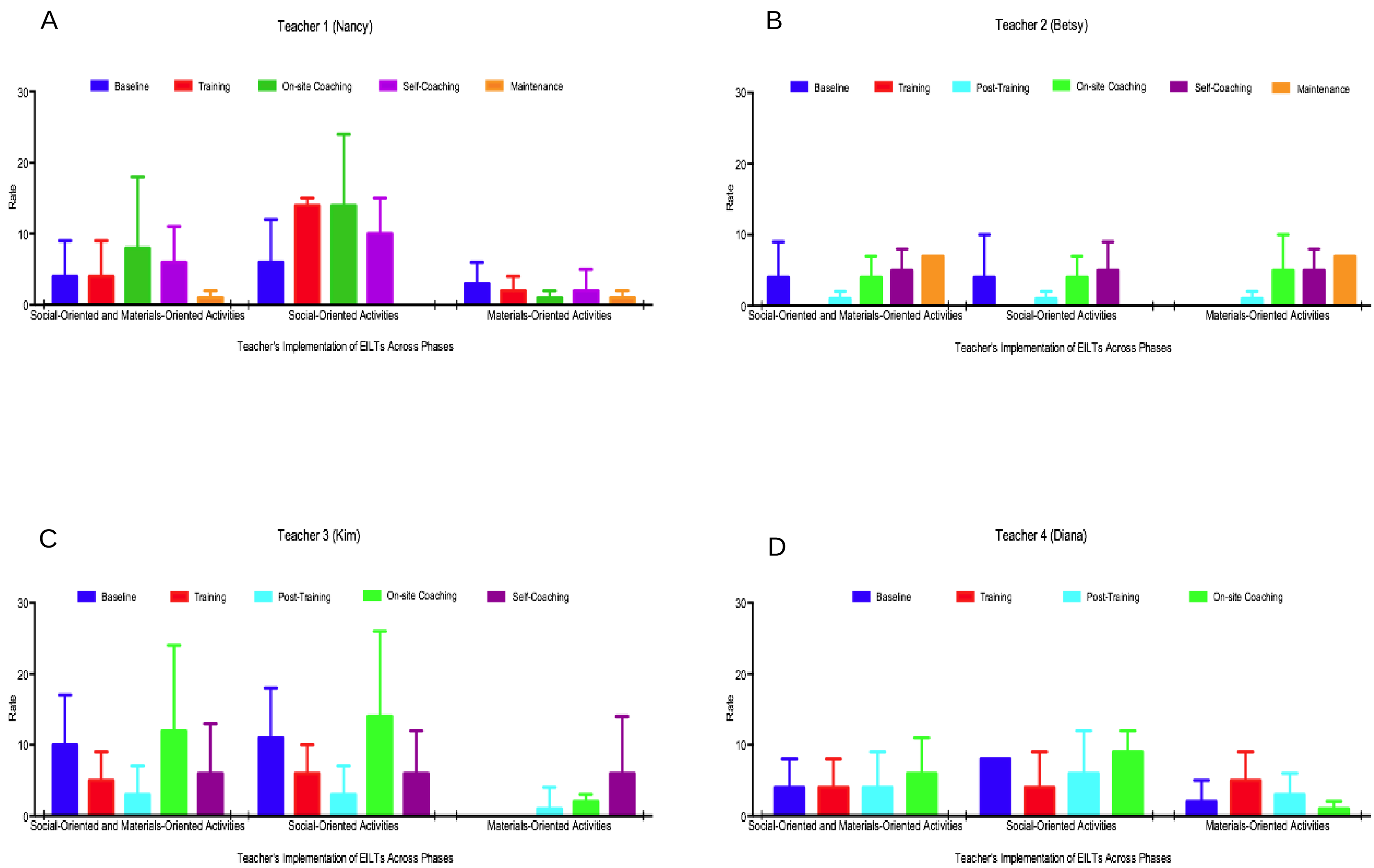

Figure 4-1. Mean rate (per 1 minute) for teachers' correct implementation of EILTs by phase and activity type. (A) teacher 1; (B) teacher 2; (C) teacher 3; (D) teacher 4.

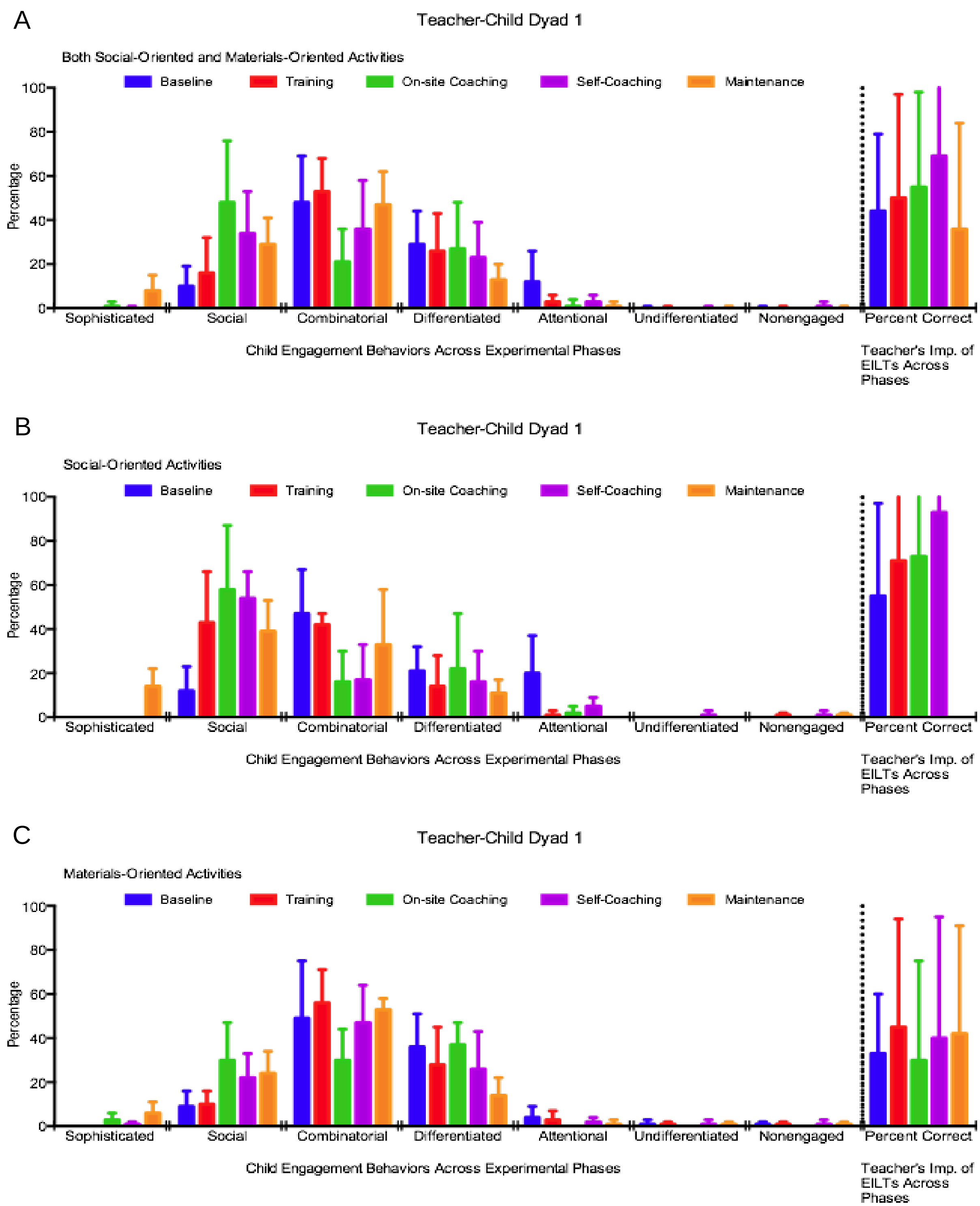

Figure 4-2. Mean percentage of intervals Devon exhibited each engagement behavior and mean percentage of Nancy's correct implementation of EILTs by phase and activity type. (A) both social-oriented and materials-oriented activities; (B) social-oriented activities; (C) materials-oriented activities.

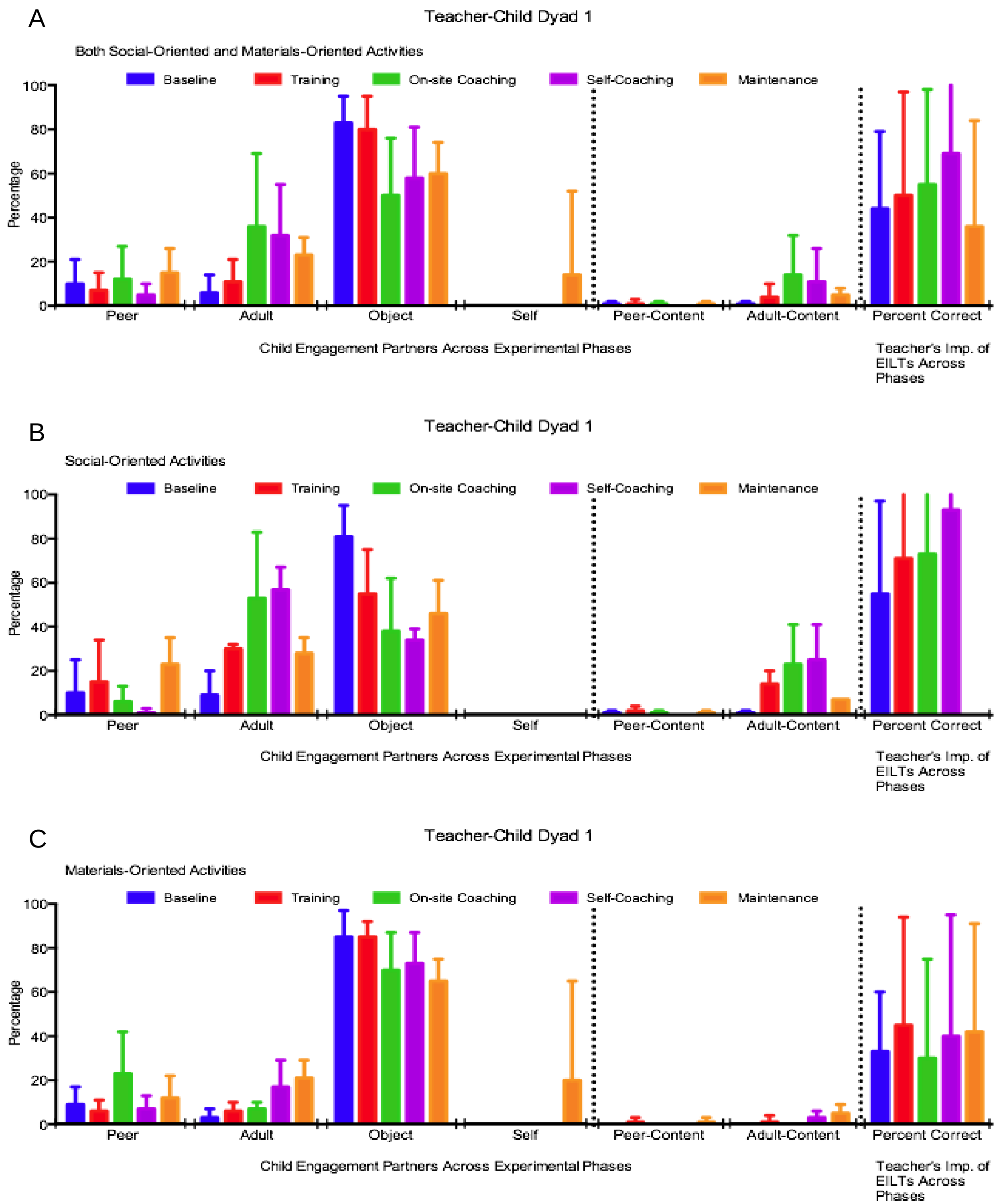

Figure 4-3. Mean percentage of intervals Devon was engaged with each engagement partner and mean percentage of Nancy's correct implementation of EILTs by phase and activity type. (A) both social-oriented and materials-oriented activities; (B) social-oriented activities; (C) materials-oriented activities.

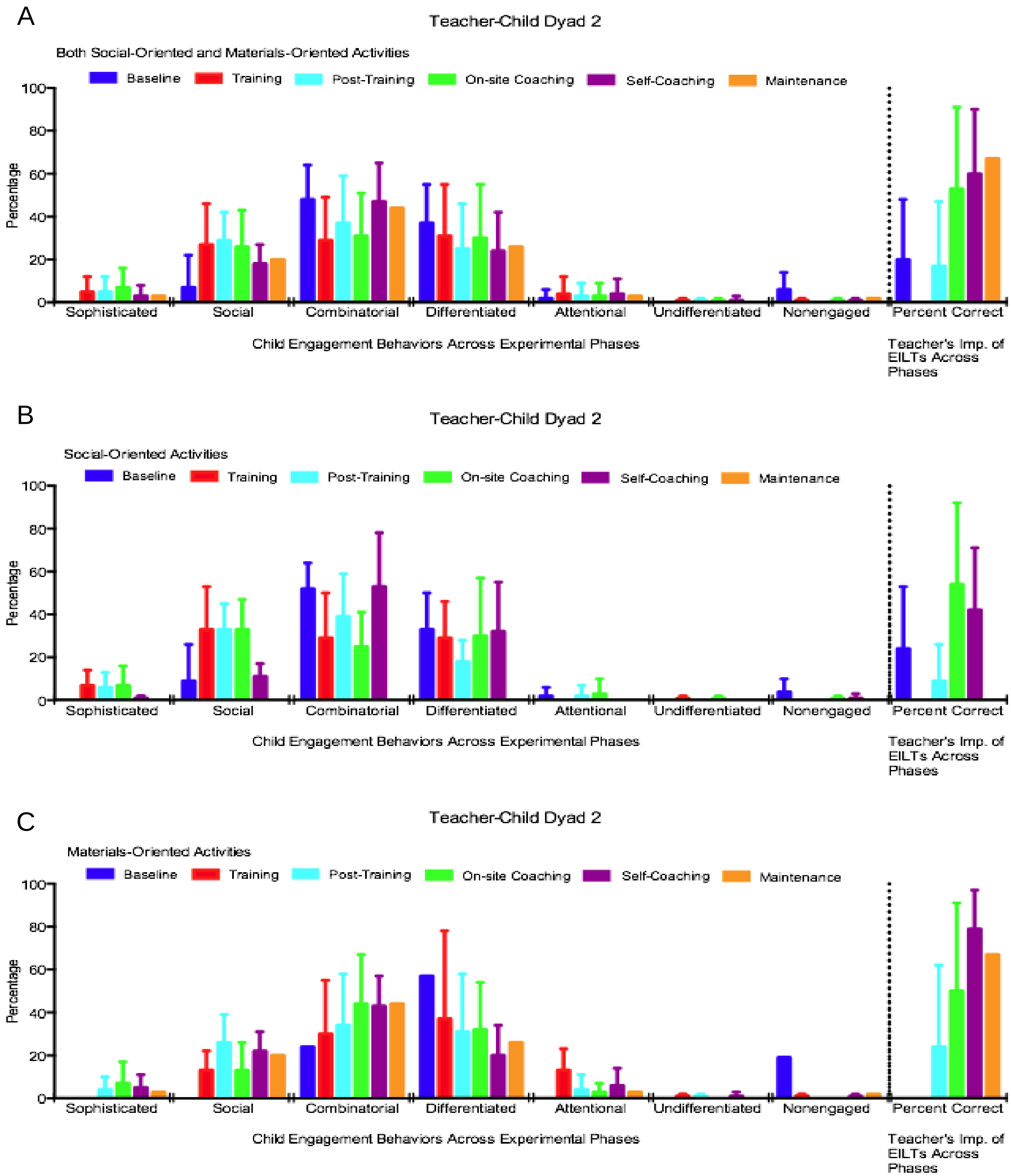

Figure 4-4. Mean percentage of intervals Arlene exhibited each engagement behavior and mean percentage of Betsy's correct implementation of EILTs by phase and activity type. (A) both social-oriented and materials-oriented activities; (B) social-oriented activities; (C) materials-oriented activities.

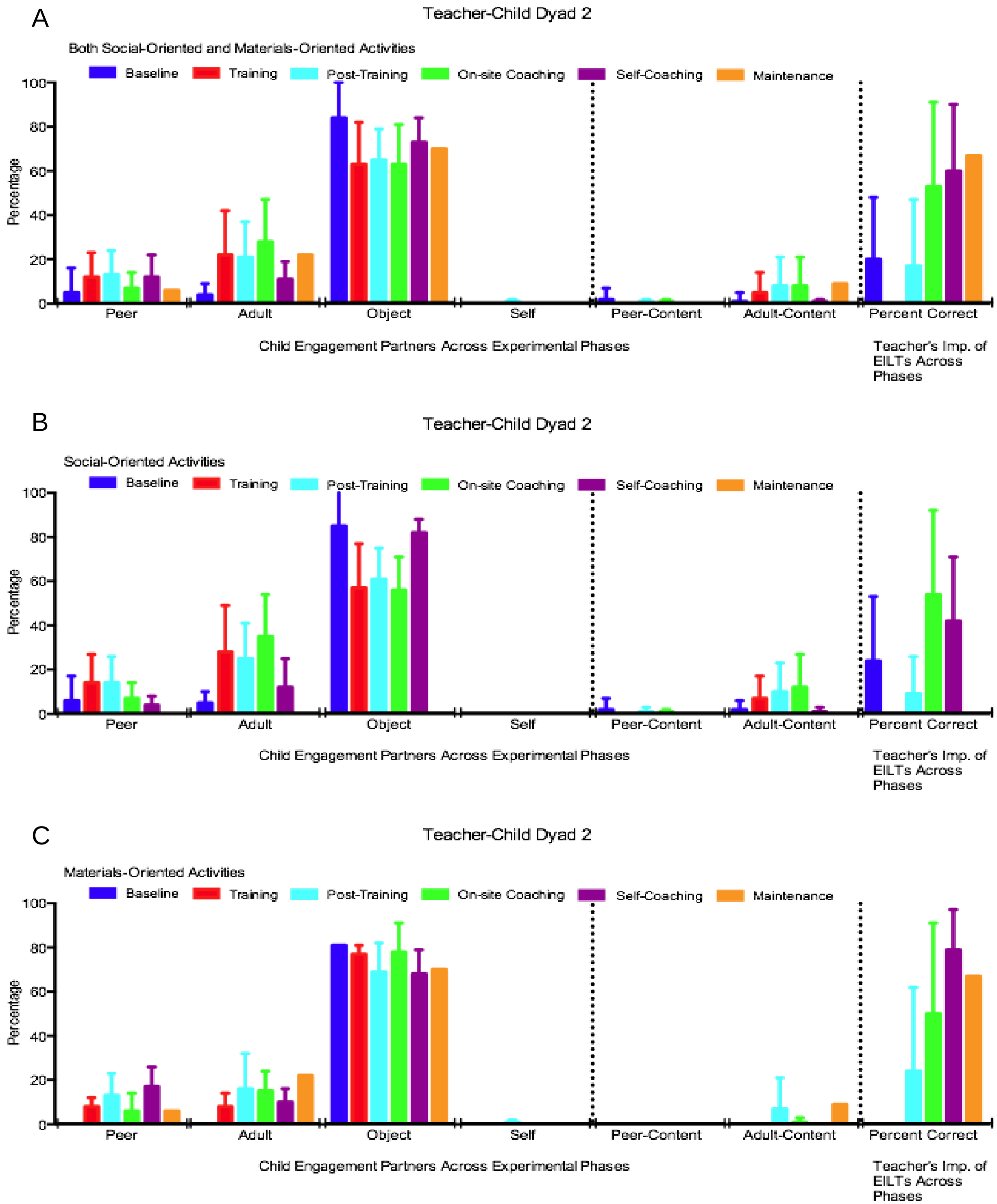

Figure 4-5. Mean percentage of intervals Arlene was engaged with each engagement partner and mean percentage of Betsy's correct implementation of EILTs by phase and activity type. (A) both social-oriented and materials-oriented activities; (B) social-oriented activities; (C) materials-oriented activities.

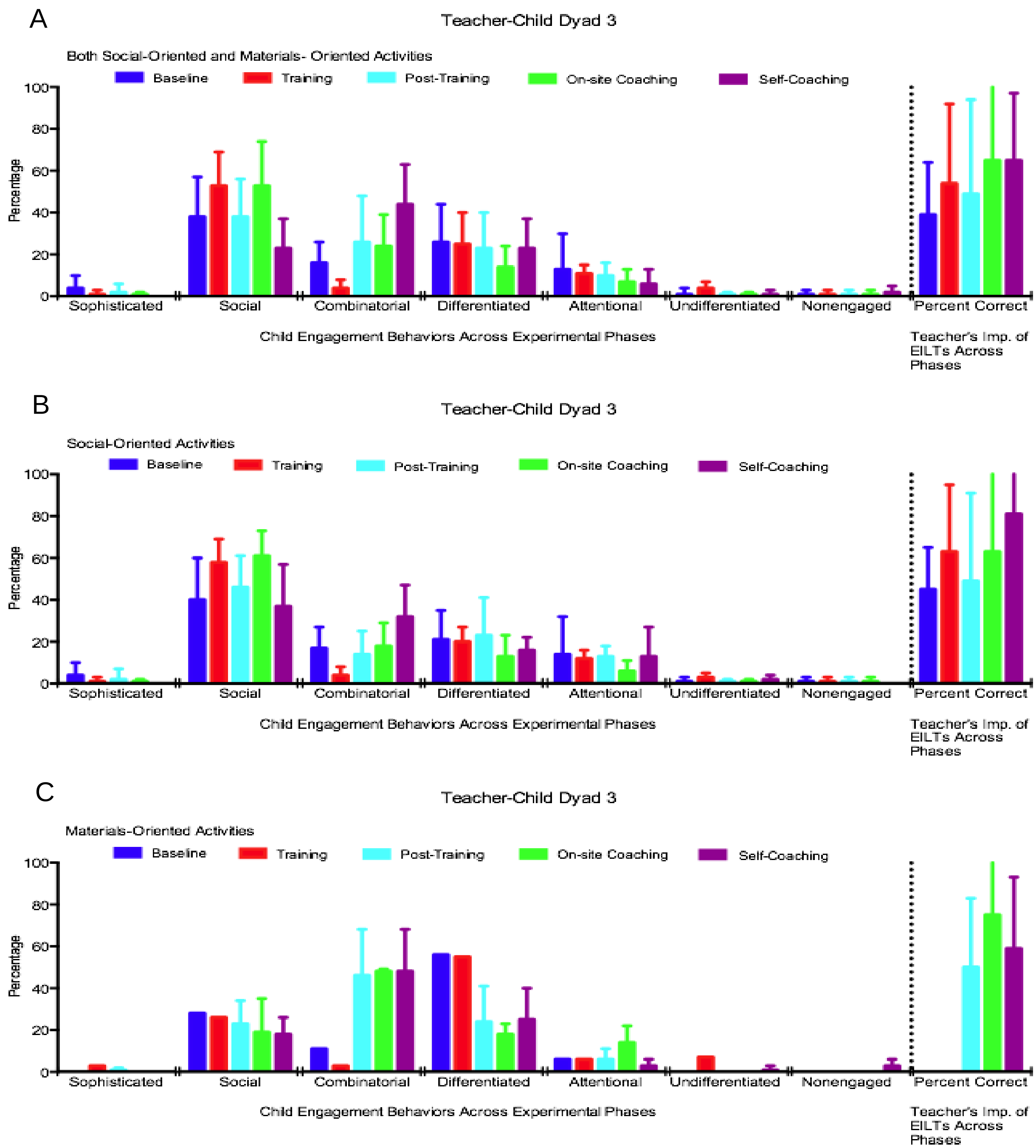

Figure 4-6. Mean percentage of intervals Brian exhibited each engagement behavior and mean percentage of Kim's correct implementation of EILTs by phase and activity type. (A) both social-oriented and materials-oriented activities; (B) social-oriented activities; (C) materials-oriented activities.

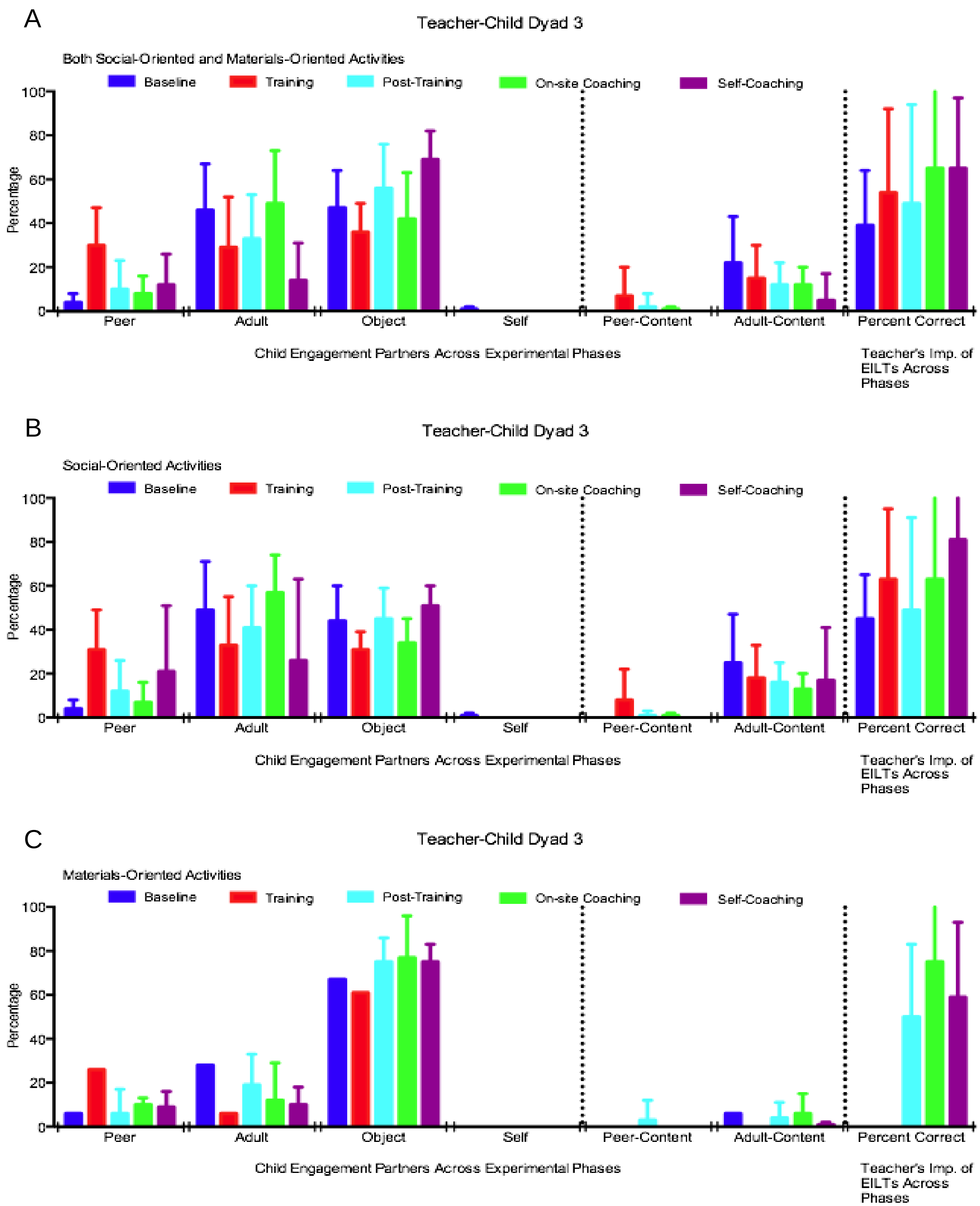

Figure 4-7. Mean percentage of intervals Brian was engaged with each engagement partner and mean percentage of Kim's correct implementation of EILTs by phase and activity type. (A) both social-oriented and materials-oriented activities; (B) social-oriented activities; (C) materials-oriented activities.

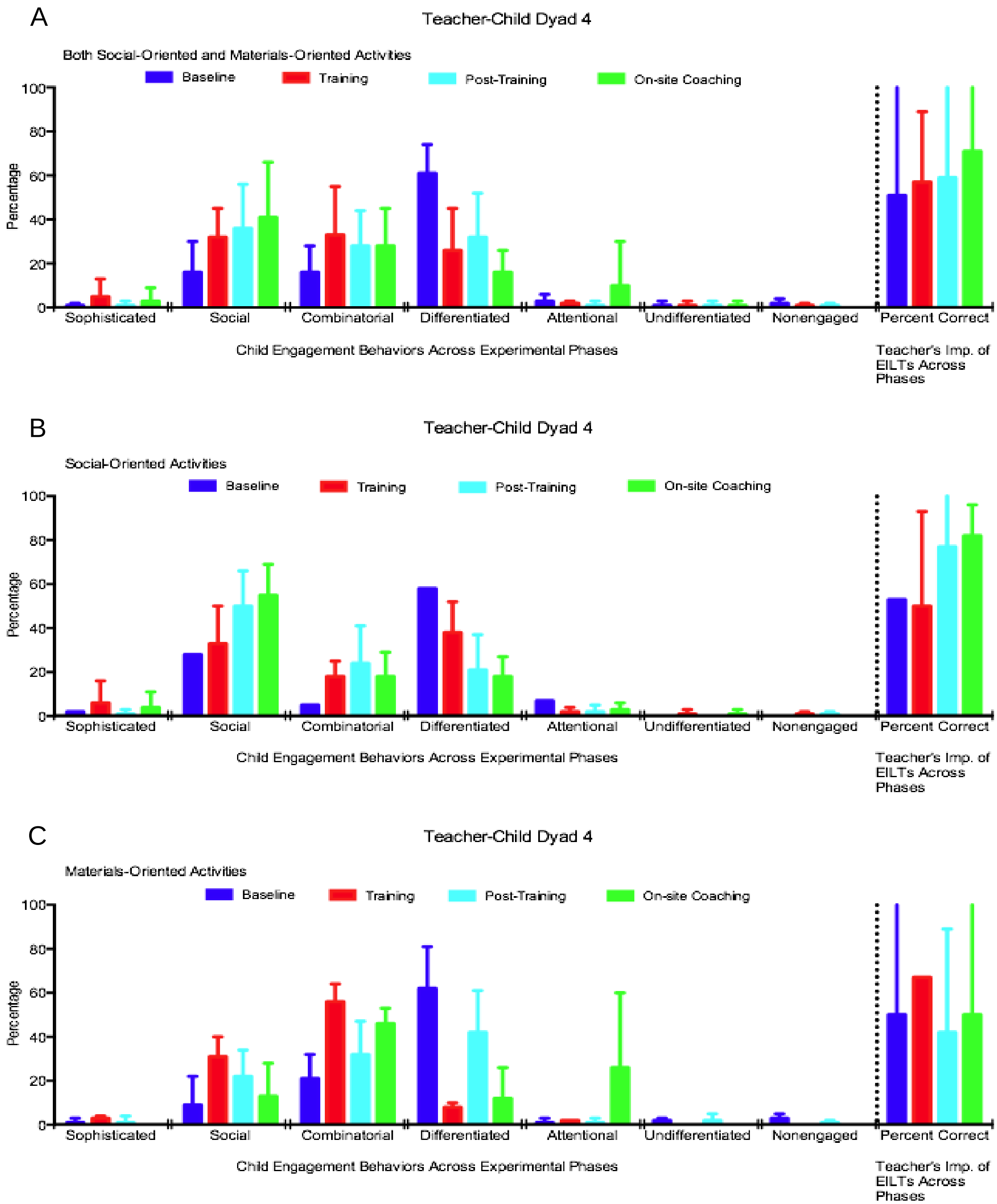

Figure 4-8. Mean percentage of intervals Jessica exhibited each engagement behavior and mean percentage of Diana's correct implementation of EILTs by phase and activity type. (A) both social-oriented and materials-oriented activities; (B) social-oriented activities; (C) materials-oriented activities.

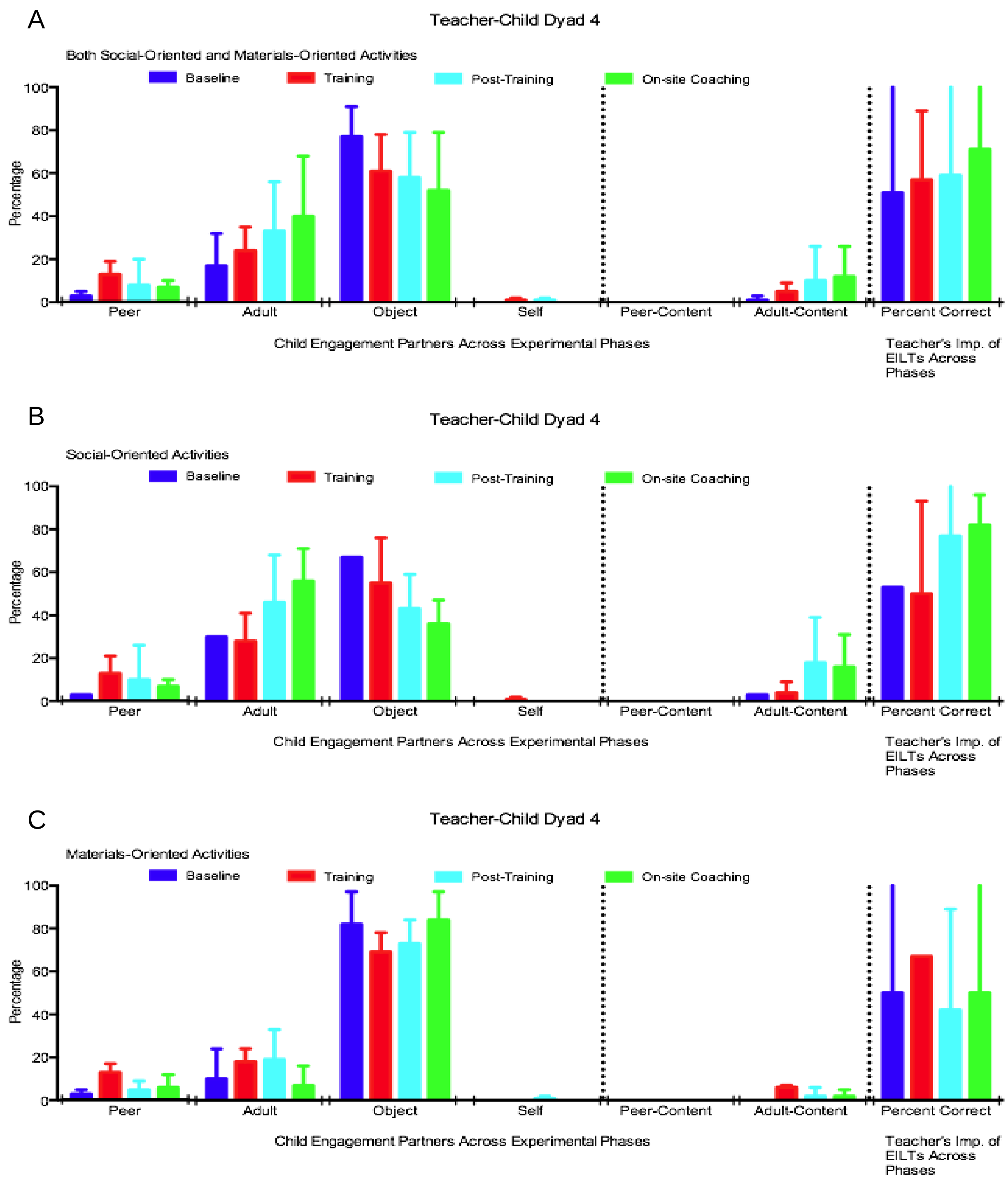

Figure 4-9. Mean percentage of intervals Jessica was engaged with each engagement partner and mean percentage of Diana's correct implementation of EILTs by phase and activity type. (A) both social-oriented and materials-oriented activities; (B) social-oriented activities; (C) materials-oriented activities.

CHAPTER 5
DISCUSSION

The primary purpose of the present study was to examine corollary relationships between observed engagement behaviors of young children with disabilities and their teachers' implementation of embedded instruction learning trials (EILTs) during child-initiated classroom activities classified as social-oriented and materials-oriented. EILTs data were obtained from a previously conducted single-subject experimental study involving four teachers (Snyder et al., 2009). The single-subject experimental study was designed to evaluate functional relationships between teachers' exposure to three components of an embedded instruction professional development intervention and their implementation of EILTs. In the present study, data collected during the single-subject study were used to quantify child engagement behaviors during social-oriented and materials-oriented child-initiated activities, examine teachers' implementation of EILTs during child-initiated activities, and explore whether there were corollary relationships between child engagement behaviors and teachers' implementation of EILTs during child-initiated activities.

The purpose of this chapter is to summarize and interpret key study findings, discuss these findings in relation to previous research, and describe the contributions of the present study. Limitations of the present study are noted and recommendations for future research and practice are offered.

Key Findings and Relationships to Previous Research

Child Engagement Behavior

Children in the present study exhibited very low levels of sophisticated engagement behaviors across study phases and activity types (mean percentage range across children = 1% - 5%), and levels of their sophisticated engagement across study phases and activity types did not appear to be associated with the changes in their teacher's correct implementation of EILTs. The low levels of sophisticated engagement across children, study phases, and activity types might be partially explained by the developmental ages of participating children and their functional abilities. All four children in the present study had identified disabilities and an average score of 2.1 on the ABILITIES Index (range = 1.4 – 2.8) with functional limitations in 3 to 5 out of 9 areas. The mean ABILITIES Index score suggests the children had mild to moderate functional limitations overall but many of the children had functional limitations in ability areas that might preclude them from demonstrating sophisticated engagement behaviors as defined on the EBOS-RVII (e.g., limitations in expressive language, limitations in motor skills).

Previous studies investigating association between child engagement and developmental age or severity of disability reported positive relationships between child engagement and these two variables (Blasco, Bailey, & Burchinal, 1993; Casey, McWilliam, & Sims, 2012; de Kruif & McWilliam, 1999; Kontos, Moore, & Giorgetti, 1998; Malone, Stoneman, & Langone, 1994; McWilliam & Bailey, 1995). For example, Blasco et al. (1993) reported that children who were developmentally advanced exhibited more sophisticated engagement behaviors than did children who were less developmentally advanced. Similarly, Malone and colleagues (1994) found that children's developmental quotient was positively correlated with their sophisticated engagement behaviors. Additional evidence for the relationship between sophisticated engagement and developmental differences was found in the present study. Although levels of sophisticated engagement were low across children, phases, and activity types, Arlene engaged in sophisticated engagement behaviors slightly more often than the other children in the study. This finding might be partially explained by developmental differences between Arlene and the other three children. Arlene was the second oldest child in the study and her ABILITIES Index score was higher than the other children, indicating that she had more functional abilities and fewer limitations than Devon, Brian, or Jessica.

With respect to social engagement, previous nominal descriptive research focused on child engagement has reported that children with disabilities exhibit low levels of social engagement. Researchers have noted it is unlikely that levels of social engagement will increase without intervention (McWilliam & Bailey, 1995; McWilliam, Scarborough, & Kim, 2003). In the present study, three children showed relatively low levels of social engagement behaviors during baseline across activity types, when compared to Brian whose social engagement during baseline ranged from 28% to 40% across the two types of activities (i.e. social-oriented or materials-oriented). The introduction of the training component of the professional development intervention to teachers resulted in increases in the mean percentage of intervals that all children exhibited social engagement behaviors across both social-oriented and materials-oriented activities. This pattern was also noted for social-oriented activities only for all four children and for three children when materials-oriented activities only were analyzed. For three children (excluding Brian), the mean percentage of intervals in which social engagement occurred during on-site coaching and self-coaching was higher than during baseline across both activity types. In general, for these three children, changes in social engagement across study phases and activity types appeared to be associated with the changes in their teacher's correct implementation of EILTs.

Three findings with respect to social engagement are highlighted. First, a substantial increase in social engagement was observed during the training phase for three children, followed by relatively small changes during on-site or self-coaching. This finding would be expected if teachers started to spend more time with target children during the training phase to implement what they learned during the workshop training sessions. In addition, teachers' attempts to deliver EILTs during the training phase might have promoted target children's interaction with peers, as some learning targets focused on language and social-emotional skills involving interactions. Second, participating children exhibited more social engagement behaviors overall across social-oriented activities (M = 41%, SD = 19%), when compared to materials-oriented activities (M = 19%, SD = 12%). This finding was expected, as there were more opportunities for participating children to interact with peers or adults during social-oriented activities than materials-oriented activities. Third, an unexpected finding was the increase in social engagement for three children across phases of the study during materials-oriented activities, although this increase was smaller when compared to changes in social engagement during social-oriented activities. The smaller increases in social engagement across study phases during materials-oriented activities might be explained by the finding that teachers delivered a limited number of EILTs during these activities, reducing the number of intentionally planned opportunities to respond to adults or peers.

For combinatorial engagement, two children (Devon and Arlene) in the present study demonstrated combinatorial engagement behaviors for a noteworthy percentage of intervals during baseline across the two types of activities (mean range = 24% - 52%), while the other two children (Brian and Jessica) exhibited combinatorial engagement behaviors less often (mean percentage of intervals range = 5% -21%). Across activity types, in general, a negative association between levels of combinatorial engagement and teachers' correct implementation of EILTs was observed for children who had higher levels of combinatorial engagement during baseline. An exception to this was the between-phase changes in Arlene's combinatorial engagement during materials-oriented activities where a positive association between levels of combinatorial engagement and teacher's implementation of EILTS was found. Moreover, across activity types, a positive association between levels of combinatorial engagement and teachers' correct implementation of EILTs was observed for two children who had lower levels of combinatorial engagement during baseline. As expected, participating children exhibited more combinatorial engagement behaviors across materials-oriented activities (*M* = 42%, *SD* = 19%), when compared to social-oriented activities (*M* = 25%, *SD* = 16%). In addition, children's levels of combinatorial engagement during self-coaching across both social-oriented and materials-oriented activities (*M* = 42%, *SD* = 20%) was higher than their levels of combinatorial engagement during on-site coaching (*M* = 27%, *SD* = 17%). An unexpected finding with respect to combinatorial engagement was the increase in combinatorial engagement for two children across phases of the study during social-oriented activities given that combinatorial engagement behaviors involve interactions with materials.

With respect to differentiated engagement, Devon (*M* = 29%) and Brian (*M* = 26%) exhibited relatively low levels of differentiated engagement behaviors during baseline across both social-oriented and materials-oriented activities, when compared to Arlene (*M* = 37%) and Jessica (*M* = 61%). Generally, differentiated engagement showed a declining trend across phases of the study, children, and activity types. This is a positive finding given the hierarchical structure of the engagement behavior codes, with differentiated engagement behaviors considered to be less advanced than combinatorial, social, or sophisticated engagement behaviors (Casey et al., 2012; McWilliam & Bailey, 1992; McWilliam & Ware, 1994; Raspa et al., 2001). Excluding Devon's mean percentages of differentiated engagement during on-site coaching across social-oriented and materials-oriented activities, the mean percentage of intervals children demonstrated differentiated engagement behaviors during on-site coaching and self-coaching across activity types were lower than their baseline levels of differentiated engagement. It appears that decreases in differentiated engagement coincided with the increases in social engagement in most cases and combinatorial engagement in some cases. When teachers' correct implementation of EILTs increased across phases of the study, children's social engagement showed increases and as a result, their levels of differentiated engagement decreased.

The findings related to more differentiated engagement during baseline in the present study is similar to findings from previous research investigating child engagement. These studies reported children with disabilities who had mild developmental delays showed more differentiated engagement relative to other engagement behaviors (Appanaitis, 2003; Casey et al., 2012; Raspa, McWilliam, &

Ridley, 2001). However, findings with respect to changes in children's differentiated engagement behaviors across experimental phases in the present study were contradictory to those reported in the study conducted by Appanaitis (2003). In this study, the impacts of preschool teachers' use of three intervention strategies (e.g., zone defense scheduling, incidental teaching, and data collection) on the engagement of five preschool children with disabilities during free-play activities were examined. Results showed that 4 of the 5 children exhibited slight increases in differentiated engagement behaviors during the last intervention phase of the study. Minimal increases or no change in differentiated engagement across the phases of the Appanaitis (2003) study might be explained by how the "differentiated engagement" code is defined in the E-Qual III coding system (McWilliam & de Kruif, 1998). This code encompasses all "active engagement" behavior that is not included as part of more or less advanced engagement behavior codes. When decreases in less advanced engagement behaviors correspond with increases in more advanced engagement behaviors, children's differentiated engagement does not change.

In the present study, attentional engagement behaviors were infrequently observed across study phases, children, and activity types. This is a positive finding, given the focus of analysis for child engagement behaviors in the present study was child-initiated activities. Despite its infrequent occurrence, Devon and Brian, two children with the lower ABILITIES Index scores, had more coded intervals of attentional engagement during baseline across both activity types when compared to Arlene and Jessica. In the present study, it was hypothesized that if teachers' increased their implementation of EILTs across phases of the study, attentional engagement would decease during both social-oriented and materials-oriented activities. In general, Devon's and Brian's attentional engagement did decrease across phases of study and activity types, but Arlene's and Jessica's attentional engagement increased, although only slightly. Previous research focused on child engagement has found that children with disabilities or children who are developmentally less mature exhibit higher levels of attentional engagement when compared to peers who are typically developing. In addition, when examining relationships between type of activity and child engagement, attentional engagement has been shown to occur more frequently during certain types of activities (e.g., playing on the computer, reading book, or circle time) than others (e.g., playing with cars on the floor, building with blocks, playing at the sand table; Appanaitis, 2003; de Kruif & McWilliam, 1999; Kemp, Kishida, Carter, & Sweller, 2013; McWilliam & Bailey, 1995). Findings of the present study with respect to lower levels of attentional engagement relative to other engagement behaviors is logical, given engagement was coded during child-initiated activities and most children in the present study were actively engaged with people or materials during these activities (rather than passively attending).

In the present study, the percentage of intervals in which children exhibited either undifferentiated engagement behaviors or were non-engaged was very low during baseline and remained low across study phases and activity types. Child behaviors associated with these two engagement categories did not change in relation to teacher's implementation of EILTs. The findings related to low levels of undifferentiated engagement were similar to those reported in previous studies (Appanaitis, 2003; Casey et al., 2012; de Kruif & McWilliam, 1999; McMillen, 1999). However, levels of children's non-engagement in the present study were somewhat lower than those reported in previous studies (Appanaitis, 2003; Casey et al., 2012; de Kruif & McWilliam, 1999; McMillen, 1999).

Casey and colleagues (2012) conducted an observational study with 61 children with disabilities in 31 inclusive classrooms located in public schools, private community programs, or Head Start programs to investigate relationships between child engagement and developmental quotients, incidental teaching, and peer interactions. Mean age and ABILITIES Index scores for participating children were 41 months and 1.9, respectively. The Engagement Quality and Incidental Teaching for Improved Education (E-Qual-ITIE; McWilliam & Casey, 2004) was used to collect data on child engagement and the occurrence of incidental teaching during child-initiated activities. The authors reported that children were engaged in undifferentiated behaviors for 4% of the intervals (*SD* = 2.49%) and were not engaged for 14% of the intervals (*SD* = 11.51%). De Kruif and McWilliam (1999) also reported low levels of undifferentiated engagement (*M* = 3.58%, *SD* = 6.04%) and somewhat higher levels of non-engagement (*M* = 7.13%, *SD* = 4.74%) in their observational study involving 61 children with and without disabilities.

Overall, with respect to child engagement behaviors, results from the present study suggest children with disabilities generally exhibited more advanced levels of engagement behaviors as their teachers' implemented EILTs more accurately. Moreover, types of activities in which children with disabilities participated influenced their engagement behaviors. Children with disabilities demonstrated more combinatorial and differentiated engagement behaviors during materials-oriented activities and more social engagement behavior during social-oriented activities.

Engagement Partners

With respect to engagement partners, previous child engagement research found that children with disabilities tend to play alone with materials (Cavallaro & Porter, 1980; Guralnick, 1990; Guralnick & Groom, 1987; Odom et al., 1982), and they spend more time interacting with adults than their peers in the classroom (McWilliam & Bailey, 1995). Baseline data in the present study supported these findings. During baseline, across both types of activities, three children spent the majority of coded intervals engaged with objects and one child (Brian) was engaged with objects for a little less than half of the coded intervals. Across all children and activity types, peer engagement occurred in less than 11% of the intervals during baseline. During baseline across activity types, adult engagement occurred in less than 10% of the intervals for two children (Devon and Arlene), a little less than half of the intervals for one child (Brian), and between 10% and 30% of the intervals for one child (Jessica). For three of the four children across the two types of activities when compared to baseline, the percentage of intervals in which they were engaged with objects decreased and percentage of intervals they were engaged with adults and peers increased during on-site coaching and self-coaching.

Overall, findings with respect to engagement partner suggest that as teachers' correct implementation of EILTs increased across phases, children's engagement with adults and peers increased somewhat and their engagement with objects decreased. In addition, corollary to increases in teacher's correct implementation of EILTs, increases in social interactions with adults that focused on pre-academic skills were found.

Studies Examining Relationships Between Instruction and Child Engagement

To compare findings from the present study with other intervention studies described in Chapters 1 and 2 (i.e., Appanaitis, 2003; Bevill et al., 2001; Danko, 2004; Malmskog & McDonnell, 1999) that focused on relationships between systematic instruction and child engagement, the mean percentage of intervals data for some engagement codes used in the present study had to be combined given how engagement was quantified in the previous studies.

As described in Chapter 2, in Appanaitis (2003), the E-Qual III was used to evaluate child engagement. Nine engagement levels (behaviors) were grouped under five categories in this study for analyses and reporting. These categories included sophisticated engagement (levels: persistence, symbolic, encoded, constructive), differentiated engagement (level: differentiated), focused engagement (level: focused attention), unsophisticated engagement (levels: casual attention, undifferentiated), and non-engagement (level: non-engagement). To compare findings of the present study with findings from Appanaitis (2003), the mean percentages of intervals children were engaged in sophisticated, social, and combinatorial engagement behaviors were combined. This combined engagement category would be similar to the sophisticated engagement category in the Appanaitis (2003) study.

In the present study, 3 of 4 children exhibited behaviors consistent with the combined category in over 50% of baseline intervals. For the fourth child (Jessica), the mean percentage of intervals for the combined engagement category during baseline ranged from 31% during materials-oriented activities to 35% during social-oriented activities. In addition, across children and activity types, the mean percentages of intervals for the combined engagement category during on-site coaching and self-coaching phases were always higher than the mean percentages of intervals for this category during baseline. For both social-oriented and materials-oriented activities, when compared to baseline, increases in the mean percentages of intervals for the combined engagement category ranged from 9% to 39% across children during on-site coaching, and from 9% to 14% across children during self-coaching.

In Appanaitis (2003), 4 out of 5 participating children showed sophisticated engagement behaviors for less than 30% of the intervals during baseline, while one child showed sophisticated engagement for less than 50% of baseline intervals. Children showed very minimal increases in sophisticated engagement during the last intervention phase of the study when compared to baseline, even though their teachers were implementing more of the intentional instructional strategies in this phase. These findings differ from those in the present study.

Across the two studies, differences in the mean percentages of intervals children exhibited “sophisticated” engagement might be attributed to children’s age. Children in the present study were 7 months older, on average, than children who participated in Appanaitis (2003) study. However, comparisons of findings across the two studies also showed that although children in the present study demonstrated “sophisticated” engagement behaviors more often than children in the Appanaitis study during baseline, they also showed gains in their “sophisticated” engagement during on-site and self-coaching. In addition, these gains were greater than those reported for children in the Appanaitis study during the last intervention phase. This latter finding might suggest that teacher’s implementation of EILTs during child-initiated activities may promote more advanced levels of child engagement behaviors than the combination of incidental teaching, zone defense scheduling, and data collection intervention used in the Appanaitis study.

To compare the findings of the present study with those of Bevill and colleagues (2001), Danko (2004), and the Malmskog and McDonnell (1999) studies, the mean percentages of intervals in which children were engaged in differentiated through sophisticated engagement behaviors as defined on the EBOS-RVII were combined. This combined code would be similar to how Bevill et al. (2001) quantified engagement, and how Danko (2004), and Malmskog and McDonnell (1999) defined active engagement. In the present study, the combined mean percentages of intervals for sophisticated, social, combinatorial, and differentiated engagement behaviors were very high across all phases of the study, activity type, and children (80% or more of the intervals). Despite very high mean percentages of intervals during baseline for the combined engagement category, increases in engagement were still noted in the present study for two children across both social-oriented and materials-oriented activities, social-oriented-activities, and materials-oriented activities, for one child during both social-oriented and materials-oriented activities and social-oriented activities, and for one child during social-oriented activities.

In Bevill et al. (2001), the mean percentage of intervals in which children were engaged ranged between 22% and 67% during baseline. During the first intervention phase for the first teacher, child one reached the criterion level of performance on engagement (M = 99%, range = 98-100), while the other three children exhibited lower levels of engagement as their teachers remained in extended baseline (engaged, on average, in less than 34% of intervals). During the intervention phase for the second teacher, the second child reached the criterion level of engagement performance (*M* = 100%, range = 99-100), while the other two children exhibited lower levels of engagement as their teachers remained in extended baseline (engaged, on average, in less than 55% of intervals). The two other children reached criterion levels of engagement when their teachers were exposed to the intervention phase. Mean percentages of intervals engaged during intervention were 90% (range = 67%-100%) and 100% (99%-100%), respectively. The findings from this study suggest that when teachers use intentional intervention approaches within the context of naturally occurring classroom activities, levels of child engagement increased relative to baseline.

In the Danko (2004) study, two children demonstrated active engagement behavior infrequently (range = 0% of intervals – 20% of intervals) during baseline, while the other children's active engagement was relatively higher, but more variable (range = 0% - 50%). During the intervention phase, percentages of intervals in which children were actively engaged increased for two children who were less engaged during baseline while it remained similar to the baseline for the third child. The range for the percentages of intervals in which children were actively engaged during the intervention phase data points was between 8% - 88% for child one, 5% - 53% for child two, and 20% - 50% for child three. Overall, the intervention increased active engagement behaviors of two children and did not have a relationship with the third child's active engagement behavior.

In Malmskog and McDonnell (1999), the mean percentage of intervals in which children were activity engaged ranged between 5% and 46% during baseline. During intervention, increases in active engagement were observed for all three children and the mean range for percentage of intervals was between 62% and 93%. The intervention implemented appeared to be effective in promoting active engagement of participating children.

Overall, because the mean percentage of intervals in which children were actively engaged during baseline was high in the present study, when data from sophisticated, social, combinatorial, and differentiated engagement behavior codes were combined, a ceiling effect was introduced (i.e., active engagement could not increase significantly, if at all, across study phases). Although changes in the mean percentage of intervals of active engagement between baseline and on-site coaching and self-coaching were small, teacher's correct implementation of EILTs appeared to be positively associated with active child engagement as defined in the Bevill et al. (2001), Danko (2004), and Malmskog and McDonnell (1999) studies.

Activity Characteristics and Children's Engagement

Several descriptive studies that included children without disabilities have suggested that certain types or characteristics of classroom activities elicit more competent or complex child behaviors (including engagement behaviors) than others (Hadeed & Sylva, 1996; Howes & Smith, 1995; Kontos et al., 2002; Kontos & Keyes, 1999; Powell et al., 2008; Vitiello et al., 2012). These researchers have asserted that free-play or child-initiated activities promote children's active engagement while academic activities generally promote passive engagement. In the present study, data to evaluate engagement behaviors of young children with disabilities were collected during two types of child-initiated activities. In general, participating children exhibited high levels of active engagement in the form of social, combinatorial, and differentiated engagement behaviors across these two types of child-initiated activities. Findings from the present study with respect to the levels of observed active engagement during child-initiated activities supports the findings from this previous research.

In addition, findings from previous studies showed peer-to-peer engagement occurred more often during free-play than during teacher-structured activities, while teacher-structured activities were associated with more engagement with adults than with peers (e.g., Vitiello et al., 2012). Although peer and adult engagement partners were not compared across child-initiated and teacher-structured activities in the present study, children in the present study were more often engaged with adults than they were with their peers across both social-oriented and materials-oriented activities.

The only study included in the literature review involving both children with and without disabilities reported that engagement behaviors of young children without disabilities were influenced by the type and structure of activities in which they participated (Hamilton, 2005). However, the engagement behaviors of preschool children with disabilities did not change based on the type of activity or its structure. These findings are inconsistent with the present study. In the present study, social engagement behaviors were more likely to occur during social-oriented activities, while combinatorial and differentiated engagement behaviors were more like to occur during materials-oriented activities. These findings suggest that the primary characteristics and structures of child-initiated activities may occasion different engagement behaviors from young children with disabilities when teachers are implementing embedded instruction.

Teachers' Implementation of Embedded Instruction Learning Trials

During both social-oriented and materials-oriented activities in the present study, teachers' correct implementation of EILTs showed an increase with the implementation of training, followed by a decrease in the mean percentage of correct implementation during post-training. The lagged introduction of the on-site coaching and self-coaching components of the professional development intervention resulted in noteworthy increases in the percentage of correct EILTs implementation when compared to baseline. Similar changes in teachers' correct implementation were also observed during social-oriented or materials-oriented activities. In general, the mean percentages of correct EILTs implementation across study phases during social-oriented activities were higher than the mean percentages of correct implementation across study phases during materials-oriented activities.

Researchers have documented one-time "spray and pray" approaches to early childhood professional development are only minimally effective in helping teachers to acquire and master skills that will enable them to implement evidence-based instructional practices such as embedded instruction. This type of professional development rarely results in changes in teachers' classroom practices (Sexton et al., 1996; Snyder, Denney et al., 2011). Moreover, researchers have repeatedly noted that if the desired outcome of early childhood professional development is application of skills in a practice context, high quality workshops must be followed by systematic and ongoing implementation supports that include supportive and corrective feedback (e.g., coaching, mentoring, consultation; Bailey, McWilliam, & Winton, 1992; Bruder, Mogro-Wilson, Stayton, & Dietrich, 2009; Palsha & Wesley, 1998; Snyder, Hemmeter et al., 2012; Winton, McCollum, & Carlett, 1997).

During the Phase II feasibility study, teachers participated in seven high quality workshop sessions that consisted of four interrelated modules focused on key embedded instruction practices. These seven workshop training sessions were conducted for 14 hours and were delivered over a 4-week period consistent with guidelines in the literature that suggest professional development should be sustained, cohesive, and focused on a targeted set of practices (Desimone, Porter, Garet, Yoon, & Birman, 2002; Garet, Porter, Desimone, Birman, & Yoon, 2001). Following each workshop training session, teachers had opportunities to apply their new knowledge and skills in their classrooms with a target child with disabilities and receive feedback from the trainer during subsequent workshop sessions. Increases in teachers' correct EILTs implementation during training is likely related to the structure and process characteristics of the workshop series. Nevertheless, the decrease in teacher's correct EILTs implementation during post-training suggests that workshops alone are likely not sufficient to further improve or sustain teachers' implementation of EILTs. The changes in teachers' EILTs implementation when on-site coaching and self-coaching intervention components were introduced supports assertions in the professional development literature about the importance of follow-up implementation supports.

Although the percentage of correct implementation of EILTs increased during on-site coaching and self-coaching (when compared to baseline), the mean rates (per minute) for correctly implemented EILTs were low across teachers, study phases, and activity types. Generally, a small increase in the mean rate (per minute) was observed during on-site coaching and self-coaching across teachers, when compared to baseline. Across study phases and teachers, the mean rate per minute was higher during social-oriented activities than materials-oriented activities, meaning that teachers delivered more trials during social-oriented activities when compared to materials-oriented activities across phases of the study.

Findings of this study with respect to low rate of instruction during naturally occurring classroom activities were not unexpected. Researchers investigating naturalistic instructional approaches have reported that teachers are often not able to take advantage of “teachable moments” and therefore the dose of instruction children receive on priority learning targets during naturally occurring classroom activities might not be sufficient for children to efficiently acquire and master certain skills (Wolery, 2012; Wolery & Hemmeter, 2011). For example, in a recent descriptive study, Casey and colleagues (2012) found that incidental teaching, a naturalistic instructional approach, was rarely used in inclusive preschool classrooms. Across 10-minute observations, the mean number of 15-sec intervals in which an incidental teaching episode occurred across 31 teachers and 61 children was 3.9 (*SD* = 3.20).

Although teachers in the present study generally increased their rate (per 1 minute) of correctly implemented EILTs during on-site coaching and self-coaching when compared to baseline, the rate was still low. Additional research is needed to clarify the optimal dose of EILTs depending on the learning target behavior, the child’s phase of learning, and the teachers’ capacity to implement EILTs during ongoing activities in the preschool classroom. In addition, further research is needed to explore how much implementation support teachers need and in what form to support their sustained implementation of embedded instruction practices, including correctly implementing EILTs.

Contributions of the Present Study

The inclusion of young children with disabilities in early childhood settings has been in existence for over three decades and the number of young children receiving services in inclusive settings has been increasing (Grisham-Brown et al., 2000; Horn et al., 2000; Odom, 2000; US Department of Education, 2010). Recommended practices in early childhood special education emphasize the importance of both access and participation as key features of inclusion (DEC/ NAEYC, 2009). While access emphasizes providing young children with disabilities entrée to a range of learning opportunities, activities, settings, and environments; participation refers to engagement and learning in these activities, settings, and environments. Participation in everyday activities, settings, and environments is enhanced when practitioners use intentional and systematic instructional approaches in inclusive early learning settings (Wolery, 2005).

Naturalistic instructional approaches have been identified as intentional and systematic approaches that show promise for supporting the development, engagement, and learning of preschool children with disabilities within inclusive early childhood settings (Snyder et al., 2013). Embedded instruction is a naturalistic instructional approach that is designed to promote child engagement and learning in typically occurring or logical activities, routines, and transitions (Snyder, Sandall et al., 2009).

Reviews of the literature focused on naturalistic instructional approaches have shown that these approaches, including embedded instruction, are effective for teaching a variety of skills to preschool children with disabilities in inclusive preschool settings (cf. Snyder et al., 2013). Although embedded instruction and other naturalistic instructional approaches have been found to be effective in helping young children with disabilities learn a range of skills, only four studies have investigated the engagement of young children with disabilities in relation to the implementation of intentional or systematic instructional procedures (Appanaitis, 2003; Bevill et al., 2001; Danko, 200) or a naturalistic instructional approach during ongoing classroom activities (Malmskog & McDonnell, 1999).

Previous studies have investigated relationships between child engagement and practitioners' or researchers' implementation of a group of intervention strategies including zone defense scheduling, incidental teaching, and data collection (Appanaitis, 2003); an intervention package consisting of picture display, picture display plus verbal prompt, and reinforcement of correspondence (Bevill et al., 2001); a visual support intervention (Danko, 2004); and a group of adult-mediated strategies often associated with naturalistic instructional approaches (i.e., joint attention, time delay, prompts; Malmskog & McDonnell, 1999). None of these studies focused on examining relationships between practitioners' frequent and accurate use of EILTs during ongoing classroom activities and observed engagement behaviors of young children with disabilities. In addition, only one of these studies examined child engagement using a hierarchical coding system. Therefore, the present study was unique because it examined changes in child engagement behaviors in relation to teachers' implementation of EILTs across experimental phases of a single-subject experimental study.

Although previous studies reported that the implementation of the targeted intervention strategies resulted in increases in child engagement, in only two of the studies were the interventions delivered by classroom staff (Appanaitis, 2003; Danko, 2004). In the present study, EILTs were implemented by preschool teachers during child-initiated activities.

The present study also contributes to the extant literature by using a hierarchical engagement coding system to examine observed child engagement behaviors and engagement partners. In most of the previous research focused on the relationships between child engagement and the implementation of intentional and systematic instructional procedures, child engagement was evaluated using engagement measures that had two (i.e., engaged and nonengaged), or three (i.e., active engagement, attentional engagement, or nonengagement) engagement behavior codes (e.g., Bevill et al., 2001; Danko, 2004; Malmskog & McDonnell, 1999). The one notable exception was the study conducted by Appanaitis (2003) in which associations between children's engagement and the implementation of a package of intervention strategies was investigated by using a hierarchical behavioral observation system (E-Qual III) that included multiple codes for engagement behaviors and engagement partners.

As described in Chapter 2, the E-Qual III (McWilliam & de Kruif, 1998) includes nine hierarchical engagement levels categorized under five broad categories. Although behavioral observations are conducted using the nine levels, results typically have been reported only for the five categories. Appanaitis (2003) did not examine changes in each of the nine engagement behaviors in relation to the intervention implemented. The present study was the first study to examine each child engagement behavior and partner as defined in the EBOS-RVII in relation to teachers' implementation of EILTs.

Another contribution of the present study was the investigation of child engagement behaviors and partners in relation to their teacher's implementation of EILTs during two types of child-initiated activities (i.e., social-oriented activities and materials-oriented activities). Several descriptive studies have suggested that certain types of classroom activities elicit more competent or complex child behaviors than others (Hadeed & Sylva, 1996; Howes & Smith, 1995; Kontos et al., 2002;) and that activity types and characteristics might have differential influences on child engagement (Kontos & Keyes, 1999; Vitiello et al., 2012; Powell et al., 2008). However, these studies were descriptive and included children without disabilities. The only study that included children with disabilities (Hamilton, 2005) reported findings contradictory to those that only included children without disabilities. Findings from the present study offer additional evidence on differential effects of activity types and characteristics on observed child engagement behaviors for young children with disabilities.

Research studies investigating the changes in child engagement in relation to teachers' or researchers' use of intentional and systematic instructional procedure were implemented during scheduled free-play periods (Appanaitis, 2003; Bevill et al., 2001; Malmskog & McDonnell, 1999) or circle-time activities (Danko, 2004). A variety of short activities are included within center- and circle-time, including a mix of social-oriented and materials-oriented activities. None of these studies investigated the relationships between primarily social-oriented or primarily materials-oriented child-initiated activities and the engagement behaviors and partners of young children with disabilities when their teachers or a researcher implemented intentional and systematic instructional strategies. The current study investigated child engagement behavior and partners during social-oriented and materials-oriented classroom activities across experimental phases and in relation to teachers' implementation of EILTs.

Limitations

Findings from the present study showed changes in children's engagement behaviors and partners in anticipated directions as well as corollary relationships with their teachers' implementation of EILTs and identified differential influences of activity type in relation to the occurrence of some engagement behaviors. Nevertheless, these findings must be interpreted within the context of the study's limitations. A primary limitation of the study was the small sample size inherent to the single-subject experimental research design. External validity threats are present because of the small number of study participants enrolled in the present study and the lack of replication of present study findings in another single-subject experimental study.

Another limitation of the present study was the small number of activities (data points) that were available in some of the experimental phases across the two types of child-initiated activities. For example, there was only one social-oriented activity during the baseline phase for one child, one materials-oriented activity during the baseline phase for two children, one materials-oriented activity during the training phase for one child, and one materials-oriented activity during the maintenance phase for one child. Having a small number of activities in each experimental phase across the two types of activities might have impacted the representativeness of the data within phases and the interpretations of between-phase comparisons, and caused variability (large standard deviations) in the data (Moore, 1998; Yoder & Symons, 2010). An insufficient number of data points can lead to insufficient descriptions of behaviors in a given phase, and statistics reported for the phase may under- or over-represent the behaviors of interest. Increasing the number of child-initiated activities per phase across activity types could have resulted in more stable child and teacher performance, particularly considering the levels of variability for some children's engagement behavior and teachers' implementation of EILTs.

Another limitation of the present study related to the reliability of behavioral observations conducted to evaluate child engagement. Reliability of the observations on child engagement was assessed by percent agreement and Cohen's kappa (Cohen, 1960). Percent agreement statistics and Cohen's kappa yielded acceptable levels of inter-observer agreement across the majority of engagement behavior codes and teacher-child dyads. However, inter-observer agreement percentage scores for several individual engagement behaviors were not as high as desired. Percentage agreement on the occurrence of engagement behaviors with low base rates (i.e., sophisticated engagement, undifferentiated engagement, and non-engagement) was below 80%. With behaviors that occur infrequently, only one or two disagreements between observers on the occurrence of a behavior during an observation can result in extreme percent agreement reliability estimates. In addition, it is important to recognize that infrequently occurring behaviors also tend to yield low kappa estimates (Shrout, Spitzer, & Fleiss, 1987; Spitznagel & Helzer, 1985; Yoder & Symons, 2010).

Another limitation of the present study related to the measurement of child engagement behaviors and partners was the type of behavioral recording system used. The EBOS-RVII uses a partial-interval (15 second) coding system, which involves recording the engagement behavior code associated with the most advanced child engagement behavior observed at any point during an interval and noting the corresponding engagement partner for the engagement behavior code selected. Results reported in the present study with respect to child engagement behaviors represent the changes that occurred in the most advanced engagement behaviors observed during an interval. This means that less advanced engagement behaviors might have occurred during the same interval but the occurrence of these behaviors was not recorded or represented in the data reported in the present study. Similarly, data reported in the present study about engagement partners represent partners associated with the most advanced engagement behavior code selected not all partners with whom the child was engaged during an interval.

Restriction of the range of observed child engagement behaviors was the fifth limitation of the present study. Across the experimental phases, for the majority of time they were engaged, participating children demonstrated engagement behaviors that were in the middle of the hierarchy of engagement behaviors (e.g., differentiated engagement, combinatorial engagement, social engagement). As these engagement behaviors occurred frequently, it was possible to investigate the relative changes in these engagement behaviors across the phases of the study in relation to teachers' implementation of EILTs during social-oriented and materials-oriented activities. Non-engagement and other lower level engagement behaviors (undifferentiated and attentional engagement) as well as sophisticated engagement behaviors were not observed frequently during baseline and subsequent phases across children and activity types. Therefore, it was difficult to examine relative changes in these engagement behaviors across phases of the study and in relation to teachers' implementation of EILTs.

Finally, the present study employed a non-experimental, descriptive design to investigate corollary associations between child engagement behaviors and partners, and teachers' implementation of EILTs during social-oriented and materials-oriented activities. The primary independent variable (i.e., teachers' exposure to each component of the professional development intervention) was manipulated in a previously conducted single-subject experimental study.

Recommendations for Future Research and Practice

The findings and limitations of the present study were used to inform recommendations for future research and practice related to child engagement and embedded instruction. As the present study was among the first to investigate corollary relationships between child engagement behaviors and teacher's implementation of embedded instruction practices during child-initiated social-oriented and materials-oriented activities, future studies should be conducted to determine if findings are replicated. These replications could include direct replications or systematic replications conducted with children who have different types of disabilities or functional abilities. This study included children with primarily mild disabilities and mild to moderate functional limitations. The relationships between the engagement of young children with more significant disabilities or more functional limitations and their teachers' implementation of EILTs have not been addressed in the extant literature and should be investigated in future research.

In addition, replication studies should include more observational data across phases for each type of activity. This will improve the representativeness of the data, which often is a limitation in descriptive observational research studies. Although there is no consensus regarding the number and duration of observations required to obtain a representative sample and reliable estimates of behavior, McWillliam and Ware (1994) suggested that at least 30 15-minute sessions (activities) would be needed to reliably estimate every engagement behaviors included in their engagement measure (i.e., a previous version of the E-QUAL III; Dunst & McWilliam, 1988) and at least 40 15-minute sessions are required to obtain reliable estimates of engagement partners. Future research could also focus on investigating number and duration of observations needed to obtain a representative sample and reliable estimates of engagement behaviors to guide future research and practice.

The present study focused specifically on investigating corollary relationships between child engagement behaviors and teacher's implementation of EILTs during child-initiated social-oriented and materials-oriented activities. Preschool classrooms include a range of teacher-directed, routine, and transition activities that have different activity characteristics and demands. Future research could investigate how child engagement behaviors change in relation to teacher's implementation of EILTs during teacher-directed activities, routines, or transitions.

Future research should also focus on identifying typical levels of child engagement behaviors and partners during different types of naturally occurring classroom activities across a preschool day. Classroom activities can be grouped as social-oriented and materials-oriented activities, or as structured, unstructured, routine, or transition activities. Data on typical child engagement behaviors and partners during different classroom activities could be used by researchers or practitioners to establish criterion levels of engagement for children with disabilities during an intervention study or during daily instructional practice or allow them to evaluate engagement behaviors of young children with disabilities in relation to typical levels of child engagement to help inform instructional decisions (Kishida & Kemp, 2006, 2010).

Children with more significant delays and disabilities whose functional abilities are less developed than those who participated in this study often spend the majority of their time non-engaged or engaged in undifferentiated behaviors (McWilliam & Bailey, 1992). An important goal for practitioners who work with children with significant delays and disabilities should be focused on helping these children to participate in typically occurring classroom activities and to promote more advanced levels of engagement (McWilliam & Bailey, 1992; McWilliam & Casey, 2008). While environmental arrangements might be sufficient to promote active engagement for some children (e.g., children with mild delays and disabilities), other children might need direct support, assistive technology, or systematic instruction to become actively engaged in their physical and social environments. Depending on children's functional abilities and limitations, practitioners might need to use targeted or individualized instructional approaches to support active child engagement (Appanaitis, 2003; McWilliam & Casey, 2008).

Practitioners should also help children with disabilities to develop a repertoire of engagement behaviors so these behaviors can be used when needed based on the characteristics and "demands" of activities that often occur in preschool classrooms. Excluding undifferentiated engagement behaviors and non-engagement, several categories of engagement measured by EBOS-RVII might be differentially appropriate for certain types of classroom activities (Casey & McWilliam, 2008; Kontos et al., 2002; Powell et al., 2008). For example, although considered a lower level of engagement on the EBOS-RVII, attentional engagement may be appropriate during some parts of large-group activities (e.g., attending to teacher during circle) or small-group activities (e.g., watching while a teacher reads a book to a small group of children). Likewise, characteristics of free-play activities often set the occasion for social or sophisticated engagement (e.g., playing dress-up with peers in dramatic play activities), while art activities or puzzle activities often set the occasion for combinatorial engagement

Practitioners should consider the “fit” between activity type and the skills targeted as part of the EILTs (EIFEL Project, 2008b; Grisham-Brown et al, 2005). Findings from the present study showed that during materials-oriented activities, children with disabilities demonstrated differentiated and combinatorial engagement behaviors more often than other engagement behaviors and they were engaged with objects for the majority of the coded intervals. During social-oriented activities, they generally demonstrated social engagement behaviors more often than other engagement behaviors. These findings suggest that during social-oriented child-initiated activities, EILTs focused on language or social-emotional skills might be more efficiently and appropriately embedded while during materials-oriented activities EILTs focused on fine motor or pre-academic skills might be more efficiently and appropriately embedded.

Another implication for future research and practice based on findings from the present study is that preschool teachers were more likely to implement EILTs when they received professional development with a follow-up component. Teacher’s correct implementation of EILTs increased over baseline levels with the implementation of high quality workshops and correct implementation increased further in most cases during on-site coaching and self-coaching phases. In addition, the rate of correct implementation increased in most cases during the on-site and self-coaching phases, when compared to baseline rates. This finding supports an emerging evidence-base related to the importance of implementation supports to ensure fidelity of implementation of evidence-based practices (Odom, 2009; Snyder, Hemmeter, &

McLaughlin, 2011). Additional research is needed to examine the differential effectiveness of follow-up support strategies and to clarify the optimal dose of follow-up needed by practitioners to implement evidence-based practices such as embedded instruction frequently and with fidelity.

In teacher education programs focused on preparing future early childhood practitioners, it is important to emphasize relationships among child engagement, type of classroom activities and their characteristics and demands, the type of skills targeted as part of implementation of those instructional approaches, and the use of evidence-based instructional approaches (Sandall et al., 2005; Wolery, 2005). Throughout pre-service education, future practitioners should learn about and have opportunities to implement evidence-based instructional approaches that are likely to alter children's engagement behavior and support their learning. They should receive performance feedback about their fidelity of implementation of the instructional approach, including the frequency and accuracy with which they implement instructional trials. Faculty should consider including in their curricula the embedded instruction framework and associated instructional practices developed by Snyder et al. (in press) related to what to teach, when to teach, how to teach, and how to evaluate.

Engagement is considered a necessary condition to promote the development and learning of young children with and without disabilities. A major purpose of early intervention for young children with disabilities is to promote child engagement (Bailey & Wolery, 1992). While child engagement and related factors have been descriptively investigated since the 1970s, few studies have systematically examined relationships between practitioners' implementation of instructional approaches and the engagement behaviors of young children with disabilities. Findings from the present study suggest that engagement behaviors of young children with disabilities can be altered during ongoing classroom activities when evidence-based instructional approaches such as embedded instruction are used.

APPENDIX
CONSENT FORMS

University of Florida
Department of Special Education
P.O. Box 117050 / 1403 Norman Hall
Gainesville, FL 32611-7050

TEACHER INFORMED CONSENT

Protocol Title: Impact of Professional Development on Preschool Teachers' Use of Embedded-Instruction Practices

Purpose of the research study

You are being asked to participate in a research study designed to (a) develop and evaluate a professional development intervention for preschool teachers (Tools for Teachers) that focuses on embedded-instruction practices, (b) examine whether exposure to the Tools for Teachers intervention influences teachers' use of embedded–instruction practices in their class, and (c) investigate if teachers' use of embedded-instruction practices is associated with improvements in children's engagement and learning.

For this study, embedded instruction refers to planning for and providing instruction on children's learning objectives during ongoing activities, routines, and transitions in the preschool class.

What you will be asked in the research study and approximate duration of the study
Below are the steps that will happen if you agree to be in the study.

a. **Step 1:** If you agree to participate in this research study, members of the research group will visit your class. They will complete a 2 ½ hour observation. They will complete two classroom environment measures, the Early Childhood Environment Rating Scale-Revised (ECERS-R) and the Classroom Assessment Scoring System (CLASS).

b. **Step 2:** You will move onto the next part of the study if your classroom receives an average score of 4.0 or greater on the ECERS-R. You will be offered optional consultation by a member of the research team about your score.

c. **Step 3:** Researchers will collect data in your class. Before the PD begins, they will administer several measures.
   - The first measure will be an adapted version of an IEP rating scale, which will be used to evaluate the instructional objectives or curricular benchmarks related to pre-academic, language, literacy, and social-emotional on individualized education programs (IEPs). A 12-item project-developed Learning Target Rating Scale (LTRS) will be completed for the learning targets you develop for target children in your class.

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- The second measure will be the Embedded Intervention Observation System (EIOS), which will be used to evaluate use of naturalistic instructional strategies in the embedded instruction context. We will videotape, and the EIOS will be used to code 15 minutes of one teacher-planned activity, one class routine, and one free choice activity that includes the target child(ren). Videotaping will occur once or twice per month throughout the study. EIOS observations will be completed for each child in your class who is enrolled in the study.
- You will do the last measure only one time. This measure will ask information about you like your age, how many years you have worked, what kind of training you have received, etc.
- Data collectors will also administer measures to target children in your classroom before the PD intervention begins.

d. **Step 4:** Teachers selected in Step 2, will be randomly assigned (like a coin toss) to one of three conditions: (a) Tools for Teachers with on-site coaching, (b) Tools for Teachers with self-coaching, or (c) Wait-list comparison group.

e. **Step 5:** What happens during Step 5 depends on which group you are assigned to.

If you are assigned to the Tools for Teachers with on-site coaching group:
- You will participate in a 1-hour orientation session in which you will receive an orientation to the project and supportive materials.
- You will also participate in 16 hours of workshop training,which will be given by project staff.
    - In the workshops, you will learn about the major parts of embedded instruction and learn how to implement embedded instruction in your classroom.
    - Active learning strategies will be used in the workshops.
    - You will work in practice groups and will be asked to bring information about a child or children with disabilities in your class to the sessions for use as a case study.
- You will complete and submit forms each month related to planning and implementing embedded instruction in your classroom.
- You will receive coaching by project staff at least once a week for 60 minutes for 16 weeks (16 sessions) in your class.
    - The coach will demonstrate embedded instruction practices. He/ she will observe you doing embedded instruction and will give you feedback.
    - The feedback will involve oral and written review about embedded instruction and progress toward goals you and the coach have set.

If you are assigned to the Tools for Teachers with self-coaching group,

- You will participate in 1-hour orientation session in which you will receive an orientation to the project and supportive materials.
- You will also participate in 16 hours of workshop training, which will be given by project staff.
    - In the workshops, you will learn about the major parts of embedded instruction and learn how to implement embedded instruction in your classroom.
    - Active learning strategies will be used in the workshops.
    - You will work in practice groups and will be asked to bring information about a child or children with disabilities in your class to the sessions for use as a case study.
- You will be given access to a Web site that will have materials and resources to help you track your use of embedded instruction for 16 weeks.
    - You will be directed to access a password-protected Web site.
    - This Web site will have materials and forms useful for self-tracking your use of embedded instruction.
    - You will complete and submit forms each month regarding planning and implementing embedded instruction in your classroom.
    - Types of the materials for self-tracking are forms you can use for recording data about your embedded instruction practices.

If you are assigned to the wait-list or control group:

- You will continue teaching in your classroom as usual.
- You will complete and submit monthly forms regarding planning and implementing embedded instruction in your classroom.
- You will be given the opportunity to participate in 16 hours of workshop trainings and self-coaching after the completion of the study during the 2010-2011 school year.

f. **Step 6:** We will ask you to help us find three target children with IEPs in your class. You will be asked to send a letter to the children's parents about the study obtaining their consent.

g. **Step 7:** The same measures mentioned in Step 3 will be administered in your class once during workshop training, twice after workshop training, mid-way through the study, and 1 month after the study ends. At the end of the study, we will talk to you about how you liked Tools for Teachers. You also will fill out forms about how easy or difficult it was to embed instruction and how you feel about embedded instruction.

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Where and when the study will take place

The entire research study will be held at your school/program site during the school/program year. We expect this will be between August and May of a school/program year.

Risks and benefits

There are no foreseeable risks associated with study participation.

The main benefit of this study is it could help the field know which professional development approaches are most promising for linking research and practice. This project also will produce a guide for developing professional development interventions that have been tested with preschool teachers. In addition, we will learn if teachers who learn about embedded instruction use it often and if follow-up matters. We will also find out if teachers' use of embedded instruction helps children's engagement and learning.

Expected costs and compensation

You will receive the following compensation to partially offset the time you devote to study-related activities:
$50 for the environmental observations
$50 for data collection before the study begins
$50 for helping contact potential child participants and their parents
$50 for data collection mid-way through the study
$50 for data collection when the study is over

Confidentiality

Data collected will be kept confidential to the extent provided by law. Your privacy will be protected and none of your personal information will be shared or used in any manner. Every project-related file will be identifed by a four-digit code number that will be randomly assigned by the investigators. All completed data forms for the study will be kept in locked file cabinets and in a password-protected electronic database. One year after the study ends, all videotapes and hard copy data sheets will be destroyed. Videos will be used by investigators and project staff only.

With whom the results of the study will be shared

The results of the study may be published, shared, and presented at meetings or conferences. However, your privacy and identity will be protected and none of your personally-identifiable imformation will be shared or used in any manner.

Voluntary participation

Your participation in this study is completely voluntary. You may refuse to participate in the study without endangering your employment in any way. Refusing participation will not involve a penalty or loss of benefits.

Right to withdraw from the study

Your participation is voluntary. You may withdraw your consent at any time and for any reason without endangering your employment in any way. Discontinuing participation at any time will not involve a penalty or loss of benefits.

Whom to contact if you have questions about the study

If you have any questions about this research study, please feel free to contact:

Patricia Snyder, Ph.D., Professor of Special Education, David Lawrence Jr. Endowed Chair of Early Childhood Studies, Department of Special Education, 1403 Norman Hall, (352) 273-4291

Alice Kaye Emery, Ph.D., Department of Special Education, 1403 Norman Hall, (352) 273-4246

Tara McLaughlin, M.Ed., Department of Special Education, 1403 Norman Hall, (847) 804-5279 or (352) 273-4243

Whom to contact about your rights as a research participant in the study

For additional information about giving consent or your rights as a participant in this study, please feel free to contact the University of Florida Institutional Review Board Office at (352) 392-0433.

Agreement:
I have read the procedures described above. I voluntarily consent to participate in this study. I have received a copy of this description.

____________________________________ ____________________
Teacher Date

____________________________________ ____________________
Witness Date

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University of Florida
Department of Special Education
P.O. Box 117050 / 1403 Norman Hall
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PARENTAL INFORMED CONSENT

Protocol title: Impact of Professional Development on Preschool Teachers' Use of Embedded Instruction Practices

Read this consent document carefully before you decide to allow your child to participate in this study.

Purpose of the research study:
The purpose of this research study is to see if preschool teachers will use teaching practices that help them put children's learning goals in everyday activities and routines in the class and to see if this will have an effect on children's behavior and learning.

What your child will be asked to do in the study:
Some teachers will attend training this school year. If your child's teacher attends training this year, he/she will learn how to put children's learning goals into everyday class activities and routines. If your child is in the study and if your child's teacher attends training he/she will then learn how to put your child's ***specific*** learning goals into class activities. If your child's teacher does not go to training this school year, we will still watch how your child's teacher puts your child's specific learning goals into class activities.

We will watch all teachers to see if and how often they provide ways for children to practice learning goals during class activities. As your child's teacher works with your child, we will watch and videotape your child. We want to see if the teacher's practices help your child's learning.

Before we watch your child and his/her teacher, your child's teacher will complete a tool called the ABILITIES Index. This tool describes your child's abilities in nine areas (for example, how well she/he sees, hears, thinks, or moves).

To see if teacher's practices help your child's learning, we will watch your child play with toys, adults, and other children. This is called engagement. We will use the Engagement Behavior Observation System (EBOS) to observe your child's engagement. Your child will not have to do anything different while we observe. We will look at how she/he plays with toys, adults, and other children in the class. We will do the EBOS once before teachers go to the training, once after teachers are finished with training, in the middle of the study, and again near the end of the study.

We also will give your child several tools that give us information about his/her learning. We will give the tool below to your child before teachers go to training and again near the end of the study.

- Preschool Language Scale-4: This tool looks at children's understanding and use of language.

Some of the following tools will be given to your child before teachers go to the training and again near the end of the study. The Bracken Basic Concept Scale and Test of Early Reading will be given together. However, if your child is not ready to be given the concept and early reading tools, the Pediatric Evaluation of Disability Inventory will be used instead.

- The Bracken Basic Concept Scale - Third Edition: Receptive: This tool looks at skills like 'how many things are in a picture' or 'what is the first sound in the word cat'.
- Test of Early Reading Ability-Third Edition: This tool looks at children's pre-reading skills such as if he/she can hear sounds in words or pick words that rhyme like "cat" and "hat".
- Pediatric Evaluation of Disability Inventory: This tool looks at children's self-care skills such as feeding him or herself, movement such as walking alone, and social skills such as responding to her/his name.

Your child will not be removed from the class to be given any of these tools. His/her class schedule will not be changed.

Your child's teacher will fill out the following tool before teachers goes to training and at the end of the study:

- Preschool and Kindergarten Behavior Scale-Second Edition: Your child's teacher will rate your child's social skills. Examples are, how well he/she gets along with other children and whether he/she follows class directions.

Time required:
Your child's teacher will be watched as she/he teaches your child at least one time per week for approximately 30 minutes per week for 16 weeks. Your child's teacher will be videotaped about one time per month for up to 2 hours for the school year and your child will be in the videotapes. We expect giving the tools to your child will take about 2 hours each time (6 hours total). The videotaping will happen when your child is doing what your child normally does in his/her class. Your child will not be removed from the class and his/her schedule will not change.

Risks and Benefits:
This study has no foreseeable risks. Benefits might include helping your child and his/her teacher find new ways to help learning. The researchers will give the results from the tools to you if you want them.

Compensation:
There will be no compensation for your child being in the study.

Confidentiality:
Results of the study might be shared with people in education. Your child's name and identity will be kept confidential to the extent provided by law. Videotapes will be coded during the study. Researchers and people who are helping with the study may look at the videotapes and

tools. The videotapes and tools (if not requested by you) will be destroyed one year after the study is over.

Voluntary participation:
Your child's being in this study is completely voluntary. Being or not being in the study will not affect your child's program or placement in any programs.

Right to withdraw from the study:
You and your child have the right to quit the study at anytime. Nothing will happen to your or your child if you quit being in the study.

Whom to contact if you have questions about the study:
Patricia Snyder, Ph.D., Professor of Special Education, David Lawrence Jr. Endowed Chair of Early Childhood Studies, Department of Special Education, 1403 Norman Hall, (352) 273-4291

Alice Kaye Emery, Ph.D., Department of Special Education, 1403 Norman Hall, (352) 273-4246

Tara McLaughlin, M.Ed., Doctoral Student, Department of Special Education, 1403 Norman Hall, (847) 804-5279 or (352) 273-4243

Whom to contact about your rights as a research participant in the study:
University of Florida Institutional Review Board (UF IRB) office, Box 112250 University of Florida, Gainesville, FL 32611-2250; 392-0433

Agreement:
I have read the procedures described above. I voluntarily give my consent for my child to participate in this study of the use of embedded instruction to improve children's learning opportunities. I have received a copy of this description.

_______________________________ _______________
Parent Date

_______________________________ _______________
Witness Date

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University of Florida
Department of Special Education
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CHILD ASSENT

Protocol Title: Impact of Professional Development on Preschool Teachers' Use of Embedded-Instruction Practices

Hello, ___(Child's Name)___. My name is (Research Team Member's Name) and I work at a big school in (Name of City) called the (Name of University). I am here to show your teacher a new way to teach you in your classroom. Before I do that, I would like for you to look at some pictures with me and answer some questions. Then, while your teacher teaches you, either I or another person will be watching and making a movie of you and your teacher to see if the new way she teaches is a good way or not a good way. You do not have to look at my pictures, answer my questions, or let us watch you and make a movie of you if you do not want to, and you can tell us to stop any time. Nobody will be mad at you if you do not want to be watched or if you do not want us to make a movie of you, and no one will be mad if you do not want to look at pictures and answer questions. If you do not want to do these things you can still be a part of all of the things that your class does. No one will be upset.

Will you look at the pictures and answer questions with me? Can we watch you in your classroom and make a movie of you?

_______________________(Child's Name) gave oral assent to participate in the study: Impact of Professional Development on Preschool Teachers' Use of Embedded-Instruction Practices

_________________________________ _______________________________
Research Team Member Date

_________________________________ _______________________________
Witness Date

Approved by
University of Florida
Institutional Review Board 02
Protocol # ______2007-U-0945
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BIOGRAPHICAL SKETCH

Salih Rakap graduated from primary school in 1992, middle school in 1995, and high school in 1998. He earned his bachelor's degree in elementary education from the Gazi University in 2002. After his graduation, he worked as an elementary school teacher for 2 years. In February 2004, he was awarded a scholarship from the Turkish Ministry of National Education to pursue graduate studies abroad. He was among 20 individuals who were awarded the scholarship. He came to the United States in 2004 as an international student and completed a 1-year course of study at Boston University focused on English as a second language in order to prepare for his graduate studies. In 2005, he was accepted into the master's of education program in early intervention at the University of Pittsburgh. He completed the master's program in 2007.

In the same year, he applied to doctoral program in special education at the University of Florida and received acceptance with the award of an alumni fellowship to complete his studies. During his 6 years in the doctoral program, he has focused on inclusion in preschool, child engagement, naturalistic instructional approaches, social-emotional development of young children, professional development for preschool teacher, home-based early intervention practices, and effect sizes in single-subject experimental research. While completing his doctoral coursework, he taught two undergraduate-level courses focused on introduction to special education and curriculum and instruction in early childhood special education. He worked as research assistant for three research projects funded by the Institute of Education Sciences. He has several peer-reviewed publications. He has been a reviewer for and a presenter at several state and national conferences. He received the "Outstanding International Student Award" from the College of Education, as well as the "Certificate for Excellence in Academic Achievement" offered by the International Student Center at the University of Florida. In 2013, he graduated with a Ph.D. in special education with a specialization in early childhood studies and a minor in research and evaluation methods. His career goal is to assume a faculty position at a research-intensive university.