

Promoting Academic and Social-Emotional School Readiness: The Head Start REDI Program

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Forty-four Head Start classrooms were randomly assigned to enriched intervention (Head Start REDI—*Research-based, Developmentally Informed*) or “usual practice” conditions. The intervention involved brief lessons, “hands-on” extension activities, and specific teaching strategies linked empirically with the promotion of: (a) social-emotional competencies and (b) language development and emergent literacy skills. Take-home materials were provided to parents to enhance skill development at home. Multimethod assessments of three hundred and fifty-six 4-year-old children tracked their progress over the course of the 1-year program. Results revealed significant differences favoring children in the enriched intervention classrooms on measures of vocabulary, emergent literacy, emotional understanding, social problem solving, social behavior, and learning engagement. Implications are discussed for developmental models of school readiness and for early educational programs and policies.

Head Start has been referred to as the nation’s “premier” federally sponsored early childhood education program developed to reduce socioeconomic disparities in school readiness (U.S. Department of Health and Human Services [USDHHS], 2005). In general, research suggests that comprehensive, high-quality preschool programs can improve the school readiness of disadvantaged children and have extended benefits over time (Barnett, 1995; Ramey & Ramey, 2004). The recent Head Start Impact Study, which compared children randomly assigned to receive Head Start with a similar group allowed to enroll in community non-Head Start services, demonstrated significant benefits. For example, for children attending 1 year of Head Start, statistically significant effects were found on four (of six) cognitive skills measured (with effect sizes ranging from .13 to .34) and on one (of three) social-emotional indices of school readiness (USDHHS, 2005). However, no effects were found on several important aspects of school readiness, including oral comprehension skills, phonological awareness, aggressive behaviors, or social skills. Although Head Start programs provide a strong

infrastructure for service delivery, these findings demonstrate a need to further strengthen their educational programs to enhance the impact on child school readiness.

Developed in partnership with Head Start programs, the Head Start REDI (*Research-based, Developmentally Informed*) intervention targets the promotion of specific school readiness competencies in the domain of social-emotional development (prosocial behavior, emotional understanding, self-regulation, and aggression control) and cognitive development (language and emergent literacy skills). This article reports on the 1-year child outcomes of REDI assessed using a randomized-controlled design, with multi-informant, multimethod measurement.

Head Start Programs: High/Scope and Creative Curriculum for Preschool

The majority of Head Start programs in the nation use either the High/Scope curriculum, first developed in 1962 (Weikart & Schweinhart, 2005) or the Creative Curriculum for Preschool, first developed in 1978 (Dodge, Colker, & Heroman, 2002). Both of these core curricula emphasize the importance of child-initiated learning supported by positive teacher-child relationships and strategic learning interactions. Brief teacher presentations introduce a mix of large- and small-group exploratory activities each day. In High/Scope, teachers then use a formal “plan, do,

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review” process to guide children in anticipatory planning, inquiry-guided exploration, and experimentation. Both programs encourage individualized scaffolding (such as “mutual thinking”) to elicit student interest and target individualized educational objectives in the context of student activity. Teachers also use large group activities (e.g., games, songs, musical activities) to foster a sense of community and provide practice in social skills and group problem solving. A randomized trial evaluating the High/Scope Perry Preschool Curriculum has demonstrated the inherent potential of this approach, revealing long-term benefits, including higher rates of high school graduation, fewer crimes, and better employment outcomes among children who participated in the Perry Preschool program compared to those who attended no preschool (Schweinhart et al., 2005). Unfortunately, “typical” Head Start programs have not produced the same effects. This is likely due to weaknesses in the fidelity of curriculum implementation and a failure to include the level of parent-focused home visits, teacher training, and organizational support that were used in the High/Scope trial and are recommended by the program developers (Schweinhart, 2004).

Although based on the best research-based developmental practices of the time, both High/Scope and Creative Curriculum originated before contemporary research identified certain predictors of preschool language and emergent literacy skills and before strategies for facilitating social-emotional competencies were empirically evaluated in preschool settings. Both models have incorporated new emphases on literacy and social skills into their programs based on more recent research; however, achieving high-fidelity implementation in the field remains a challenge. Part of the challenge may be that both programs rely on teacher expertise to individualize educational plans. Yet, many Head Start teachers feel overstressed and poorly equipped to handle behaviorally challenging and language delayed children who are often disengaged in the preschool learning context (Yoshikawa & Knitzer, 1997). In addition, Head Start staff often lack the research expertise, financial resources, and technical assistance necessary to integrate new research-based strategies effectively and with high-implementation fidelity, into their local programs (Iutovich, Fiene, Johnson, Koppel, & Langan, 1997).

Head Start REDI was designed to make the integration of research-based practices easier by providing teachers with manualized enrichment curricula, consisting of brief lessons, “hands-on” extension activities, and specific instructional strategies, all arranged strategically to address a scope

and sequence of social-emotional and language/emergent literacy skills. In addition, mentoring was provided to support teacher understanding and effective use of these instructional strategies. The REDI program was designed to enrich and complement the broad educational programming provided by High/Scope or Creative Curriculum, increasing the systematic emphasis teachers placed on target skills. These skills were selected because they are important predictors of grade school adjustment and achievement and are associated with socioeconomic disparities in school readiness (Blair, 2002; Ladd & Profilet, 1996). In addition, in all cases and as described in the following sections, prior efficacy studies had demonstrated instructional approaches that produced improvements in the skills, and these instructional approaches provided a basis for the REDI program design.

Social-Emotional Skills

At school entry, children are faced with heightened demands for well-regulated and goal-directed activity, including sustained behavioral inhibition, compliance with rules, and the capacity to initiate and sustain positive interpersonal relationships with teachers and peers (Campbell & von Stauffenberg, 2008; Kellam, Rebok, Ialongo, & Mayer, 1994). Children growing up in poverty are particularly likely to enter school with significant deficits in social-emotional readiness, with over 40% demonstrating delays in social competencies and communication abilities at school entry and over 20% exhibiting high rates of disruptive behavior problems that undermine school adjustment (Kaiser et al., 2000). To a considerable extent, these child skill deficits reflect the negative impact of poverty—and factors associated with it, such as maternal depression and exposure to violence and stress—on parenting practices (Lengua, Honorado, & Bush, 2007; Li-Grining, 2007).

Target skills. Specific social competencies linked empirically with school success include prosocial behaviors that foster positive peer and teacher relationships (e.g., helping, sharing, taking turns) and self-regulation skills that support the inhibitory control of aggression (Coolahan, Fantuzzo, Mendez, & McDermott, 2000; Denham & Burton, 2003; Ladd, Buhs, & Seid, 2000). Effective prosocial engagement and self-regulation, in turn, appear closely linked with emotional competence (e.g., the ability to recognize and regulate emotions; Denham & Burton, 2003) and with social problem-solving skills (e.g., the capacity to define problems, generate and consider alternative solutions, and engage in anticipatory

planning that considers the consequences of various solutions; Crick & Dodge, 1994; Youngstrom et al., 2000).

In addition to these social behaviors, the social-emotional and self-regulation competencies that support effective learning engagement are important for school success (Blair, 2002). These include the capacity to participate cooperatively in classroom activities and to control attention and sustain task involvement (Ladd et al., 2000; McClelland, Acock, & Morrison, 2006). Children who can organize their behavior in a manner consistent with classroom expectations and engage with persistence on learning tasks exhibit higher levels of achievement in school (McClelland et al., 2006). Conversely, attention problems undermine effective learning and contribute to off-task behavior and reduced achievement (Hughes & Kwok, 2006). Although biological factors contribute to individual differences in children's attention skills and effortful control, socialization and educational experiences also appear to play an important role (Blair, 2006). As a result, interventions that foster social-emotional learning and improve behavioral self-regulation can strengthen cognitive development (Riggs, Greenberg, Kusche, & Pentz, 2006).

Intervention approaches. A rapidly growing research base suggests that social-emotional competencies (in areas of prosocial behaviors, aggression control, emotional understanding, social problem-solving skills, and learning engagement) can be enhanced via the use of systematic instructional approaches in the classroom (Consortium on the School-Based Promotion of Social Competence, 1994; Elias et al., 1997). Preschool teachers exert strong socialization influences on young children, affecting social-emotional learning in both formal and informal ways (Denham & Burton, 2003; Pianta & Stuhlman, 2004). Training teachers to provide warm support and effective (nonpunitive) classroom management has positive effects on children's prosocial behavior and reduced aggression (Webster-Stratton, Reid, & Hammond, 2004). In addition, explicit social-emotional learning and emotion coaching curricula enhance child skill development. For example, in a pioneering study, the "I Can Problem Solve" program promoted gains in children's social problem-solving abilities and teacher-rated improvements in frustration tolerance, impulsivity, and task engagement (Shure & Spivack, 1982). Similarly, a randomized trial of the "Al's Pals: Kids Making Healthy Choices" program produced significant effects on Head Start teacher ratings of child behavior problems and independent functioning (Lynch, Geller, & Schmidt, 2004). Further, children

with behavior problems who received the "Dinosaur School" program (targeting prosocial skills, emotional understanding, self-regulation, and social problem-solving skills) showed behavioral improvements at home and school that were maintained at follow-up 1 year after the end of the program (Webster-Stratton et al., 2004).

Of particular importance to the current study, a comprehensive, universal social-emotional learning program, Preschool PATHS (Promoting Alternative Thinking Strategies; Domitrovich, Cortes, & Greenberg, 2007) demonstrated positive effects when delivered by teachers in Head Start classrooms. In a randomized trial, Head Start children who received Preschool PATHS showed higher levels of emotional understanding and were rated more socially competent by teachers and parents than children in the control group (Domitrovich et al., 2007).

Language and Emergent Literacy Skills

Language skills support social-emotional adjustment and foster children's abilities to understand and comply with the behavioral demands of school (Catts, Fey, Zhang, & Tomblin, 1999). In addition, oral language skills, along with phonological awareness and print knowledge, provide an important foundation for success in the early years of formal reading instruction (Catts et al., 1999; National Research Council, 1998; Stanovich & Siegel, 1994). Children who start school with deficits in these language and emergent literacy skills are frequently identified as poor readers in elementary school and rarely catch up to their nonimpaired peers, often suffering life-long reading disabilities and underachievement (Shaywitz & Shaywitz, 2005).

Target skills. Oral language skills include vocabulary, and the child's ability to understand and produce grammatically varied utterances and narratives. Oral language skills are critical to the process of extracting meaning both from printed text and from teachers' oral instruction. Exposure to a responsive and expansive language environment, in the context of warm, positive relationships with parents and teachers sets the stage for positive language learning (Dickinson & Smith, 1994). Children growing up in families of lower socioeconomic status are less likely than their economically advantaged peers to experience extended discussions with their caregivers or to engage in interactive reading (Senechal & LeFevre, 2002) and hence have less exposure to decontextualized and rich talk that expands vocabulary, fosters narrative skills, and allows them to reflect on their learning experiences.

Phonological awareness, which develops during the preschool years, refers to the ability to recognize and manipulate the smaller units of sound within spoken words, such as syllables and phonemes (Lonigan, Burgess, & Anthony, 2000). Preschoolers who are able to rhyme, blend sounds together to form new sounds, and segment sound into words or syllables are more proficient readers in first and second grades, even when IQ and vocabulary skills are controlled (Bryant, MacLean, Bradley, & Crossland, 1990; Catts et al., 1999). Conversely, children with reading disabilities often exhibit deficits in phonological awareness (Torgesen, 1998). Print knowledge, particularly the child's ability to identify letters of the alphabet, also plays a central role in the child's emerging ability to decode printed text (Scarborough, 2001).

Intervention strategies. Interactive book reading, when combined with professional development activities designed to improve the quality of teacher's language use has proven effective in promoting richer conversational exchanges in the classroom and gains in child vocabulary and oral comprehension skills (Wasik & Bond, 2001; Whitehurst, Arnold, et al., 1994; Whitehurst, Epstein, et al., 1994). In addition, there is compelling evidence that carefully sequenced learning activities can substantially enhance preschool children's phonological awareness and thereby contribute to early reading success (Adams, Foorman, Lundberg, & Beeler, 1998; Hatcher, Hulme, & Ellis, 1994) with some evidence of lasting effects through the end of elementary school (Byrne, Fielding-Barnsley, & Ashley, 2000). In addition, prior efficacy studies have also demonstrated that adding explicit preschool instruction in alphabetic principles fosters later word decoding (Lonigan et al., 2000) and can be combined effectively with phonological awareness interventions to produce gains in reading achievement (Ball & Blachman, 1991; Bradley & Bryant, 1983).

The Present Study

The Head Start REDI program was designed as an enrichment intervention that could be integrated into the existing framework of Head Start programs using the High/Scope or Creative Curriculum. REDI was organized to promote teachers' capacities to use research-based practices in supporting the development of both social-emotional competencies and language/emergent literacy skills. Empirically supported interventions were used or adapted for use in this context, and teachers received training workshops and ongoing weekly mentoring to support their use of the curriculum and teaching strategies. To examine its effects, the REDI Project employed

a randomized trial design, assigning 44 classrooms to intervention or "usual practice" conditions. A large, ethnically diverse group of 4-year-old children were pretested as they entered these Head Start classrooms and were assessed again at the end of the year.

It was hypothesized that the REDI intervention would accelerate skill acquisition in the targeted domains of language development (vocabulary, syntax), emergent literacy (phonological awareness, print knowledge), and social-emotional skills (emotional understanding, social problem solving). It was further hypothesized that children would improve in socially competent behavior and learning engagement (increased classroom participation, fewer attention problems) and show reduced aggression, particularly at school, and possibly generalized to home.

Method

Participants

Participants in this study included two cohorts of 4-year-old children ($N = 356$, 17% Hispanic, 25% African American, and 54% girls) in 44 Head Start classrooms in three counties in Pennsylvania. Half of the participating classrooms came from a large, fairly densely populated county in the southeastern part of the state, which included an urban community surrounded by smaller communities. The other classrooms came from two smaller counties in the central part of the state, characterized by small towns and rural areas. Initially, classrooms were stratified on location, length of program, and student demographics to assure even representation in the intervention and comparison conditions. In the more urban county, classrooms were stratified into three groups, which varied in terms of urban (vs. nonurban) location, percentage of minority students served, and use of Spanish in the classroom. In the two more rural counties, classes were also stratified into three groups, which varied in terms of being full-day or half-day programs and located in small towns versus rural locations. Classrooms in the same center were always assigned to the same condition, to avoid inadvertent contamination of condition within centers. Within each stratified group, centers were randomly assigned to intervention or comparison conditions. This process resulted in 14 classrooms (67%) in each condition that were located in small centers (1–2 classrooms) and 8 classrooms in each condition located in four larger centers (containing 3–5 classrooms), with children from ethnic minority groups fairly evenly spread

across condition (39% of the intervention group and 45% of the control group.)

Children were recruited across 2 years. Each year, teachers were studied as they implemented the intervention for the first time, and 4-year-old children were assessed after receiving 1 year of REDI intervention. Teachers in the comparison classrooms continued to conduct curriculum "as usual." On average, classrooms contained about 14 children (typically, one-third 3-year-olds, two-thirds 4-year-olds). Approximately 60% of the 4-year-olds recruited for this study had attended Head Start as 3-year-olds, and this proportion was similar across the intervention and control classrooms. Pretest scores for all children were used to control statistically for initial differences in child skills.

To recruit participants for the evaluation trial, brochures describing the study were distributed to parents of all 4-year-old children in participating classrooms. Overall, only 14 eligible families declined to participate in the evaluation procedures, but an additional 21 primary caregivers were very difficult to reach and failed to complete the preassessment. Two children were dropped because they had a twin or sibling in the study, and 19 families withdrew early from Head Start and hence completed only parts of the assessment procedures. Hence, study participants represent 86% of the initially eligible population. Primary caregivers included 89% mothers, 4% fathers, 4% grandparents, and 3% other, including stepparents or foster parents.

Data Collection Procedures

Parent interviews were conducted at a time and location that was convenient for the parents (e.g., at the Head Start center, their home, or at a community location such as a library). A trained interviewer met privately with the primary caregiver and read through all the measures. Based on teacher recommendation or parent request, some interviews were conducted in Spanish. Parent interviews were initiated shortly before the start of the school year and continued through the end of October. Parents were reinterviewed at the end of the school year, in May and June. Each time, parents were compensated \$20 for this 30-min interview.

Child assessments were conducted at school by trained interviewers, during two individual 30- to 45-min "pull-out" sessions. After each session, interviewers rated the child's task-approach and learning behaviors, as observed during the session. To give children time to acclimate to the classroom setting, assessments began 3 weeks after school began and

continued through the end of October. End-of-year child assessments were conducted in March and April.

End-of-year child ratings were collected from teachers in April. Teachers were compensated \$20 to provide general information about themselves and their classrooms, and they received an additional \$7 per child for completing behavioral ratings. One lead and one assistant teacher in each classroom provided independent ratings of child behavior.

Beginning in April, each child was observed during two 12- to 15-min play sessions held on 2 separate days. Using a roster generated by the research staff, classmates were randomly assigned to groups of three, taken to a separate space, and given the opportunity to play with an interesting and novel toy together (playground set and castle set). By using a standard play setting that encouraged social interaction, these sessions were designed to control for classroom variations in play opportunities and to elicit meaningful individual differences in social competencies. Observers were naive concerning the intervention or control status of the children. One observer focused on each child, noting discrete social behaviors and interactions, and at the end of the session, completed rating forms describing the quality of social behavior observed.

Intervention Design

The intervention was delivered by classroom teachers and integrated into their ongoing classroom programs. It included curriculum-based lessons, center-based extension activities, and training in "teaching strategies" to use throughout the day.

Social-emotional skill enrichment. The Preschool PATHS Curriculum (Domitrovich, Greenberg, Cortes, & Kusche, 1999) was used to promote children's social-emotional skills. This curriculum targets four domains: (a) prosocial friendship skills, (b) emotional understanding and emotional expression skills, (c) self-control (e.g., the capacity to inhibit impulsive behavior and organize goal-directed activity), and (d) problem-solving skills, including interpersonal negotiation and conflict resolution skills. The curriculum is divided into 33 lessons that are delivered by teachers during circle time. These lessons include modeling stories and discussions and use puppet characters, photographs, and teacher role-play demonstrations. Each lesson includes extension activities (e.g., cooperative projects and games) that provide children with opportunities to practice the target skills with teacher support. Teachers taught one PATHS lesson and conducted one extension activity each week.

Generalized teaching strategies were encouraged with mentoring, including positive classroom management, use of specific teacher praise and support, emotion coaching, and induction strategies to promote appropriate self-control.

Language/emergent literacy skill enrichment. Four language and emergent literacy skills were targeted in REDI: (a) vocabulary, (b) syntax, (c) phonological awareness, and (d) print awareness. Three program components were developed to target these skills, including an interactive reading program, a set of "Sound Games," and print center activities.

The interactive reading program was based on the shared reading program developed by Wasik and Bond (2001; Wasik, Bond, & Hindman, 2006), which was, in turn, an adaptation of the dialogic reading program (Whitehurst, Arnold, et al., 1994). The curriculum included two books per week, which were scripted with interactive questions. Each book had a list of targeted vocabulary words, presented with the aid of physical props and illustrations. In addition to presenting these materials in a systematic way during the week, teachers received mentoring in the use of "language coaching" strategies, such as expansions and grammatical recasts, to provide a general scaffold for language development in the classroom (Dickinson & Smith, 1994). The overall goal was to improve teacher's strategic use of language in ways that would increase child oral language skills, including vocabulary, narrative, and syntax.

Teachers were provided with curricula materials to promote phonological awareness and print knowledge. A set of Sound Games was based primarily on the work of Lundberg and colleagues (Adams et al., 1998). The games were organized developmentally, moving from easier to more difficult skills during the course of the year (e.g., listening, rhyming, alliteration, words and sentences, syllables, phonemes.) Teachers were asked to use a 10- to 15-min Sound Game activity at least three times per week.

In addition, teachers were provided with a developmentally sequenced set of activities and materials to be used in their alphabet centers, including letter stickers, a letter bucket, materials to create a Letter Wall, and craft materials for various letter-learning activities. They were asked to make sure that each child visited the alphabet center several times per week and were given materials to track the children's acquisition of letter names.

Training and professional development support. Teachers received detailed manuals and kits containing all materials needed to implement the intervention. A 3-day professional training was conducted in August, prior to initiating the intervention, and a 1-day "booster"

training session was conducted in January. Teachers also received weekly mentoring support provided by local educational consultants ("REDI trainers"), experienced master teachers who were supervised by two project-based senior educational trainers. The weekly consultations were intended to enhance the quality of implementation through modeling, coaching, and providing ongoing feedback regarding program delivery. REDI trainers spent an average of 3 hr per week ($SD = 0.18$) in each classroom observing, demonstrating, or team teaching lessons. They also met with the head and assistant teacher for 1 hr each week outside of class.

Parent take-home materials. Three "take-home" packets were mailed to parents during the course of the year, each containing a modeling videotape, with parenting tips and learning activities to use at home. In addition, the PATHS curriculum included handouts for parents, with suggestions for home activities. Children also took home letter stickers and compliment pages to prompt their parents to ask them about their school day and provide positive support at home.

Integrating the program components. Half of the participating classrooms used High/Scope as their base curriculum; the others used Creative Curriculum. Project staff developed "crosswalk" tables to illustrate how the REDI target skills and methods mapped onto each of these base curricula. Although both High/Scope and Creative Curriculum have recently developed supplemental materials to enhance language and emergent literacy skills, none of the Head Start programs participating in this project were using them. The interactive reading program and emphasis on language use, as well as the emotion coaching and social problem-solving strategies that were central to the REDI program were philosophically compatible with the strategic, child-centered teaching approach used in High/Scope and Creative Curriculum. They were easily integrated into existing book reading, learning center, and play activities and routines. The Sound Games, alphabet centers, and social-emotional lesson presentations used more direct teacher instruction, and hence represented components that were not well integrated with the core curriculum but were "added on" to enhance the acquisition of specific skill concepts.

A central objective of REDI was to maximize the integration of the social-emotional and language/emergent literacy intervention components that comprised the enrichment program. Each week, one of the books used in the interactive reading program focused on the PATHS theme for that week (e.g., friendship, feelings, self-control, social problem

solving), and feeling words were included in the vocabulary prompts. Conversely, PATHS extension activities incorporated language and emergent literacy skills.

Intervention implementation. Teachers reported to REDI trainers regarding the enrichment lessons and activities they used. On average, each week they reported implementing 1.77 PATHS lessons and extension activities ($SD = 0.12$), 6.08 dialogic reading activities ($SD = 0.25$), 2.57 sound game activities ($SD = 0.34$), and 3.56 alphabet center activities ($SD = 0.18$). In addition, teachers answered 10 questions, using 3-point scales to describe the quality of their implementation (e.g., Were you able to complete the lesson as written? How well did the children understand the major points of the lesson?; $\alpha = .87$). The average rating was 2.78 ($SD = 0.15$) indicating that, from the teachers' perspective, the curriculum was being delivered with high fidelity, and children were engaged in the lessons.

On a monthly basis, REDI trainers assessed the fidelity and quality of implementation of program components, using a 6-point Likert scale (*poor to exemplary*). Implementation quality ratings were: PATHS, $M = 4.61$ ($SD = 0.74$), dialogic reading, $M = 4.39$ ($SD = 0.57$), alphabet activities, $M = 4.70$ ($SD = 0.55$), sound games, $M = 4.52$ ($SD = 0.72$), and overall REDI program, $M = 4.55$ ($SD = 0.67$). Scores of 4–5 reflected descriptions of “adequate” to “strong.”

Measures

A multimethod, multimeasure assessment battery included child assessments, teacher ratings, parent ratings, and direct observations. Outcome measures represented six core domains: (a) language skills, (b) emergent literacy skills, (c) emotional understanding and social-cognitive skills, (d) social behaviors, (e) learning engagement at school, and (f) learning engagement at home.

Language skills. Three tests were administered directly to children to assess their language skills. In the Expressive One-Word Picture Vocabulary Test (Brownell, 2000), children gave the word that best described pictures they were shown ($\alpha = .94$). The Grammatical Understanding subtest of the Test of Language Development (TOLD; Newcomer & Hammill, 1997) assessed syntax comprehension. Children listened to a sentence and chose one of the four pictures that “best matched” the meaning of the sentence ($\alpha = .80$). The Sentence Imitation subtest assessed syntax expression. Children repeated sentences read aloud by the interviewer. Scores reflected

the number of increasingly complex sentences a child imitated correctly ($\alpha = .90$). Prior research has documented strong test–retest reliability for TOLD subtests ($r = .90$) and concurrent validity with comprehensive language assessments (Newcomer & Hammill, 1997).

Emergent literacy skills. Three subscales assessing emergent literacy skills were drawn from the Test of Preschool Early Literacy (TOPEL; previously labeled the Pre-CTOPP; Lonigan, Wagner, Torgesen, & Rashotte, 2007). The Blending subtest assessed phonological processing. Children were asked to combine different parts of a word, such as “hot” and “dog” or “b” and “air” and point to the correct picture or say the full word ($\alpha = .86$). On the Elision subtest of the TOPEL, children deconstructed compound words and pointed to the correct picture (e.g., Point to “snowshoe” without “snow”; Say “airport” without “air”; $\alpha = .83$). In the Print Knowledge subtest of the TOPEL, children identified pictures of letters or words and named letters ($\alpha = .97$). Prior research has reported correlations in the range of .43–.88 between these three subscales and the acquisition of initial reading skills (Lonigan, 2006).

Emotional understanding and social-cognitive skills. Two measures assessed emotional understanding. On the Assessment of Children's Emotion Skills (Schultz, Izard, & Bear, 2004), children determined whether the facial expressions in 12 photographs reflected happy, mad, sad, scared, or no feelings. The score was the total number correctly identified ($\alpha = .57$). On the Emotion Recognition Questionnaire (Ribordy, Camras, Stafani, & Spacarelli, 1988), children listened to 16 stories describing characters in emotionally evocative situations and identified their feeling by pointing to pictures of happy, mad, sad, or scared faces. Children received a score of 2 for correctly identifying the feeling and a score of 1 for correctly identifying the valence ($\alpha = .63$).

Social problem-solving skills were assessed using a variation of the Challenging Situations Task (Denham, Bouril, & Belouad, 1994.) Children were presented with pictures of four peer scenarios (e.g., a peer knocking down blocks, being hit, entering a group, a peer taking a ball). After each scenario, children were asked what they would do in the situation. Their open-ended responses were coded as competent (i.e., appropriately asserting oneself or calmly negotiating a solution, $\alpha = .68$), aggressive (i.e., responding with verbal or physical antagonism, intimidation, or force, $\alpha = .77$), or inept (i.e., passive avoidance, $\alpha = .68$). Coding agreement between research assistants and data checkers on 1,616 responses was high ($\kappa = .94$).

Social-emotional behaviors. Teacher ratings, observer ratings, and parent ratings assessed social competence and aggressive-oppositional behavior. The 13 items of the Social Competence Scale (Conduct Problems Prevention Research Group [CPPRG], 1995) were rated on a 6-point Likert scale (*never to almost always*) and included prosocial behaviors such as sharing, helping, understanding other's feelings, as well as self-regulatory behaviors, such as resolving peer problems independently. Ratings provided by lead and assistant teachers were averaged ($r = .56, p < .001$). Internal consistency was high for teachers ($\alpha = .94$) and parents ($\alpha = .87$). Observers used the same rating scale to describe child behavior after each of the play observation sessions

($\alpha = .88$). Interrater reliability was assessed for 23% of the playgroup sessions and demonstrated adequate agreement (intraclass correlation coefficient [ICC] = .70). Ratings collected after each of the two playgroup sessions were averaged ($r = .24, p < .001$).

Seven items from the Teacher Observation of Child Adaptation—Revised (TOCA—R; Werthamer-Larsson, Kellam, & Wheeler, 1991) assessed overt aggression (e.g., stubborn, yells, fights). Six items from the Preschool Social Behavior Scale—Teacher Form (Crick, Casas, & Mosher, 1997) assessed relational aggression (e.g., "Tells other kids he/she won't be their friend unless they do what he/she wants"). Items were rated on a 6-point Likert scale (*almost never to almost always*; $\alpha = .88$ and $.93$, for the two scales, respectively). Ratings from lead and assistant teachers were averaged ($r = .68, p < .001$, for overt aggression, and $r = .51, p < .001$, for relational aggression), and overt and relational ratings were combined to form a total aggression score ($r = .58, p < .001$). Parents and observers completed the seven items from the TOCA—R only ($\alpha = .86, \alpha = .92$, respectively). Interrater agreement among observers was acceptable (ICC = .74), and ratings were averaged across the two sessions ($r = .42, p < .001$).

Learning engagement at school. Teacher ratings were used to assess learning engagement at school, using an eight-item inventory developed for this study. Items were rated on a 6-point Likert scale (*strongly disagree to strongly agree*), and reflected self-regulation (e.g., "Has the self-control to do well in school" and "Can follow the rules and routines that are part of the school day"), learning motivation and involvement (e.g., "Seems enthusiastic about learning new things"), and compliance (e.g., "Is able and willing to follow teacher directions"). Lead and assistant teacher ratings were averaged ($\alpha = .95, r = .70, p < .001$).

Observers completed the Adapted Leiter—R Assessor Report (Roid & Miller, 1997) to assess task

orientation at school (Smith-Donald, Raver, Hayes, & Richardson, 2007). After the child assessments, interviewers rated the child's participation and involvement, using 13 items (e.g., "Shows pleasure in accomplishment and active mastery," "Careful and interested in accuracy," "Alert and interactive.") Each item was rated on a 4-point scale ($\alpha = .93$). Scores from the two assessment sessions were averaged ($r = .62, p < .001$).

Teachers also completed the ADHD Rating Scale (DuPaul, 1991). Based on the *Diagnostic and Statistical Manual* symptoms of attention deficit hyperactivity disorder, this scale includes 14 items reflecting attention problems (e.g., "Is easily distracted," "Has trouble following directions") each rated on a 4-point scale. Lead and assistant teacher ratings were averaged ($\alpha = .94; r = .76, p < .001$) and used in this study to represent a continuous dimension reflecting difficulties with impulse control, distractibility, and sustained attention.

Learning engagement at home. Parents completed the ADHD Rating Scale ($\alpha = .90$). In addition, they responded to five questions about children's language and communication at home (e.g., "How many times in a typical week do you and your child have a conversation that lasts 10 min or more?" "How often does your child volunteer to tell you about something that happened when you were not with him or her?"; $\alpha = .49$). Finally, parents answered six questions about children's engagement in reading at home (e.g., "When was the last time you and your child read a book together?" "How many books did you read at that time?"; $\alpha = .63$).

Results

Preliminary Analyses

Scores on Sentence Imitation and observer ratings of aggressive-oppositional behavior were highly skewed. Log transformations were conducted on those scores, after which all measures were normally distributed with values of skewness and kurtosis below 2.00. Correlations among the measures of child skills (language, emergent literacy, and social-emotional cognitions) are presented in Table 1, and correlations among the measures of child behavior ratings (by teachers, parents, and observers) are presented in Table 2.

To examine preintervention differences between the intervention and the comparison groups, hierarchical linear models (HLM) were estimated, accounting for the nesting of children within classrooms. Child sex and race were included as Level 1 covariates

Table 1
Correlations Among Child Skills

	1	2	3	4	5	6	7	8	9	10	11
1. Vocabulary											
2. Grammatical understanding	.50										
3. Sentence imitation	.47	.39									
4. Blending	.35	.30	.40								
5. Elision	.52	.43	.45	.50							
6. Print awareness	.48	.40	.37	.37	.45						
7. Emotion identification (Assessment of Children's Emotion Skills)	.38	.43	.33	.32	.29	.33					
8. Emotion recognition (Emotion Recognition Questionnaire)	.44	.45	.39	.35	.38	.40	.42				
9. CST competent responses	.18	.21	.14	.17	.13	.19	.12	.17			
10. CST aggressive responses	-.06	-.06	-.01	-.07	-.06	-.03	-.09	-.09	-.37		
11. CST inept responses	-.21	-.21	-.18	-.14	-.26	-.17	-.12	-.20	-.27	-.16	

Note. All correlation coefficients greater than .10 are statistically significant ($p < .05$). CST = Challenging Situations Task.

and center site (e.g., central or southeastern Pennsylvania), cohort, and intervention status were included as Level 2 covariates in each of these models. No significant ($p < .05$) pretreatment intervention-control group differences emerged on the 11 measures of child skills or the 6 measures of child behavior for which pretreatment scores were available. Overall, the stratified randomization process appeared effective in creating equivalent groups prior to the intervention.

Postintervention Group Differences

The first set of analyses examined the 11 measures of child language, emergent literacy, emotional understanding, and social problem-solving skills that were targeted directly by the intervention and were

measured using direct assessments of child skill knowledge. Because the intervention was delivered at the classroom level, analyses accounted for the nonindependence of data at that level. Child sex and race were included as Level 1 covariates and site, cohort, and intervention status were included as Level 2 covariates. Preintervention scores were available for all these measures and also were included as Level 1 covariates.

The results of these HLM are summarized in Table 3. For ease of interpretation, all measures were standardized with a mean of 0 and a standard deviation of 1. By doing this, the coefficient for the intervention effect represents the difference in average expected scores between children in the intervention and control groups as a proportion of a standard deviation. This difference is similar to

Table 2
Correlations Among Behavioral Ratings

	1	2	3	4	5	6	7	8	9	10	11
1. Social competence: Teacher											
2. Social competence: Parent	.18										
3. Social competence: Observer	.29	.18									
4. Aggression: Teacher	-.67	-.09	-.26								
5. Aggression: Parent	-.26	-.70	-.13	.22							
6. Aggression: Observer	-.15	-.11	-.62	.23	.13						
7. Learning engagement: Teacher	.73	.22	.26	-.39	-.17	-.11					
8. Task orientation: Observer	.28	.15	.28	-.10	-.13	-.26	.41				
9. Attention problems: Teacher	-.72	-.14	-.35	.60	.19	.28	-.73	-.32			
10. Attention problems: Parent	-.21	-.49	-.22	.20	.54	.10	-.16	-.20	.21		
11. Language use/communication	-.05	.14	.02	.08	.02	.05	.01	.05	.06	-.01	
12. Reading activities	-.02	.13	-.04	.08	-.07	.06	.07	.09	.02	-.11	.35

Note. All correlation coefficients greater than .10 are statistically significant ($p < .05$).

Table 3
Intervention Effects on Child Skills

Variable	Control group		Intervention group		Intervention effect	
	Pre	Post	Pre	Post	Effect	<i>p</i> Value
Language skills						
Vocabulary	34.62 (10.76)	41.03 (11.24)	34.94 (11.10)	42.79 (11.55)	.15	.02
Grammatical understanding	8.62 (5.14)	11.72 (4.90)	9.72 (4.95)	11.95 (4.70)	-.07	.56
Sentence imitation	1.11 (0.72)	1.56 (0.80)	1.19 (0.79)	1.57 (0.75)	-.04	.73
Emergent literacy skills						
Blending	11.53 (4.30)	13.04 (4.30)	11.58 (4.26)	14.71 (4.33)	.39	.001
Elision	7.71 (3.43)	9.61 (3.58)	8.21 (3.49)	11.19 (4.02)	.35	.001
Print awareness	7.97 (8.31)	16.49 (12.59)	8.86 (9.43)	18.84 (12.84)	.16	.10
Social cognitions						
Emotion identification	5.68 (2.27)	7.12 (2.28)	5.39 (2.16)	7.45 (2.36)	.21	.06
Emotion recognition	1.34 (0.29)	1.52 (0.26)	1.37 (0.31)	1.61 (0.24)	.23	.03
CST aggressive responses	2.01 (2.30)	2.06 (2.55)	1.96 (2.27)	1.53 (2.21)	-.21	.04
CST competent responses	2.37 (2.05)	2.29 (2.05)	2.51 (2.16)	3.16 (2.55)	.35	.005
CST inept responses	2.52 (2.11)	2.56 (2.34)	2.51 (2.11)	1.94 (2.01)	-.28	.03

Note. Group means are presented with standard deviations in parentheses. Effect estimates represent approximate effect size. CST = Challenging Situations Task.

an effect size that controls for all other measures in the HLM. There were significant treatment effects ($p < .05$) for 7 of the 11 skills directly targeted by the intervention and marginally significant intervention effects ($p < .10$) for 2 other skills. Only 2 of the skills (grammatical understanding and sentence imitation) showed no evidence of intervention impact. The effect size for the 9 skills showing an intervention effect ranged from .15 to .39. This suggests that children who received the REDI enrichment gained about one fourth of a standard deviation more in these areas of target skill acquisition than children in the control group who received usual practice Head Start.

Next, HLM analyses were conducted to assess intervention effects on the 12 behavioral ratings provided by teachers, observers, and parents. Ideally, the cognitive and social-emotional skills acquired by children in the intervention group, along with the emotion coaching and inductive support provided by their teachers should produce generalized improvements in social competence, aggression control, and learning engagement. As before, the HLM nested children within classroom, included child sex and race as Level 1 covariates and included site, cohort, and intervention status as Level 2 covariates. In this case, however, we only had preintervention parent ratings and preintervention observer ratings of task orientation as Level 1 covariates. As shown in Table 4, 3 of the 12 behavioral ratings showed significant ($p < .05$) intervention effects—teacher

ratings of aggression, observer ratings of task orientation, and parent ratings of communication/language use. Five additional measures showed nonsignificant trends ($p < .10$) favoring intervention—teacher ratings of social competence, observer ratings of social competence, and parent ratings of aggression, attention problems, and reading involvement. Only four measures (parent ratings of social competence, observer ratings of aggression, teacher ratings of learning engagement, and teacher ratings of attention problems) showed no evidence of intervention impact. On the dimensions that showed marginal or statistically significant intervention effects, the effect sizes ranged from .11 to .29. Hence, children who received the REDI enrichment showed behavioral improvements in these areas that averaged about one fifth of a standard deviation more than the behavioral maturation observed in control group children.

Discussion

The Head Start REDI intervention was designed to capitalize on the existing service delivery infrastructure and quality programming of the Head Start system. The goal was to improve program impact on child skill acquisition by increasing the teachers' use of research-based instructional materials and teaching strategies. To do so, REDI provided supplementary curricula and mentoring to assist teachers

Table 4
Intervention Effects on Child Behaviors

Variable	Control group		Intervention group		Intervention effect	
	Pre	Post	Pre	Post	Effect	<i>p</i> value
Social-emotional behaviors						
Social competence: Teacher	NA	3.98 (0.88)	NA	4.15 (0.82)	.24	.10
Social competence: Parent	3.59 (0.76)	3.66 (0.84)	3.60 (0.84)	3.73 (0.80)	.09	.24
Social competence: Observer	NA	2.21 (0.53)	NA	2.36 (0.49)	.26	.08
Aggression: Teacher	NA	4.12 (1.70)	NA	3.69 (1.52)	-.28	.05
Aggression: Parent	2.93 (0.94)	2.86 (0.97)	2.88 (1.02)	2.71 (0.99)	-.13	.08
Aggression: Observer	NA	0.37 (0.34)	NA	0.30 (0.31)	-.19	.23
Learning engagement at school						
Learning engagement: Teacher	NA	4.97 (0.90)	NA	5.08 (0.86)	.17	.11
Task orientation: Observer	3.35 (0.48)	3.38 (0.49)	3.27 (0.60)	3.49 (0.49)	.29	.02
Attention problems: Teacher	NA	0.73 (0.66)	NA	0.66 (0.63)	-.14	.21
Learning engagement at home						
Attention problems: Parent	1.28 (0.62)	1.64 (0.70)	1.24 (0.68)	1.48 (0.81)	-.10	.06
Language/communication: Parent	0.00 (0.59)	-0.07 (0.52)	0.00 (0.55)	0.06 (0.56)	.25	.02
Reading activities: Parent	-0.01 (0.63)	-0.05 (0.65)	0.01 (0.58)	0.05 (0.51)	.17	.07

who were using High/Scope or Creative Curriculum to incorporate language more effectively throughout the day, provide both explicitly taught and more generalized support for child social-emotional development, and include explicit instruction in phonological sensitivity and letter identification skills.

Prior studies have shown that model preschool programs can have strong and long-lasting effects on the educational attainment and life adjustment of children growing up in socioeconomically disadvantaged situations. However, Head Start programs are often underresourced in comparison, and many lack the high levels of teacher training and organizational support that characterize the most successful models (Schweinhart, 2004). Both High/Scope and Creative Curriculum encourage teachers to promote child-centered learning, individualizing their approach to expand on individual student interests and strengths. In addition, teachers are expected to use professional development workshops to master new, research-based strategies for promoting emergent literacy and social-emotional competencies and to incorporate these strategies into their classroom practice. These expectations can create "overload" for teachers, who often lack the time, technical assistance, financial resources, and organizational support needed for effective and high-fidelity implementation (Iutovich et al., 1997; Yoshikawa & Knitzer, 1997).

Head Start REDI sought to support teachers and improve the fidelity of research-based instructional

practice in Head Start classrooms, by providing teachers with a well-specified enrichment curriculum, along with a year of mentored professional development in the implementation of that curriculum and corresponding teaching practices. The curriculum included specific instructional strategies and hands-on extension activities that were strategically diffused within the context of regular High/Scope and Creative Curriculum activities, as well as "scripted" lessons, all carefully organized to address a scope and sequence of language/emergent literacy and social-emotional skills.

The Program Impact on Child School Readiness

Language skills and social-emotional competencies were targeted for emphasis in REDI because these skills provide fundamental support for effective school engagement; they facilitate the child's ability to follow classroom rules, cope actively with learning challenges, and relate to teachers and peers (McClelland et al., 2006). These skills are intertwined developmentally. Language skills enhance the child's capacity to regulate emotions and promote effective social interaction (Greenberg, Kusche, & Speltz, 1991), and conversely, social-emotional competencies foster positive adult and peer relationships, motivating and providing important opportunities for language learning and cognitive development (Bierman, Greenberg, & the Conduct Problems Prevention Research Group, 1996). A key feature of the REDI

program was the synchronized and integrated focus on both language/emergent literacy skills and social-emotional competencies, designed to support skill development in both domains and foster transactional processes promoting cross-domain and comprehensive school readiness.

Teachers taught explicit lessons on social-emotional skills and, with mentoring, were encouraged to use emotion coaching, induction strategies, and problem-solving dialogue techniques throughout the day to encourage child social-emotional development. Statistically significant effects emerged on direct assessments of children's emotional understanding and social problem-solving skills, reflecting modest effect sizes (range = .21–.35). Corresponding improvements were also noted on measures of behavioral functioning, although not as consistent or strong as the impact on the targeted social-cognitive skills. Specifically, statistically significant differences in aggression were reported by teachers and statistically significant improvements in task orientation were reported by observers. Nonsignificant trends also favored children in the intervention classrooms on measures of teacher- and observer-rated social competence and parent-rated aggression and attention problems. Effect sizes ranged from .11 to .29. These are relatively small effects and require follow-up assessment in elementary school to determine whether they promote generalized and sustained improvements in school adaptation over time.

Additional REDI program components focused on improving classroom support for child language development (Dickinson & Smith, 1994). The interactive reading program provided teachers with scripted books and targeted vocabulary. Mentors encouraged teachers to elicit children's language more effectively and respond to it more sensitively. Mentors also encouraged teachers to model decontextualized and rich talk and to use questions and summaries to foster child narrative skills (Wasik & Bond, 2001; Whitehurst, Arnold, et al., 1994). Significant effects favoring children in intervention classrooms emerged on child vocabulary and on parent reports of communication and language use at home (with effect sizes of .15 and .25, respectively), but no effects emerged on the measures of child grammatical understanding.

In addition, the REDI curriculum used explicit instruction to promote the discrete skills of phonological awareness and print knowledge (Lonigan et al., 2000; Scarborough, 2001). Two indices of phonological awareness (blending and elision) showed a significant intervention effect; print awareness showed a nonsignificant trend favoring intervention

(effect sizes ranged from .16 to .39). These findings suggest that the intervention successfully promoted the discrete skills targeted in this domain. However, follow-up data are required to determine whether these discrete skills foster early reading skill acquisition, as they are hypothesized to do.

Several major components of the REDI program—specifically, sensitive-responsive language use, emotion coaching, and social problem-solving dialogue—were philosophically compatible with the strategic, child-centered teaching approach used in High/Scope and Creative Curriculum. However, the use of explicit instruction (PATHS lessons, sound games, print center focus on letter identification) was less consistent with this philosophy because of the emphasis on direct instruction. Proponents of “developmentally appropriate practice” in preschool settings have concerns about explicit instructional techniques of this kind that teach skills in a decontextualized fashion. The main concern is that an overemphasis on explicit instruction may reduce the learning engagement of young children and stifle curiosity and exploratory learning. Countering these concerns are proponents of explicit instruction who cite evidence that emergent literacy skills (such as letter identification and phonemic awareness) are strong predictors of later school achievement that are not likely to be acquired by children in Head Start unless explicit instruction techniques are employed (Lonigan et al., 2000). The results of the Head Start REDI program suggest that it is possible to integrate empirically validated strategies for promoting these critical emergent literacy skills in ways that are consistent with Head Start practices. With support and mentoring, Head Start teachers implemented the REDI curriculum components with a high level of fidelity and quality throughout the year. Interactive reading techniques were integrated into preexisting read-aloud sessions, alphabet center activities were integrated into preexisting print centers, and PATHS lessons were conducted during preexisting morning “circle times.” Sound games were most often added during transition periods, and PATHS extension support (emotion coaching and social problem-solving support) was used during free play periods. The significant effects on child skill acquisition suggest that this hybrid approach of incorporating some explicit instruction in the context of a child-centered, comprehensive early childhood program may be beneficial. Follow-up assessments are needed to determine the sustainability of these gains as well as to determine whether the program had any costs for children, in terms of reduced motivation or decreased gains in other domains of development.

Strengths and Limitations of the Study

Several strengths of the study warrant mention. The randomized-controlled design and use of multiple informants enhance confidence in the validity of the findings. Although teachers knew which children were receiving intervention, child assessors, observers, and parents were naive concerning the intervention/control status of the children. Hence, most of the measures used in the study were unbiased. HLM were used to control for the nesting of children within classrooms and to adjust for the potential dependencies in intervention effects associated with the classroom implementation of the program.

An added feature of this study involved the use of usual practice Head Start classrooms for a control group. Many of the studies that have produced larger effect sizes for preschool interventions have relied on comparison children who received no or minimum preschool support. This study demonstrated the effects of the enrichment relative to Head Start classrooms using standard High/Scope or Creative Curriculum, increasing the confidence with which the findings can be attributed to the specific teacher mentoring and supplementary curriculum used, rather than to more general features associated with the Head Start preschool experience.

A limitation of the study that should be noted, however, is that no measures were collected to determine the fidelity with which these programs were implementing their basic High/Scope or Creative Curriculum. It is possible that, had an equal amount of professional development effort been exerted to improve and monitor the fidelity of these core curricula, the results would have been similar to the impact of adding new curricular components. We hypothesize that providing teachers with a well-specified curriculum and lesson plans that are ordered along a developmental sequence makes it easier for them to introduce concepts and learning activities in a systematic and strategic manner. However, similar to most models of early childhood education, the REDI program assumes that young children acquire new skills when they are actively interested and engaged in goal-oriented activity, and hence that effective teaching requires sensitive and flexible responding to child-initiated inquiries and responses. For this reason, the REDI program included both a well-specified curriculum and a heavy emphasis on professional development and mentoring for teachers. The consequence is that one cannot determine whether either one of these components (without the other) would have been sufficient to

promote the same child outcomes. It is quite possible that changes in teaching practices (e.g., enriched language use, more positive behavioral support, improved instructional quality) were the key features that accounted for positive changes in child outcomes. The REDI curriculum and mentoring program are likely just one of the several approaches that improve child outcomes via improvements in teaching quality.

In addition, the parent component of the REDI intervention was minimal, consisting of take-home handouts, videos, and a few parent-child activities. Even so, parents reported significant differences in child communication and language use at home and nonsignificant trends favoring intervention on the child's reading involvement, aggression, and attention problems at home. To a large degree, the negative impact of family poverty on child school readiness is mediated by home learning opportunities, particularly the quality of parent-child interactions and associated provision of cognitive stimulation and emotional support (Campbell & von Stauffenberg, 2008; Duncan, Brooks-Gunn, & Klebanov, 1994; Eccles & Harold, 1996). Hence, it seems quite likely that greater attention to parenting might strengthen program impact.

A third limitation of the present study involves the timing of the assessments. Because we needed to give children some time to acclimate to the classroom setting, and then work around classroom schedules, it took us 8 weeks at the beginning of the year to conduct all the child preintervention assessments. Similarly, we had to start the child postintervention assessments 8 weeks before the end of the school year. On average, the impact on child skills was evaluated on the basis of approximately 25 weeks of exposure of the 35-week program year.

Fourth, because we needed to assess young children with limited attention on a wide range of cognitive and social-emotional domains, we had to rely on very brief assessments of discrete skills that are assumed to reflect broader domains of school readiness. We do not know, for example, how well some of our indicators of emergent literacy will predict future reading ability, and we do not know how well postintervention differences on teacher ratings or the relatively brief behavioral observations will predict later social skills.

Relatedly, although REDI appears to have had a positive effect on children's development, we cannot know how robust those changes are. Follow-up data are needed on these children as they enter kindergarten and proceed into first grade to determine whether the gains observed on these measures

will predict longer range benefits in school achievement and behavioral adjustment.

Implications for Early Educational Policies and Programs and Future Directions

The present findings suggest that the impact of Head Start on children's cognitive and social-emotional school readiness can be improved by incorporating research-based instructional strategies and teaching practices into existing high-quality curricula, such as High/Scope and Creative Curriculum. They also suggest that usual practice strategies for teacher training in research-based practices are insufficient. That is, during the course of this trial, teachers in control classrooms participated in Head Start–sponsored professional development workshops but were not able to leverage this training into changes in classroom practice that supported the same rate of student skill acquisition as did REDI. The specific and scripted REDI curricula may provide critical scaffolds to enhance improved practice, assisting teachers by organizing skill presentation along a scope and sequence, reducing teacher preparation time, and providing teachers with a platform for skill coaching throughout the day. This type of intensive skill focus may be most effective when it is integrated into a comprehensive, child-centered educational program, such as High/Scope and Creative Curriculum, which provides broad support for the child's overall development and emphasizes emotionally supportive and responsive teaching.

More broadly, the present program validates the strategy of enriching current "best practices" curricula with emerging research-based curriculum materials and teaching strategies. Given the limited number of hours in the school day, teachers sometimes feel that they must choose between focusing on the cognitive skills or the social-emotional needs of socioeconomically disadvantaged students. These findings demonstrate that a dual-focus integrated intervention model can effectively and simultaneously promote gains in both domains.

References

- Adams, M. J., Foorman, B. R., Lundberg, L., & Beeler, T. (1998). *Phonological sensitivity in young children: A classroom curriculum*. Baltimore: Brookes.
- Ball, W. W., & Blachman, B. A. (1991). Does phoneme segmentation training in kindergarten make a difference in early word recognition and developmental spelling? *Reading Research Quarterly*, 26, 49–66.
- Barnett, S. (1995). Long-term effects of early childhood programs on cognitive and school outcomes. *Future of Children*, 5, 25–50.
- Bierman, K. L., Greenberg, M. T. & the Conduct Problems Prevention Research Group. (1996). Social skill training in the FAST Track program. In R. D. Peters & R. J. McMahon (Eds.), *Preventing childhood disorders, substance abuse, and delinquency* (pp. 65–89). Newbury Park, CA: Sage.
- Blair, C. (2002). School readiness: Integrating cognition and emotion in a neurobiological conceptualization of child functioning at school entry. *American Psychologist*, 57, 111–127.
- Blair, C. (2006). How similar are fluid cognition and general intelligence? A developmental neuroscience perspective on fluid cognition as an aspect of human cognitive ability. *Behavioral and Brain Sciences*, 29, 109–160.
- Bradley, L., & Bryant, P. E. (1983). Categorizing sounds and learning to read: A causal connection. *Nature*, 301, 419–421.
- Brownell, R. (2000). *Expressive one-word picture vocabulary test manual*. Novato, CA: Academic Therapy Publications.
- Bryant, P. E., MacLean, M., Bradley, L. L., & Crossland, J. (1990). Rhyme and alliteration, phoneme detection, and learning to read. *Developmental Psychology*, 26, 429–438.
- Byrne, B., Fielding-Barnsley, R., & Ashley, L. (2000). Effects of preschool phoneme identity training after six years: Outcome level distinguished from rate of response. *Journal of Educational Psychology*, 92, 659–667.
- Campbell, S. B., & von Stauffenberg, C. (2008). Child characteristics and family processes that predict behavioral readiness for school. In A. Crouter & A. Booth (Eds.), *Early disparities in school readiness: How families contribute to transitions into school* (pp. 225–258). Mahwah, NJ: Erlbaum.
- Catts, H. W., Fey, M. E., Zhang, X., & Tomblin, J. B. (1999). Language basis of reading and reading disabilities: Evidence from a longitudinal investigation. *Scientific Studies of Reading*, 3, 331–361.
- Conduct Problems Prevention Research Group. (1995). *Teacher social competence scale technical report*. Retrieved August 9, 2008, from the Fast Track Project Web site: <http://www.fasttrackproject.org>
- Consortium on the School-Based Promotion of Social Competence. (1994). The school-based promotion of social competence: Theory, research, practice, and policy. In R. J. Haggerty, L. R. Sherrod, N. Garnezy, & M. Rutter (Eds.), *Stress, risk, and resilience in children and adolescents: Processes, mechanisms, and interventions* (pp. 268–316). New York: Cambridge University Press.
- Coolahan, K., Fantuzzo, J., Mendez, J., & McDermott, P. (2000). Preschool peer interactions and readiness to learn: Relationships between classroom peer play and learning behaviors and conduct. *Journal of Educational Psychology*, 92, 458–465.
- Crick, N. R., Casas, J. F., & Mosher, M. (1997). Relational and overt aggression in preschool. *Developmental Psychology*, 33, 579–588.

- Crick, N. R., & Dodge, K. A. (1994). A review and reformulation of social information processing mechanisms in children's social adjustment. *Psychological Bulletin*, *115*, 74–101.
- Denham, S., Bouril, B., & Belouad, F. (1994). Preschoolers' affect and cognition about challenging peer situations. *Child Study Journal*, *24*, 1–21.
- Denham, S. A., & Burton, R. (2003). *Social and emotional prevention and intervention programming for preschoolers*. New York: Kluwer-Plenum.
- Dickinson, D. K., & Smith, M. W. (1994). Long-term effects of preschool teachers' book readings on low-income children's vocabulary and story comprehension. *Reading Research Quarterly*, *29*, 105–1102.
- Dodge, D. T., Colker, L. J., & Heroman, C. (2002). *The creative curriculum for preschool* (4th ed.). Washington, DC: Teaching Strategies.
- Domitrovich, C. E., Cortes, R., & Greenberg, M. T. (2007). Improving young children's social and emotional competence: A randomized trial of the preschool PATHS curriculum. *Journal of Primary Prevention*, *28*, 67–91.
- Domitrovich, C. E., Greenberg, M. T., Cortes, R., & Kusche, C. (1999). *Manual for the preschool PATHS curriculum*. South Deerfield, MA: Channing-Bete.
- Duncan, G. J., Brooks-Gunn, J., & Klebanov, P. K. (1994). Economic deprivation and early childhood development. *Child Development*, *65*, 296–318.
- DuPaul, G. (1991). Parent and teacher ratings of ADHD symptoms: Psychometric properties in a community-based sample. *Journal of Clinical Child Psychology*, *20*, 245–253.
- Eccles, J. S., & Harold (1996). Family involvement in children's and adolescents' schooling. In A. Booth & J. F. Dunn (Eds.), *Family-school links: How do they affect educational outcomes?* (pp. 3–34). Mahwah, NJ: Erlbaum.
- Elias, M. J., Zins, J. E., Weissberg, R. P., Frey, K. S., Greenberg, M. T., Haynes, N. M., et al. (1997). *Promoting social and emotional learning: Guidelines for educators*. Alexandria, VA: Association for Supervision and Curriculum Development.
- Greenberg, M. T., Kusche, C. A., & Speltz, M. (1991). Emotional regulation, self control, and psychopathology: The role of relationships in early childhood. In D. Cicchetti & S. L. Toth (Eds.), *Internalizing and externalizing expressions of dysfunction: Rochester symposium on developmental psychopathology* (Vol. 2, pp. 21–66). Hillsdale, NJ: Erlbaum.
- Hatcher, P. J., Hulme, C., & Ellis, A. W. (1994). Ameliorating early reading failure by integrating the teaching of reading and phonological skills: The phonological linkage hypothesis. *Child Development*, *65*, 41–57.
- Hughes, J. N., & Kwok, O. (2006). Classroom engagement mediates the effect of teacher-student support on elementary students' peer acceptance: A prospective analysis. *Journal of School Psychology*, *43*, 465–480.
- Iutovich, J., Fiene, R., Johnson, J., Koppel, R., & Langan, F. (1997). *Investing in our children's future: The path to quality child care through the Pennsylvania child care/early childhood development training system*. Erie, PA: Keystone University Research Corporation.
- Kaiser, A. P., Hancock, T. B., Cai, Xinsheng, Foster, E. M., & Hester, P. P. (2000). Parent-reported behavioral problems and language delays in boys and girls enrolled in Head Start classrooms. *Behavioral Disorders*, *26*, 26–41.
- Kellam, S. G., Rebok, G. W., Ialongo, N. S., & Mayer, L. S. (1994). The course and malleability of aggressive behavior from early first grade into middle school: Results of a developmental epidemiology-based preventive trial. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *35*, 259–281.
- Ladd, G. W., Buhs, E. S., & Seid, M. (2000). Children's initial sentiments about kindergarten: Is school liking an antecedent of early childhood classroom participation and achievement. *Merrill-Palmer Quarterly*, *46*, 255–279.
- Ladd, G., & Profilet, S. (1996). The Child Behavior Scale: A teacher report measure of young children's aggressive, withdrawn, and prosocial behaviors. *Developmental Psychology*, *32*, 1008–1024.
- Lengua, L. J., Honorado, E., & Bush, N. R. (2007). Contextual risk and parenting as predictors of effortful control and social competence in preschool children. *Journal of Applied Developmental Psychology*, *28*, 40–55.
- Li-Grining, C. P. (2007). Effortful control among low-income preschoolers in three cities: Stability, change, and individual differences. *Developmental Psychology*, *43*, 208–221.
- Lonigan, C. J. (2006). Development, assessment, and promotion of preliterate skills. *Early Education and Development*, *17*, 91–114.
- Lonigan, C. J., Burgess, S. R., & Anthony, J. L. (2000). Development of emergent literacy and early reading skills in preschool children: Evidence from a latent-variable longitudinal study. *Developmental Psychology*, *36*, 596–613.
- Lonigan, C. J., Wagner, R. K., Torgesen, J. K., & Rashotte, C. A. (2007). *TOPEL: Test of Preschool Early Literacy*. Austin, TX: Pro-Ed.
- Lynch, K. B., Geller, S. R., & Schmidt, M. G. (2004). Multi-year evaluation of the effectiveness of a resilience-based prevention program for young children. *Journal of Primary Prevention*, *24*, 335–353.
- McClelland, M. M., Acock, A. C., & Morrison, F. J. (2006). The impact of kindergarten learning-related skills on academic trajectories at the end of elementary school. *Early Childhood Research Quarterly*, *21*, 471–490.
- National Research Council. (1998). *Preventing reading difficulties in young children*. Washington, DC: National Academy Press.
- Newcomer, P. L., & Hammill, D. D. (1997). *The test of language development—Primary* (3rd ed.). Austin, TX: Pro-Ed.
- Pianta, R. C., & Stuhlman, M. W. (2004). Teacher-child relationships and children's success in the first years of school. *School Psychology Review*, *33*, 444–458.
- Ramey, C. T., & Ramey, S. L. (2004). Early learning and school readiness: Can early intervention make a difference? *Merrill-Palmer Quarterly*, *50*, 471–491.

- Ribordy, S., Camras, L., Stafani, R., & Spacarelli, S. (1988). Vignettes for emotion recognition research and affective therapy with children. *Journal of Clinical Child Psychology, 17*, 322–325.
- Riggs, N. R., Greenberg, M. T., Kusche, C. A., & Pentz, M. A. (2006). The mediational role of neurocognition in the behavioral outcomes of a social-emotional prevention program in elementary school students: Effects of the PATHS curriculum. *Prevention Science, 7*, 91–102.
- Roid, G. H., & Miller, L. J. (1997). *Leiter International Performance Scale – Revised (Leiter–R) manual*. Wood Dale, IL: Stoelting.
- Scarborough, H. (2001). Connecting early language and literacy to later reading (dis)abilities: Evidence, theory and practice. In S. Neuman & D. Dickinson (Eds.), *Handbook of emergent literacy research* (pp. 97–110). New York: Guilford.
- Schultz, D., Izard, C. E., & Bear, G. (2004). Children's emotion processing: Relations to emotionality and aggression. *Development and Psychopathology, 16*, 371–387.
- Schweinhart, L. J. (2004). *The High/Scope Perry Preschool Study through age 40: Summary, conclusions, and frequently asked questions*. Retrieved May 8, 2008, from <http://www.highscope.org/Research/PerryProject/perrymain.htm>
- Schweinhart, L. J., Montie, J., Xiang, Z., Barnett, W. S., Belfield, C. R., & Nores, M. (2005). Lifetime effects: The High/Scope Perry Preschool Study through age 40. *Monographs of the High/Scope Educational Research Foundation, 14*. Ypsilanti, MI: High/Scope Press.
- Senechal, M., & LeFevre, J. (2002). Parental involvement in the development of children's reading skill: A five-year longitudinal study. *Child Development, 73*, 445–460.
- Shaywitz, B. A., & Shaywitz, S. E. (2005). Dyslexia (specific reading disability). *Biological Psychiatry, 57*, 1301–1309.
- Shure, M. B., & Spivack, G. (1982). Interpersonal problem-solving in young children: A cognitive approach to prevention. *American Journal of Community Psychology, 10*, 341–356.
- Smith-Donald, R., Raver, C. C., Hayes, T., & Richardson, B. (2007). Preliminary construct and concurrent validity of the preschool self-regulation assessment (PSRA) for field-based research. *Early Childhood Research Quarterly, 22*, 173–187.
- Stanovich, K. E., & Siegel, L. S. (1994). The phenotypic performance profile of reading disabled children: A regression based test of the phonological core variables difference model. *Journal of Educational Psychology, 86*, 24–53.
- Torgesen, J. K. (1998). Catch them before they fall: Identification and assessment to prevent reading failure in young children. *American Educator, 22*, 32–39.
- U.S. Department of Health & Human Services (2005). *Head start impact study: First year findings*. Retrieved May 5, 2008, from http://www.acf.hhs.gov/programs/opre/hs/impact_study/reports/
- Wasik, B. A., & Bond, M. A. (2001). Beyond the pages of a book: Interactive book reading and language development in preschool classrooms. *Journal of Educational Psychology, 93*, 243–250.
- Wasik, B. A., Bond, M. A., & Hindman, A. (2006). The effects of a language and literacy intervention on Head Start children and teachers. *Journal of Educational Psychology, 98*, 63–74.
- Webster-Stratton, C., Reid, J., & Hammond, M. (2004). Treating children with early-onset conduct problems: Intervention outcomes for parent, child, and teacher training. *Journal of Clinical Child and Adolescent Psychology, 33*, 105–124.
- Weikart, D. P., & Schweinhart, L. J. (2005). The high/scope curriculum in early childhood care and education. In J. L. Roopnarine & J. E. Johnson (Eds.), *Approaches to early childhood education* (4th ed., pp. 277–294). Upper Saddle River, NJ: Prentice Hall.
- Werthamer-Larsson, L., Kellam, S., & Wheeler, L. (1991). Effect of first-grade classroom environment on shy behavior, aggressive behavior, and concentration problems. *American Journal of Community Psychology, 19*, 585–602.
- Whitehurst, G. J., Arnold, D., Epstein, J. N., Angell, A. L., Smith, M., & Fischel, J. E. (1994). A picture book reading intervention in daycare and home for children from low-income families. *Developmental Psychology, 30*, 679–689.
- Whitehurst, G. J., Epstein, J. N., Angell, A. C., Payne, A. C., Crone, D. A., & Fischel, J. E. (1994). Outcomes of an emergent literacy intervention in Head Start. *Journal of Educational Psychology, 86*, 542–555.
- Yoshikawa, H., & Knitzer, J. (1997). *Lessons from the field: Head Start mental health strategies to meet changing needs*. ERIC # ED423053.
- Youngstrom, E., Wolpaw, J. M., Kogos, J. L., Schoff, K., Ackerman, B., & Izard, C. (2000). Interpersonal problem-solving in preschool and first-grade: Developmental changes and ecological validity. *Journal of Clinical Child Psychology, 4*, 589–602.