8 The Head Start REDI Project and school readiness

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National statistics suggest that, on average, 16 percent of American children enter school without the readiness skills they need for success (Rimm-Kaufman, Pianta and Cox, 2000). Children growing up in poverty are particularly vulnerable; over 40 percent of these children demonstrate delayed language skills and social skills at school entry, and over 20 percent exhibit high rates of disruptive behavior problems that undermine school adjustment (Macmillan, McMorris, and Kruttschnitt, 2004). Children who begin school unprepared for the learning and behavioral demands typically remain low achievers throughout elementary school, and are more likely than their more advantaged peers to experience learning disabilities, conflictual relationships with teachers and peers, grade retention, early school drop-out, and long-term underemployment (Ryan, Fauth, and Brooks-Gunn, 2006). Rates of child poverty are on the rise in the United States, with nearly one in four preschoolers living in poverty and nearly one in two preschoolers living in low-income families (200 percent of poverty; National Center for Children in Poverty, 2010), making the problem of understanding and promoting school readiness a national priority.

Delays in school readiness are part of a larger set of health and mental health disparities associated with low socioeconomic status (SES), which confers elevated health risks in diverse areas, including cardiovascular disease, hypertension, arthritis, diabetes, and cancer, as well as overall

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higher mortality (Adler and Newman, 2002). The link between SES and child risk for mental illness is well established, evident particularly in elevated rates of depressive and anxiety disorders, conduct problems, and attention deficit hyperactivity disorder (ADHD) among children growing up in poverty (Ritsher et al., 2001). Although multiply determined, the negative impact of low SES on child mental health appears driven in part by parental education, maternal depression, and single-parenthood, all of which are associated with SES and affect the quality of parenting and parent–child interaction and support (Ritsher et al., 2001).

Remediating delays in school readiness, although only one facet of SES-related disadvantage, may be highly strategic, given the likelihood that improved educational outcomes have the potential to leverage upward socioeconomic mobility and promote corresponding improvements in adult health and well-being (Adler and Newman, 2002). Logically, investing in early education makes sense, as education shapes future occupational opportunities and earning potential, provides knowledge and life skills that allow better-educated persons to gain more ready access to information and resources to promote health, and allows individuals to live in better resourced, less polluted, and less stressful neighborhoods (Adler and Newman, 2002; Winkleby, Cubbin and Ahn, 2006). In addition, past research on model preschool programs, such as the High/Scope Perry Preschool curriculum, suggests that optimal school readiness support can promote long-term benefits for children, including higher rates of high school graduation, fewer crimes, and better employment outcomes (Schweinhart et al., 2005).

The challenge, however, is to "go to scale" with optimal preschool programming. Head Start, which has been referred to as the nation's premier federally sponsored early childhood education program, has proven somewhat effective in promoting some aspects of school readiness, but has not attained the kind of impact promised by model programs such as Perry Preschool, nor demonstrated a consistent capacity to improve social-emotional and behavioral readiness for school (USDHHS, 2005). Two factors likely limit its impact. First, programming often does not take advantage of recent research that might increase its effectiveness. The majority of Head Start programs in the nation use either the High/Scope curriculum, first developed in 1962, or the Creative Curriculum for Preschool, first developed in 1978. Since then, both models have upgraded programming; however, evidence-based curriculum components are often lacking when these programs are used in the field. Second, an ongoing challenge is achieving the high-fidelity implementation of evidence-based practice or model programs in the field. For example, when "typical" Head Start programs use High/Scope, the fidelity of

curriculum implementation is often weak, and the quality of parent-focused home visits, teacher training, and organizational support falls far short of that used in the model Perry Preschool program (Schweinhart, 2004). Overall, Head Start centers 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, which results in lower-impact programming and less benefit for participating children (Iutcovich et al., 1997).

In this chapter, we review recent research describing the impact of early disadvantage on the developing brain, and identify the implications for the strategic design of enriched preschool interventions that have the capacity to remediate early delays. We also review research on the challenges of "going to scale" with evidence-based preschool programming, and the critical role of professional development and support to promote high-fidelity implementation of quality preschool curricula and teaching practices. We then describe the implementation and outcomes of the Head Start REDI (Research-Based, Developmentally Informed) preschool enrichment program, which was designed to facilitate the integration of research-based practices into Head Start classrooms by providing teachers with manualized enrichment curricula and mentored professional development opportunities, targeting improvements in the dual domains of child language-literacy skills and social-emotional well-being. We conclude that evidence-based preschool programming has considerable potential to enhance the school readiness of vulnerable and disadvantaged children, but that reaching that potential requires strategic and sustained investment in curriculum enrichment and professional development support.

The impact of early disadvantage on children's development

Language and emergent literacy skills

Research accumulating since the 1990s leaves no doubt concerning the importance of early cognitive development, particularly the acquisition of oral language and emergent literacy skills for school readiness (Lonigan, 2006). A meta-analysis conducted by the National Early Literacy Panel (2005) demonstrated that, when measured at school entry, a child's phonological sensitivity (the capacity to detect and manipulate sounds and parts of words) and alphabet knowledge are robust predictors of their later reading decoding and comprehension skills, with correlations ranging from .39 to .50. Oral language skills, including vocabulary, syntax

(understanding of various grammatical forms), and narrative (being able to sequence events when describing experiences or retelling a story) also support school success (Catts, Fey, Zhang and Tomblin, 1999). In addition to providing essential support for reading comprehension, oral language skills form the basis for understanding information and directions provided in class, and for developing and maintaining positive relations with teachers and peers (Catts et al., 1999). Children who are delayed in their development of these critical language and emergent literacy skills often struggle to learn to read in elementary school and rarely catch up to their non-impaired peers, sometimes suffering lifelong reading disabilities and underachievement.

Relative to socio-economically advantaged children, children growing up in poverty often show delays in oral language development and emergent literacy skills (Hart and Risley, 1995). To a large degree, the negative impact of family poverty on child development and school readiness reflects lower-quality learning opportunities within the home and in early child care and preschool settings that are associated with low SES (Duncan, Brooks-Gunn, and Klebanov, 1994). The frequency and quality of parent–child verbal interaction dramatically affects children's oral language skills and early literacy development, as does the quality of language use in child care and early school setting (Hart and Risley, 1995). For example, family SES is associated with exposure to books and other print materials, the frequency of parent–child reading, and adult language use that includes complex oral vocabulary and syntax. In families with higher SES, parents are more likely to engage in interactive reading approaches with their children, discussing stories in ways that expand vocabulary and foster story comprehension and narrative skills, and children are more likely to be in child care and preschools that reinforce and enrich this language exposure (Senechal, 2006). In part, the lower frequency and quality of parent–child conversation, reading, and learning activities associated with low SES reflects low levels of parent education, but it also reflects the high rates of parental depression and stress experienced by families living in poverty, as well as financial and environmental factors that limit access to high-quality child care and preschool opportunities (Duncan et al., 1994).

Mental health and related social-emotional skills

In addition to its negative impact on cognitive development, poverty takes a toll on children's mental health, delaying social-emotional and behavioral development. The World Health Organization defines mental health as: "a state of well-being in which an individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and

is able to make a contribution to his or her community" (WHO, 2010). In early childhood, mental health is reflected in the developing social, emotional, and behavioral skills that foster a child's capacity for effective interpersonal interaction, learning, and adaptation. Developing mental health is dependent upon skills in three interrelated domains that play a critically important role in school readiness and school success (Blair, 2002): (1) social skills that support positive interpersonal relations, (2) emotional skills that allow children to understand and manage their feelings, and feel empathy for others, and (3) self-control and social-problem solving skills that foster the child's ability to comply with societal expectations regarding behavioral control (i.e., inhibit aggression, follow dictions), manage conflicts peacefully, and approach learning tasks with interest and concentration.

Social skills

Developing the capacity for social collaboration represents a critical developmental task of the preschool years and an important marker of mental health and school readiness. Normatively, first friendships are established during the preschool years, and most preschool children take great pleasure in cooperative and shared fantasy play with peers (Bierman and Erath, 2006). In order to sustain friendly exchanges, children must learn to negotiate, cooperate, and compromise – requiring the development of prosocial skills, such as helping, sharing, and taking turns. In order to contribute to elaborated play, they must develop play skills that include an understanding of the "scripts" of various play activities, and they must follow through by enacting complementary social roles and social routines. In addition to the behaviors needed for effective social collaboration, positive peer interactions motivate and support the development of perspective-taking skills, communication skills, and flexible problem solving (Coolahan et al., 2000).

Although teachers and parents provide some explicit guidance (e.g., "don't hit," "use your words," "share"), social skills develop primarily through implicit learning (i.e., observing how individuals treat each other) and experience. The degree to which parents and other child care givers are able to provide stable, warm, sensitive, and responsive caregiving fosters prosocial skill development. Conversely, the frequent use of harsh and punitive discipline practices predicts low levels of prosocial skill development and elevated oppositional and aggressive behavior problems, which in turn predict problematic school adjustment (Campbell, 2006). Positive, well-supervised peer experiences are also important, so that children have the opportunity to practice developing social skills in a supportive context (Bierman and Erath, 2006).

Emotional awareness and management

In addition to social skills, emotional understanding and emotion regulation skills are important for adaptive development. Poor emotional understanding and low levels of frustration tolerance are often associated with elevated aggressive and oppositional behavior in preschool and elementary school (Ladd, Buhs and Seid, 2000). The preschool years represent an important period for the development of emotional understanding; normatively, empathy and altruism emerge in preschool, as children recognize and differentiate a broader array of emotions and begin to understand that their actions can cause feelings in other people that are different from their own (Fabes and Eisenberg, 1992).

Emotional awareness fosters social development and aggression control in several ways. First, the capacity to use language to describe internal affective states allows children to redirect emotional arousal into adaptive activity, and thus facilitates the inhibition of reactive aggressive behavior (Izard, 2002). Second, the ability to share feelings verbally with others fosters the capacity for negotiation and peaceful conflict management. In addition, being able to identify unpleasant arousal with specific labels empowers children to identify cause–effect sequences associated with those feelings, promoting anticipatory problem solving.

Emotional understanding and corresponding language skills also allow children to better understand the feelings of others, allowing them to be more sensitive and responsive in their peer interactions. Positive peer exchanges further motivate children to inhibit impulsive and aggressive behaviors that might alienate their peers. Conversely, low levels of emotional understanding increase the likelihood that children will fail to understand or will misinterpret the actions of others, thus fueling interpersonal conflicts and supporting negative attributional biases (Bierman and Erath, 2006).

Executive functioning and self-control

Intertwined with the development of oral language skills, social skills, and emotional management skills are the self-control skills that foster adaptive approaches to learning in school, including the capacity to participate cooperatively in classroom activities, follow teacher directions, focus attention, control behavior, and sustain task involvement (Ladd et al., 2000; McClelland, Acock and Morrison, 2006). Kindergarten teachers list these self-control skills high on the list of competencies they believe are necessary for successful school adjustment (Rimm-Kaufman et al., 2000).

During the preschool years, growth in the executive regulatory system plays a central role in supporting the preschool child's acquisition of these self-control skills (Blair, 2002). Specific skills that are part of the executive

regulatory system include: (1) working memory, which allows children to hold ideas and information in mind, so they can think about and manipulate the information in new ways, (2) inhibitory control, which allows children to delay impulsive or habitual responding in order to consider alternative, strategic responses, and (3) attention set-shifting, which allows children to strategically focus attention, maintain concentration, and ignore distractions (Blair, Zelazo and Greenberg, 2005). Supported by neural processes located in the prefrontal cortex, the executive regulatory system modulates arousal, and regulates attention and emotion (Blair et al., 2005). Functionally, these skills enhance children's capacity for goal-oriented learning and flexible problem solving, and support the acquisition of emergent literacy and math skills (Welsh et al., 2010). Conversely, delays in executive functioning skill development increase a child's risk for adjustment difficulties and poor mental health in the elementary school context.

Although the development of the executive regulatory system and corresponding self-control skills depends upon biological maturation, the process appears heavily influenced by environmental experiences and input. Exposure to early adversity has a negative impact on the development of the executive regulatory system, and children who experience extreme adversity in their early years, such as maltreatment or severe neglect, show increased levels of attention problems, emotion dysregulation, and language delays (Cicchetti, 2002). Exposure to adversity and threat requires "fight or flight" reactivity, modulated by neuroendocrine and autonomic stress responses, which increases demands on the executive regulatory system and diverts resources that might otherwise be employed for goal-oriented learning (Cicchetti, 2002).

Summary

In summary, SES disadvantage is associated with developmental impairments in both cognitive and mental health domains of school readiness. Relative to socio-economically advantaged children, children growing up in poverty exhibit lower levels of prosocial skills, emotional awareness, self-regulated behavior, and adaptive approaches to learning, and they display elevated rates of inattention and disengaged behavior at school entry. To a large extent, the delays in both language skills and these social-emotional skills reflect low levels of cognitive stimulation during early childhood, reduced exposure to sensitive-responsive caregiving, and fewer opportunities for guided exploration of the social and physical environment (Lengua, Honorado, and Bush, 2007). Poverty, and the

factors associated with it, reduces access to high-quality child care and preschool experiences, which further contributes to delays in both cognitive and social-emotional development (Lengua et al., 2007).

Improving preschool quality

The positive news is that research has demonstrated the capacity of early intervention to make a difference. In addition to studies which show that high-quality preschool programs can reduce the SES gap in cognitive skills at school entry (Barnett, 1995), a rapidly growing research base suggests that social-emotional competencies (in areas of prosocial behaviors, emotional understanding, self-control, and social problem solving skills) can also be enhanced via the use of systematic instructional approaches in the classroom (Consortium on the School-Based Promotion of Social Competence, 1994).

In recent years, efforts to promote school readiness for children growing up in poverty have focused primarily on improving the instructional content of Head Start and public pre-kindergarten programs, in order to enhance children's acquisition of key emergent literacy skills, such as letter identification and phonemic sensitivity (Lonigan, 2006). Although this is an important area of focus, a failure to also address the mental health needs of these vulnerable children may be one factor that has limited the impact of school-based programs. Several recent studies suggest that preschool interventions designed to enhance social-emotional learning and self-regulation skills have the potential to strengthen neurocognitive executive functioning as it develops, which should support both academic and behavioral readiness for school (Diamond et al., 2007; Riggs et al., 2006). The practical question to address is whether teachers are able to integrate multiple research-based curriculum components at the same time, enriching the support they are providing to children in both cognitive and social-emotional domains, and whether a dual emphasis has synergistic effects on child outcomes.

Enriching preschool curricula with evidence-based approaches that address the social-emotional as well as the cognitive needs of disadvantaged children is an important step in improving the quality of their preschool experience. However, introducing evidence-based lesson plans without including sufficient professional development to support high-quality implementation and teaching practices is unlikely to produce optimal effects. A growing body of research suggests that proximal features of teaching quality, including teachers' instructional practices and the quality of teacher–student relationships, play a primary role in fostering child skill development and school readiness (Pianta, 2003).

Preschool teachers exert strong socialization influences on young children, affecting their learning in both formal and informal ways (Denham and Burton, 2003). Hence, to maximize the benefits of preschool for disadvantaged children, it is important to enrich both the curriculum and more general teaching practices with evidence-based approaches. In terms of evidence-based teaching quality, two domains are important: the quality of instructional support and language use, and the quality of social-emotional support and classroom management strategies (La Paro and Pianta, 2003; Pianta, 2003).

Learning is enhanced when teachers organize classroom activities in ways that maximize children's opportunities to receive guidance as they explore instructional materials, extend their knowledge, practice higher-order thinking and problem solving skills, and receive high-quality feedback (Pianta, 2003). Children's linguistic development is fostered by teacher–student verbal interactions that include rich and varied vocabulary, back and forth exchanges between teacher and students, and decontextualized and cognitively challenging talk. In particular, teachers enhance children's syntax skills when they build upon students' communications by expanding or recasting children's utterances using new words or grammatical structures that fit the context of the ongoing activity and are just slightly beyond children's current skill levels (Nelson and Welsh, 1998).

Teachers who interact with students in a warm, sensitive, and responsive style validate their students' emotional experiences and foster a sense of security that supports active engagement in classroom learning activities (Pianta, 2003). In addition, several specific teaching strategies promote children's emotional understanding and social competence. These include "emotion coaching," which involves empathic and non-judgmental responses to children's emotional expressions, and the use of social problem solving dialogue, which provides children with "on line" support to manage conflicts by identifying problems and associated feelings, generating alternative solutions, and selecting solutions that are acceptable to all parties (Denham and Burton, 2003). When teachers reduce their reliance on directives and negative consequences and instead focus on clear expectations, predictable and appropriate routines (La Paro et al., 2004), and induction strategies involving social feedback, they are most likely to encourage and support children's self-control efforts (Bierman, 2004).

Fostering improvements in teaching quality

Workshop training, which is the most common form of professional development activity, is of limited utility in improving teaching quality.

However, research has demonstrated that teaching quality can be improved with a more strategic and sustained set of professional development activities, including a combination of: (1) specific and targeted workshop training, with (2) opportunities for practice in classroom contexts with feedback, and (3) adequate supervision time for teachers to reflect on and evaluate their own practices and set future goals (see Domitrovich et al., 2009). In order to provide opportunities for guided and reflective practice in high-quality teaching, a number of studies have included mentoring with in-class coaching and individual meetings. For example, Raver and colleagues (Raver et al., 2008) provided Head Start teachers with five six-hour training sessions throughout the school year and weekly coaching from mental health consultants in behavior management strategies. Results indicated significantly higher levels of positive climate, teacher sensitivity, and behavior management in intervention classrooms at the end of the year. In another study using mentoring to support improved teaching quality, Wasik and colleagues (Wasik, Bond, and Hindman, 2006) introduced a language and literacy intervention in Head Start classrooms that combined interactive reading (i.e., asking questions, making connections, and explicitly teaching target vocabulary words while reading) with professional development designed to enhance general teacher language use (i.e., coaching in explicit routines and strategies to expand on children's utterances, foster listening, encourage conversations, and model rich language). Teachers attended nine monthly, two-hour workshops and received in-class coaching sessions in which a mentor modeled the strategy, observed the teacher using the strategy, and provided the teacher with written and oral feedback. Post-intervention observations indicated that intervention teachers talked significantly more than control teachers, posed more open-ended questions, and used more conversational strategies.

Rather than piecemeal approaches to improving the benefits of preschool to disadvantaged children, these findings suggest a comprehensive and integrated approach is needed. We need to focus on building language and emergent literacy skills and promoting social-emotional skills, and we need to do that by combining the enrichment provided by evidence-based curriculum components with intensive professional development support.

The Head Start REDI Project

The goal of the REDI intervention was to improve children's school readiness and associated academic and mental health outcomes by supplementing Head Start programs with evidence-based curriculum

components and enhancing teaching quality. REDI was designed to enrich and complement the broad educational programming provided by High/Scope or Creative Curriculum, increasing the systematic emphasis teachers placed on a set of target skills that research has linked with school success. As described in more detail below, the REDI intervention included specific curriculum components targeting children's language, emergent literacy, and social-emotional development, and also utilized professional development activities designed to improve the quality of teacher's language use, emotional support, and positive behavioral management strategies in the classroom. To evaluate its effectiveness, the REDI Project employed a randomized trial design, assigning forty-four classrooms to intervention or "usual practice" conditions. A large, ethnically diverse group of 4-year-old children was pre-tested as they entered these Head Start classrooms and assessed again at the end of the year. In the next sections, the intervention is described, followed by a review of the research findings.

Intervention design

The REDI intervention is delivered by Head Start lead and assistant teachers and integrated into their ongoing classroom programs. It includes curriculum-based lessons, center-based extension activities, and training in teaching strategies to use throughout the day. A major goal of REDI is to assist teachers with the integration of evidence-based practices in their classrooms, 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 language/emergent literacy and social-emotional skills.

Language and emergent literacy skill enrichment

Four language and emergent literacy skills are targeted in REDI: (1) vocabulary, (2) syntax, (3) phonological awareness, and (4) print awareness. Three program components target these skills. First, an interactive reading program uses an approach developed by Wasik and colleagues (Wasik et al., 2006) and by Whitehurst and colleagues (Whitehurst et al., 1994) that encourages active and engaging discussion with children during book-reading activities. When done interactively, book-reading provides an ideal setting for the types of conversational exchanges that appear most central to supporting oral language skill development. The reading technique, labeled dialogic reading by Whitehurst and colleagues, shifts the child role from being one of passive listener to one of active

participant in the reading experience. By asking questions, and prompting children to describe the pictures and events in the stories, the goal is to enhance the children's comprehension and reasoning skills, building vocabulary, and enhancing narrative understanding. The REDI curriculum includes two books per week, which are scripted with interactive questions, to help teachers focus on the main points of the story and provide exemplars of the interactive style of reading. Each book has 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 also 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. The overall goal is to improve teachers' strategic use of language in order to increase children's oral language skills, including vocabulary, narrative, and syntax.

REDI also targets phonological awareness skills with a set of "Sound Games" that helps children recognize and manipulate different sounds, based on the work of Adams and colleagues(1998). The games are organized developmentally, progressing through increasingly challenging skills during the year, from listening, to rhyming, to alliteration, to word-play, and finally to the manipulation of syllables and phonemes. In REDI, teachers use a ten-minute Sound Game at least three times per week.

Third, REDI includes developmentally sequenced activities and materials to be used in alphabet centers to promote letter knowledge. These materials include letter stickers, a letter bucket, Letter Wall supplies, and craft materials for various letter-learning activities. Teachers are asked to make sure that each child visits the alphabet center several times per week, and are given records to track the children's acquisition of letter names.

Social-emotional skill enrichment

To promote children's social-emotional skills, REDI uses the Preschool PATHS curriculum (Domitrovich et al., 1999). This curriculum targets four domains: (1) prosocial friendship skills, (2) emotional understanding and emotional expression skills, (3) self-control (i.e., the capacity to inhibit impulsive behavior and organize goal-directed activity), and (4) problem solving skills, including interpersonal negotiation and conflict resolution skills. The curriculum is divided into thirty-three lessons that are delivered by teachers during circle time. These lessons include modeling stories and discussions, and utilize 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 conduct one PATHS lesson and one extension activity each week. Generalized teaching strategies are encouraged with mentoring, including positive classroom management, use of specific teacher praise and support, emotion coaching, and induction strategies to promote appropriate self-control.

The Preschool PATHS curriculum was designed specifically to foster neuro-cognitive developmental control by improving emotional understanding and social problem solving skills, and increasing children's capacity to use language effectively in the service of emotion regulation (see also Riggs et al., 2003). It has proven effective at promoting more socially competent behavior among children attending Head Start (Domitrovich, Cortes, and Greenberg, 2007). In addition, Riggs and colleagues (2006) found that PATHS improved the executive function skills of second and third grade children, suggesting that it may also strengthen the developing executive function skills of preschool children.

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

Teacher support and parent take-home materials

For the evaluation trial of REDI, teachers received detailed manuals and kits containing all materials needed to implement the intervention. A three-day professional training was conducted in August, prior to initiating the intervention, and a one-day booster training session was conducted in January. Teachers also received weekly mentoring support provided by local "REDI trainers," experienced master teachers who were supervised by two project-based senior educational consultants. The weekly mentoring was intended to enhance the quality of implementation through modeling, coaching, and providing ongoing feedback regarding program delivery. REDI trainers spent an average of three hours per week in each classroom observing, demonstrating, or team teaching lessons. They also met with the head and assistant teacher for one hour each week outside of class.

Finally, to help parents understand and reinforce what children were learning in REDI, three "take-home" packets were mailed 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.

REDI research evaluation

In this section of the chapter, we review the findings from the research evaluation of the REDI program. Head Start programs in three counties participated in the research trial. Using a stratified randomization process, classrooms were divided into groups based on demographics, location (e.g., central or southeastern Pennsylvania), and length of school day (e.g., full-day or half-day). Within stratified groups, centers were randomly assigned to intervention or control conditions. Although classrooms contained 3- and 4-year-old children, only 4 year olds participated in this evaluation. Teachers were studied as they implemented the intervention for the first time, and 4-year-old children were assessed after receiving one year of REDI intervention. Teachers in the comparison classrooms continued to teach "as usual."

Participants

Participants included 356 children (17 percent Hispanic, 25 percent African American, 42 percent European American; 54 percent girls) in forty-four Head Start classrooms. Families were recruited via brochures sent home at the beginning of the school year. Only fourteen eligible families declined to participate, but an additional forty families were unable to complete the assessments (e.g., could not be reached or withdrew early from Head Start). Overall, 86 percent of the eligible children participated. At the beginning of the Head Start year, children were, on average, 4.49 years old (SD = .31, range = 3.72–5.65). On the Block Design scale of the WPPSI – III, a measure of non-verbal cognitive ability that is highly correlated with Full Scale IQ (r = .72; Wechsler, 2002), children received an average standard score of 7.98 (SD = 2.88), approximately two-thirds of a standard deviation below the national mean of 10 and comparable to similar samples of children growing up in poverty.

Data collection procedures

Child assessments were conducted at school by trained assessors, during two individual "pull-out" sessions (30–45 minutes each). Baseline assessments began three weeks after school started, and continued through the

end of October. End-of-year child assessments were conducted in March and April. In April, teachers were asked to complete ratings on each child in the study. Each child also was observed during two 12–15 minute play sessions. In addition, parents provided ratings of their children's social-emotional skills and behavior problems at the start and end of the year.

Intervention implementation

The first question we addressed involved the feasibility of REDI program implementation, which required teachers to integrate multiple new curriculum components into their daily activities and to adjust their teaching in new ways in order to optimize support for children's language development and social-emotional development. Monitoring of program implementation indicated that teachers were able to deliver the intervention with relatively high levels of fidelity (see Bierman, Domitrovich et al., 2008 for details.) On average, teachers reported implementing each week: 6.08 dialogic reading activities, 2.57 sound game activities, 3.56 alphabet center activities, and 1.77 PATHS lessons and extension activities. In addition, teachers answered ten questions using three-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 lesson?). The average rating of 2.78 indicated that, from the teachers' perspective, the curriculum was being delivered with fidelity and children were engaged in the lessons.

On a monthly basis, REDI trainers assessed the fidelity and quality of implementation of program components, based on their own observations in the classrooms, using a six-point Likert scale. Their average implementation quality ratings were 4.39 for dialogic reading activities, 4.52 for sound game activities, 4.70 for alphabet center activities, and 4.61 for PATHS lessons and extension activities. Scores of 4–5 reflected descriptions of "adequate" to "strong."

REDI effects on teaching quality

A second important question was whether the REDI professional development focus led to improvements in the quality of teacher language use, instructional support, positive classroom management, and emotional support in the classroom. In order to evaluate the impact on teaching quality, research assistants who were blind to study condition visited intervention and "usual practice" comparison classrooms, and coded teachers on general dimensions of Emotional Support (e.g., positive climate, negative climate, teachers' sensitivity, and behavior

management) and Instructional Support (e.g., productivity, concept development, instructional learning formats, and the quality of feedback provided to children) using the *Classroom Assessment Scoring System* (CLASS; La Paro and Pianta, 2003). In addition, observers rated the degree to which teachers used Positive Discipline (e.g., specific praise, reinforcement, redirection, and the absence of negative discipline) and Positive Classroom Management (e.g., teacher's preparedness, use of consistent routines, and effective control and limit-setting), and maintained a Positive Emotional Climate (e.g., support for student emotion regulation, and emotion modeling) using the *Teaching Style Rating Scale* (TSRS; Domitrovich, Cortes, and Greenberg, 2000). Finally, research assistants conducted time sampling counts of language use (e.g., directives, questions, statements, decontextualized talk) and completed ratings of language quality, including richness of teacher talk (e.g., vocabulary, elaboration, cognitive challenge) and sensitivity (e.g., availability, warmth, balance, responsiveness) with the *Classroom Language and Literacy Environment Observation* (CLEO; Holland-Coviello, 2005).

Compared to the "usual practice" comparison group, research assistants rated intervention teachers significantly or marginally significantly higher on dimensions of Positive Emotional Climate, Positive Classroom Management, and Instructional Support. A full account of these findings is available in Domitrovich et al., 2009; a summary is provided in Table 8.1. Moreover, REDI teachers talked with children more frequently and in more cognitively complex ways. Overall, these findings indicate that the REDI intervention successfully improved teaching quality in dimensions associated with school readiness.

REDI effects on child outcomes

Next, we examined the impact of REDI on children's skill acquisition in the targeted domains of language and emergent literacy skill development and social-emotional skills. These child outcomes are reported in full in Bierman, Domitrovich, et al., 2008 and Bierman, Nix et al., 2008. Our summary here highlights the significant or marginally significant findings on children's vocabulary, using the Expressive One Word Vocabulary Test (Brownell, 2000), and emergent literacy skills, using the Blending, Elision, and Print Awareness scales of the Test of Preschool Early Literacy (Lonigan et al., 2007). The summary also includes direct assessments of children's social-emotional skills, including emotion knowledge, using the Assessment of Children's Emotion Skills (Schultz, Izard, and Bear, 2004); emotion recognition, using the Emotion Recognition Questionnaire (Ribordy et al., 1988); and aggressive and competent social

Table 8.1 *Impact of Head Start REDI on broad summary scales of teaching quality.*

	Control group mean (SD)	Intervention mean (SD)	Effect size
Emotional-behavioral support			
Positive emotional climate (TSRS)	2.52 (1.05)	3.18 (1.24)	.69*
Emotional support (CLASS)	5.65 (.81)	5.97 (.45)	.39
Classroom management (TSRS)	4.09 (.71)	4.32 (.67)	.60**
Positive discipline (TSRS)	3.91 (.91)	4.39 (.72)	.65
Cognitive-linguistic support			
Instructional support (CLASS)	3.76 (.72)	4.14 (.68)	.45+
Statements (CLEO)	5.77 (1.78)	7.03 (1.58)	.82***
Questions (CLEO)	2.98 (1.15)	3.95 (1.20)	.89***
Decontextualized utterances (CLEO)	.61 (.64)	1.06 (.86)	.68**
Language richness-sensitivity (CLEO)	3.07 (.53)	3.41 (.44)	.67**

$^{+}p < .10$, $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$

Note: Because modal values were near scale extremes for the TSRS, random-effects ordered probit models were used to analyze treatment differences. For these outcomes, Vargha and Delaney's *A* is presented rather than Cohen's *d*, as the latter is sensitive to deviations from normality in variable distribution. An *A* of .56, .64, and .71 corresponds to a small, medium, and large effect size, respectively (Vargha and Delaney, 2000).

problem solving, using the Challenging Situations Task (Denham, Bouril, and Belouad, 1994). The summary includes teacher, parent, and observer ratings of children's social competence and aggression, using the Social Health Profile (Conduct Problems Prevention Research Group, 1995) and Teacher Observation of Child Adaptation-Revised (Werthamer-Larsson, Kellam, and Wheeler, 1991), respectively. Finally, the summary includes an assessment of children's executive functioning, using the Dimensional Change Card Sort (Frye, Zelazo, and Palfai, 1995), which measures working memory, inhibitory control, and set shifting. We also report on interviewer ratings of the child's task orientation, using the Preschool Self-Regulation Assessment Ratings (Smith-Donald et al., 2007), which measures the ability to sustain concentration and behavioral control while engaging in challenging work.

To examine REDI effects on child outcomes, we estimated a series of hierarchical linear models that accounted for the nesting of children within classrooms and controlled for factors such as child sex, child race, Head Start center location, and baseline assessment of the outcome, when available. As shown in Table 8.2, positive effects for REDI were found on children's growth in vocabulary and emergent literacy skills.

Table 8.2 *Impact of Head Start REDI on child skills and behaviors.*

	Control group mean (SD)	Intervention group mean (SD)	Effect size (p-value)
Language and emergent literacy skills			
Vocabulary	41.03 (11.24)	42.79 (11.55)	.15*
Blending	13.04 (4.30)	14.71 (4.33)	.39***
Elision	9.61 (3.58)	11.19 (4.02)	.35***
Print awareness	16.49 (12.59)	18.84 (12.84)	.16+
Social-emotional skills			
Emotion knowledge	7.12 (2.28)	7.45 (2.36)	.21+
Emotion recognition	1.52 (.26)	1.61 (.24)	.23*
Aggressive social problem solving	2.06 (2.55)	1.53 (2.21)	−.21*
Competent social problem solving	2.29 (2.05)	3.16 (2.55)	.35**
Behavior			
Social competence (teacher ratings)	3.98 (.88)	4.15 (.82)	.24+
Social competence (parent ratings)	3.66 (.84)	3.73 (.80)	.09
Social competence (observer ratings)	2.21 (.53)	2.36 (.49)	.26+
Aggression (teacher ratings)	4.12 (1.70)	3.69 (1.52)	−.28*
Aggression (parent Ratings)	2.86 (.97)	2.71 (.99)	−.13+
Aggression (observer ratings)	.37 (.34)	.30 (.31)	−.19
Self-regulation skills			
Executive functioning	.63 (.45)	.71 (.39)	.20+
Task orientation	2.61 (.49)	2.72 (.49)	.28*

$^{+}p < .10$, $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$

Similarly, positive effects for REDI were found for children's emotion knowledge and recognition, as well as in their ability to generate non-aggressive and competent solutions to hypothetical social problems. In terms of behavior, teachers, parents, and observers rated children in REDI classrooms as displaying higher levels of social competence and lower levels of aggression than children in "usual practice" Head Start classrooms.

The REDI findings show that evidence-based instruction and positive classroom management can accelerate the pace of learning for children in Head Start classrooms. It can increase the rate at which they acquire critically important emergent literacy and social-emotional skills during the pre-kindergarten year, and thereby enhance their school readiness. The REDI findings also demonstrate the utility of a dual-domain focus on the promotion of cognitive skills as well as social-emotional competencies in preschool programs serving children who have experienced early adversity. Because of the relations over time among language skills, social competence, self-regulation, and learning engagement (Bierman et al.,

2009; Welsh et al., 2010), we suspect that the broad focus of the REDI intervention may have generated synergistic effects in enhancing school readiness across domains.

Implications for practice and policy

Too often child mental health needs are viewed as separate and distinct from their academic needs; yet, they are intertwined developmentally. Both are affected adversely by early exposure to the high stress and low support that so often affect children growing up in poverty. Evidence-based practices are available that can reduce the school readiness gaps associated with early disadvantage; however, rarely are they implemented in a comprehensive manner with high quality. Additional efforts to improve the quality of preschool programming with evidence-based practice are needed.

The most important finding from the REDI project was that evidence-based practices produced simultaneous – and perhaps synergistic – gains in child school readiness in the dual domains of language/emergent literacy and social-emotional skills. Compared with their peers in "usual practice" classrooms, children in REDI classrooms made greater gains in areas of vocabulary, phonological awareness, print knowledge, emotion recognition, and social problem solving skills. Behavioral improvements were documented as well, with children in REDI classrooms showing higher levels of social competence and engaging in less aggression. A prior study (Bierman, Nix, et al., 2008) indicated that the provision of the REDI intervention was particularly beneficial to children who started the year with low levels of behavioral inhibitory control (e.g., difficulties delaying motor responding and sustaining effortful task engagement). REDI also demonstrated that preventive intervention can foster the development of self-regulation. REDI promoted improvements on measures of executive function and task orientation, which is notable because these capacities enable children to approach learning tasks more effectively and efficiently, thus facilitating learning and social-emotional adjustment to school.

One of the factors that has limited current efforts to improve preschool programming is that evidence-based curricula are often "piecemeal" and focus on reducing gaps in highly specific cognitive skills, such as phonological awareness or language delays. Although very important, efforts that focus only on the cognitive skills of disadvantaged children ignore the serious impact that early adversity has on children's mental health, and on the development of the social-emotional and self-regulatory skills needed for goal-oriented learning and school success. Academic achievement

requires the development of adaptive learning behaviors as well as the acquisition of content knowledge (Blair, 2002). In addition, a successful life benefits from social skills, emotion regulation abilities, and self-control, all core components of mental health. To strengthen impact, preschool programs designed for socio-economically disadvantaged children need to adapt evidence-based practices that support developing social-emotional skills and mental health, as well as promoting cognitive development.

In addition, to promote the widespread implementation of evidence-based practice, more must be done to support teachers in their efforts to learn and implement evidence-based practices with fidelity. Head Start teachers often report feeling overwhelmed by the dual demands of implementing curriculum improvements designed to close the achievement gap, while also effectively managing behaviorally challenging children who lack the self-regulation and social skills needed for engaged learning (Iutcovich et al., l997). Current practice, which typically involves introducing new curriculum approaches during brief workshops, is not sufficient to provide teachers with the knowledge and skills needed to implement evidence-based curricula effectively. Even when teachers are provided with a complete curriculum, their capacity to integrate it effectively into their classrooms and to utilize effective teaching strategies is limited (Pianta, 2003). More intensive professional development efforts are needed, including opportunities for guided practice in classroom contexts, and adequate mentoring time to allow teachers to reflect on their own practices, set goals, and receive performance feedback (Domitrovich et al., 2009).

The REDI intervention was designed to evaluate the feasibility and impact of enriching Head Start programs with a comprehensive set of evidence-based curriculum components, targeting emergent literacy as well as social-emotional skills. To support teachers in mastering these multiple curriculum components and to improve their language use and emotional support in the classroom, REDI provided sustained professional development, including workshop training and in-class coaches who observed and mentored teachers over the course of a year.

The approach was successful. By the end of the year, when compared to teachers in "usual practice" classrooms, Head Start REDI teachers talked with children more frequently and in more cognitively complex ways, using richer vocabulary and asking more questions in a manner that was more sensitive and responsive to children. They also established a more positive classroom climate, and used more preventive behavior management strategies. The changes in multiple domains of teaching quality by REDI teachers reflect the importance and value of an intensive

professional development support model provided during the first year of implementation of a new evidence-based curriculum. Head Start REDI also made it easier for teachers to incorporate evidence-based instruction by providing teachers with a well-specified enrichment curriculum. The specific and scripted REDI curricula provided a useful scaffold, assisting teachers by providing lesson plans and organizing skill presentation along a scope and sequence, thereby reducing teacher preparation time and providing teachers with a platform for skill coaching throughout the day. The REDI results document that, with well-developed curriculum guides and effective professional development support, Head Start teachers can incorporate comprehensive evidence-based practices, and improve instructional and emotional support in their classrooms.

Although the coaching model used in REDI was highly effective, a key limitation is that it is not easily portable or sustainable without additional resources. Hence, a key challenge for the future will be the development of more cost-effective means of providing similar levels of professional development support for teachers. The use of technology-assisted platforms to deliver professional development may be very useful in this regard. In a recent project, Pianta and his colleagues (Pianta et al., 2008) used an innovative web-based platform to deliver teacher professional development support. The My Teaching Partner (MTP) program includes an array of web-based professional development resources, including video exemplars and lesson plans. In addition, web-mediated consultation was provided, in which teachers met regularly with an "on-line" coach. Teachers shared videotaped excerpts of their classroom lessons, and received positive support, feedback, and suggestions from their on-line MTP coach. Teachers who received the full MTP program, with full access to web-based resources along with on-line coaching showed the greatest improvement in teaching quality (relative to those who had access to the web resources but no coaching), and these effects were most pronounced in classrooms serving a high proportion of socio-economically disadvantaged children (Pianta et al., 2008).

"Going to scale" with comprehensive evidence-based preschool programming that addresses the cognitive and social-emotional needs of disadvantaged children remains a future goal. The REDI project findings validate the importance of this goal, the potential benefits to children, and the critical need to further develop and disseminate the curriculum guides and professional development support systems that enable the widespread adoption and high-quality implementation of evidence-based preschool programs and practices.

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