

**Appendix B.4:**  
**Promoting Children’s Socioemotional Development in Contexts of  
Early Educational Intervention and Care:**  
**A Review of the Impact of Federally-Funded Research Initiatives on  
Young Children’s School Readiness**

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Working Paper prepared for *A Working Meeting on Recent School Readiness Research:  
Guiding the Synthesis of Early Childhood Research*  
Washington, DC  
October 21-22, 2008

This paper is part of a series of working papers prepared for a meeting sponsored by the U.S. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation (ASPE) and the Administration for Children and Families, Office of Planning, Research, and Evaluation (OPRE). Abt Associates Inc and the National Center for Children in Poverty (NCCP) were funded to convene the meeting. The views represented in this paper are those of the author(s) and do not necessarily reflect the opinions of the U.S. Department of Health and Human Services.



## **Abstract**

Recent findings in applied developmental science highlight ways that children's socioemotional development may play an important foundational role for later chances of school success. Children's social skills and emotional and behavioral adjustment have been identified as particularly important sources of support for low-income children facing higher risk of school failure. The following report reviews selected models and methods in applied developmental science that focus on young children's socioemotional development. It then reviews recent findings from a large number of randomized trials as well as nonexperimental studies and places those findings in the context of applied developmental science. Lessons learned regarding ways to strengthen children's school readiness will be discussed.



Three decades of research in the fields of developmental psychology and early childhood have suggested that children's socioemotional development is clearly associated with their school readiness (see Blair, 2002; Zaslow et al., 2003). Children have been argued to draw upon positive styles of self-regulation and social skill as key sources of support when navigating new contexts of school (Raver, 2002). Conversely, children who are persistently emotionally dysregulated and behaviorally disruptive have been found to receive less instruction from teachers and to have fewer opportunities for learning from peers (see Arnold et al., 2006; McClelland & Morrison, 2003). However, claims of the role of socioemotional competence for children's later academic achievement have recently received greater scrutiny (Duncan et al., 2007). In addition, recent analyses using the nationally representative Early Childhood Longitudinal Survey-Kindergarten (ECLS-K) data set suggest that preschool experience may pose both risks and benefits to children's long-term chances of success in school (Magnuson, Ruhm, & Waldfogel, 2007). It is against this backdrop that a new set of federally funded research initiatives funded by the U.S. Department of Health and Human Services and the U.S. Department of Education were to test innovative models of program improvement and support for children's school readiness. Findings from these sets of research initiatives are particularly timely from both the standpoints of science and social policy.

Tests of the role of children's socioemotional development for their later chances of success in school become even more pressing in the context of income poverty. Specifically, young children in poverty are more likely to be exposed to multiple ecological stressors such as higher levels of neighborhood and family violence, greater psychological distress among adult caregivers, and a range of other "co-factors" that appear to place children's ability to regulate their emotions and behavior in jeopardy (Brooks-Gunn, Duncan, & Aber, 1997; Li-Grining, 2007; Raver, 2004). Policy contexts (such as early childhood education) that provide direct services to children have been argued to be the most effective means of supporting low-income children's optimal outcomes (Magnuson & Duncan, 2003). This context underscores the significance of major federal investments in evaluations of the impact of interventions targeting low-income children's school readiness (such as the interventions within the ISRC and PCER consortia).

This review provides the opportunity to briefly review emerging findings from this set of major federal research initiatives. After providing a brief definition for each relevant socioemotional construct, this review summarizes the rationale for targeting that domain. Models of program impact mediated through improvements in "instructional support" (such as changes in teachers' use of emotionally and behaviorally supportive classroom practices) are also reviewed, with the recognition that children within this set of interventions were hypothesized to be affected primarily through improvement in the quality and quantity of teachers' instruction. (It is important to note that interventions such as Head Start and Early Head Start have invested in more comprehensive approaches that include provision of family supports and services, but those more comprehensive approaches will not be discussed, here). This review also discusses some of the potential tradeoffs in implementing new curricula in early childhood settings. Specifically, this review examines whether there is any evidence for any unexpected benefits or of any unanticipated negative consequences for children's socioemotional development or for emotionally supportive classroom practices from the implementation of a large number of interventions in preschool settings. Finally, new directions for applied developmental science in early childhood educational settings are briefly outlined.

## **Contrasting models of the role of socioemotional development for children’s school readiness**

The empirical “case” for the importance of children’s socioemotional development in classroom contexts has emerged from several different traditions in developmental, clinical, and educational psychology. From developmental perspectives, converging lines of inquiry from social developmental and neurobehavioral literatures suggest that children enter schools with distinct profiles of emotional reactivity, regulation and executive functioning that appear to facilitate or hinder their engagement with other learners, teachers, and the process of learning (Blair, 2002; Fantuzzo et al., 2007; Howse, Calkins, Anastopoulos, Keane, & Shelton, 2003; Raver, 2002). Similarly, drawing from a tradition of attachment theory, developmental researchers have highlighted ways that some children establish and maintain relationships with teachers that are characterized by a high degree of mutual positive engagement while other children engage in relationships with teachers that are characterized by a high level of conflict (for review, see Pianta, Justice, Cottone, Mashburn, & Rimm-Kaufman, symposium presentation). Third, clinical and educational psychological studies have highlighted the extent to which children’s disruptive, aggressive, and withdrawn behaviors have serious implications for short-term opportunities as well as long-term opportunities for learning, both for children manifesting behavioral difficulty and for their peers (Campbell, Shaw, & Gilliom, 2000). A fourth tradition of observational research in classrooms has highlighted ways that teachers also bring their own regulatory and interpersonal profiles of strength and difficulty to classroom interactions and instruction with their students (LoCasale-Crouch et al., 2007). These four mechanisms are likely to be transactionally, bidirectionally related as children with varying self-regulatory profiles elicit differing patterns of responsiveness versus conflict with teachers. These variables are also likely to be highly confounded by “omitted variables” or unmeasured characteristics across children, teachers, and settings (Duncan, 2003). For these reasons, investigators across developmental, clinical, and educational fields have come to consensus that experimental and quasi-experimental approaches are integral to our ability to draw causal inferences on the roles and modifiability of these processes as predictors of children’s school readiness.

In each of the sections below, a brief literature review is provided for each of these four possible mechanisms supporting low-income children’s school readiness. Findings from federally funded research initiatives are then considered, with close attention to whether those interventions yielded clear evidence of significant impacts on children’s socioemotional development (see Table 1 for summary of interventions’ designs, samples, and findings).

### **Self-regulation: How children handle their emotions, attention, and behavior in classroom contexts**

Preschool has long been viewed as an important social context where children learn to follow adults’ directions, to handle their own emotions, attention, and impulses with increasing independence from adult regulatory support. Imagine any one of a number of routine classroom scenarios, where children are expected to sit attentively through circle time, line up for trips to the playground or bathroom without pushing or shoving peers, and to follow teachers’ directions to gather materials for a writing activity, clean up, or share a favorite book even when children feel tired, bored, or frustrated.

Investigators have identified individual differences and growth trajectories in children’s ability to handle these regulatory challenges, based on a research tradition focusing on reactivity and regulation (see McClelland et al., 2007; Graziano, Reavis, Keane, & Calkins, 2007 for recent reviews). More recently, children’s ability to handle classroom challenges has been examined through a second

**Table 1. Brief overview of selected RCT efficacy trials targeting school readiness**

Title of Intervention	Principal Investigator	Targeted Sample	Synopsis of intervention/ treatment	Synopsis of control	Analytic approach	Evidence of school readiness benefit?
Project REDI	Bierman	356 urban and suburban/rural southeastern PA HS children (25% African American, 17% Hispanic)	Teacher-delivered, curriculum-based lessons; SEL and literacy enrichment ; teacher training; parent materials	"usual practice" Head Start curricula	HLM, Level 1: child sex and race Level 2: center site, cohort, intervention status	Yes
Chicago School Readiness Project (CSRP)	Raver	90 teachers (71% African American, 20% Hispanic); 602 low-income, ethnic minority children (% African American, % Hispanic) in Chicago HS	30 hours of teacher training, coaching, and mental health consultancy for teacher and children	Teacher aide rather than mental health consultant	HLM, Level 1: child characteristics Level 2: classroom characteristics Level 3: site-level characteristics + randomized status in treatment vs. control	Yes
Tools of the Mind	Diamond	147 low-income, urban students (78% annual income <\$25,000)	Teacher training on Vygotskian emphasis on activities that promote executive functioning	District's version of <i>Balanced Literacy</i> curriculum	Multiple regression analyses with age, gender, curriculum, years in curriculum as IV	Yes
Project Approach	Powell	13 teachers with at least a BA in urban Midwest serving 204 ethnic minority children (40% African American, 17% Hispanic)	48 hours of teacher training and support (18 introductory, 12 follow-up, 12 individual consultation)	Teacher-developed, nonspecific curricula	ANCOVA and repeated measures analyses	No, iatrogenic impact reported.
My Teaching Partner (MTP)	Pianta	113 early childhood teachers with at least BA (24% African American, 4% "multiracial") in Virginia serving "at-risk" children in state-funded pre-K	Traditional materials; access to planning materials through website; interactive, web-based consultancy	Materials and website only resource	HLM growth trajectories accounting for observer influence, teacher education and experience, number of students, % of students in poverty	Yes

Title of Intervention	Principal Investigator	Targeted Sample	Synopsis of intervention/ treatment	Synopsis of control	Analytic approach	Evidence of school readiness benefit?
Building Language for Literacy	Ramey	24 classrooms of at-risk, mostly ethnic minority children in Louisiana and Maryland	Job-embedded coaching with literacy skills emphasis and quality of classroom environment	Existing MCPS supports		Yes
N Florida ELLM	Fountain	28 teachers (64% African American) serving 297 children (71% African American, 8% Hispanic) in Florida	5-day training session for literacy coaches, 2-day follow-up months later; teacher training with focus on materials and curriculum; weekly literacy coach visits	Assorted curricula: <i>Creative Curriculum, Beyond Centers and Circletime, High Reach Learning Pre-K, High/Scope</i>	ANCOVA; repeated measures analyses	Yes
Pre-K Mathematics		316 children (45% African American, 23% Hispanic) in California and New York	4-day teacher training workshops, ongoing on-site training twice per month, feedback after bimonthly observations	Assorted curricula: <i>Creative Curriculum, Montessori, High Scope, BPS Benchmarks</i>	ANCOVA	Yes
Language-Focused Curriculum	Justice	14 teachers and 205 children (21% African American, 5% Hispanic) in rural and suburban Virginia	3-day teacher training workshop and two follow-up sessions over school year, with focus on language stimulation	<i>High/Scope</i> curriculum materials	ANCOVA and repeated measures analyses	No statistically significant findings
Doors to Discovery/Let's Begin with the Letter People	Assel	603 pre-kindergarten children (21% African American, 42% Hispanic) in greater Houston area	Teacher training and materials, focus on small group activities and scaffolding/Teacher training and materials, focus on "responsive teaching practices" to encourage strong socioemotional skills; both curricula utilized mentors	Comparison school	Multilevel growth curve modeling	yes

neurobehavioral “lens” with research on children’s executive functioning emphasizing the roles of children’s working memory, attention deployment, and ability to inhibit prepotent impulses in order to meet external demands (Diamond & Taylor, 1996; Greenberg, Riggs, & Blair, 2007). In applied developmental contexts, investigators have considered children’s modulation of positive affect, attention, and behavior in classroom contexts as important “approaches to learning” that are correlated with teacher reports and direct assessments of children’s academic skill (Fantuzzo et al., 2007; McDermott, Leigh, & Perry, 2002; Rimm-Kaufman, Fan, Chiu, & You, 2007)

Evidence from a small, extant literature on self-regulation and executive functioning among low-income children suggests that exposure to more poverty-related risks is associated with children’s greater difficulty in their executive functioning and self-regulation skills (Li-Grining, 2007; Lengua, 2002). Evidence from recent neurobehavioral research suggests that executive functioning skills are late-developing through early childhood, suggesting an important “window of opportunity” or sensitive period for the development of competent regulation of attention, impulses, and use of working memory in early childhood (Diamond & Taylor, 1996). On the basis of this model of self-regulation and school readiness (see Greenberg, 2006), several federally funded interventions in the ISRC consortium posited that children in treatment group would show significant gains in this domain of school readiness as compared to their control group counterparts (Bierman, Nix, Greenberg, Blair, & Domitrovich, in press-b; Fantuzzo, in preparation, Raver et al., revised and resubmitted).

Was there evidence from these federally funded research initiatives of significant impact of interventions on children’s self-regulatory skills? Several studies within the ISRC have found that children would specifically gain in self-regulatory skills when in classrooms that provided greater regulatory support. These have included Project REDI (Bierman et al., in press-a, reporting effect size of  $d = .29$  on direct assessments of task engagement) and the CSRP (unpublished findings). Across these two studies, children in the treatment group were found to demonstrate stronger levels of attention, engagement, or focused effort on a direct assessment of attention and impulsivity at post-test, compared to children in the treatment group. In contrast, no statistically significant differences were found on teacher reports of children’s attentiveness, persistence, and other learning-related skills, on the Preschool Learning Behavior Scale (McDermott, Green, Francis, & Stott, 1996; PCER final report, 2008). These null findings are interpreted with caution in this review. This caution is based on concerns for power and correspondingly, the relatively high values that effect sizes would have to achieve, in order to be minimally detectable (see cell sizes and MDEs listed in PCERS final report, pp. 31)

Findings from REDI and CSRP are in line with prior work by Greenberg and colleagues (e.g., Riggs, Greenberg, Kusché, & Pentz, 2006) with older children, suggesting significant program impact on children’s executive function, and by recent findings by Diamond, Barnett, Thomas, & Munro (2007) where children assigned to the treatment group receiving the Tools of the Mind curriculum demonstrated significant benefits on a directly-assessed executive function task (the flanker task) relative to their control group assigned counterparts. In short, these findings suggest substantial evidence for the modifiability of children’s self-regulatory skills across the preschool year. What are the implications of these hypothesized and demonstrated short-term gains in children’s executive function or self-regulation skills? An optimistic hypothesis might be that children with improved self-regulatory skills may be placed on a more positive developmental trajectory, better able to capitalize on future opportunities for learning in kindergarten and early elementary years. A less optimistic hypothesis is that these behavioral gains will be sustained only as long as children continue to have access to the conditions and classroom practices that supported the development of

executive function and adaptive self-regulation within the intervention year. Future research is needed to learn whether these early gains in children's ability to regulate their engagement, attention, and behavior are sustained into early elementary school years.

## **Children's social cognitions and prosocial skills in classroom contexts**

A parallel area of research has focused on what children know about their emotions and the negotiation of interpersonal problems, emphasizing the social cognitive mechanisms revealed in children's successes versus failures to get along with peers and adults (see classic work by Dodge, Pettit, & Bates, 1994; Conduct Problems Prevention Research Group, 2002). Additional research on children's attachment relationships with teachers, with the development of relationships characterized by closeness versus conflict also informs several interventions funded by the ISRC and PCER initiatives (Hamre & Pianta, 2001). Children's social skills and quality of relationship with teachers have been found to be correlated to their later social and academic competence in early elementary school (see Raver, Garner, & Smith-Donald, 2007 for review). Both of those research areas suggest that children develop relatively stable social cognitions or attributions regarding strategies of getting along with peers and adults in classroom contexts. These attributions appear to be built on a foundation of children's knowledge of emotions, knowledge of prosocial behaviors (e.g., helping, sharing, and taking turns), and the ability to generate and use more effective social problem-solving skills (see Domitrovich, Cortes, & Greenberg, 2007).

Past correlational research has faced the persistent problems of omitted variables bias and reverse causality (or bidirectional influence). For example, children who are temperamentally prone to be more sociable have been found to elicit more positive responses from peers and teachers than do children who express more anger and distress in the classroom (see for example, Justice, Cottone, Mashburn, & Rimm-Kaufman, under review). In the context of those relationships, more well-liked children may have greater opportunities to talk about, process, and remember information about their own and others' feelings, and about strategies for successfully navigating social relationships than might children who are less well-liked. Similarly, children's placement in classrooms with more emotionally supportive teachers and their negotiation of academic as well as social challenges are likely to be at least partially influenced by time-invariant individual and contextual variables that are often "omitted" from models (see O'Connor & McCartney, 2007 for exception and methodological solutions using longitudinal data).

It is within this framework that the federally funded research initiatives targeting children's SEL skills are likely to be of major impact to the field. In this area, randomized trials represent a key opportunity to test causal claims of the role of Social Emotional Learning (SEL) curricula for children's knowledge, attributions, and behaviors regarding prosocial versus aggressive behavior with peers. Interventions targeting teachers' practices also offer the opportunity to test the modifiability of children's relationships with adults in classroom contexts. Outcomes that are commonly tapped in interventions that target children's social problem-solving with peers and positive relationships with teachers include direct assessments of children's emotion understanding, of children's selection of adaptive versus maladaptive strategies in hypothetical vignettes of conflict with peers. Outcome variables also include more general teacher reports of children's social skills as well as teachers' reports of the quality of their relationships with individual children.

With that brief review as an empirical “backdrop,” was there evidence from the federally funded research initiatives of significant impact of interventions on children’s social problem-solving skills and their ability to get along with peers? Evidence from Project REDI suggests that the intervention, comprised of cognitive and socioemotional curricula as well as teachers’ provision of emotion coaching and support was associated with moderate to medium-sized program impacts for children’s emotion understanding and interpersonal problem-solving (*ds* ranging from .15 to .39; Bierman et al., symposium presentation). These gains in children’s socioemotional skill acquisition were paralleled by substantial gains in treatment enrolled children’s generalized social competence, with effect sizes of  $d = -.28$  for teacher rated aggression,  $d = .26$  for observer-rated social competence ( $p < .08$ ) (Bierman et al., in press-a). These findings are in keeping with prior randomized trial research by Bierman and colleagues (see Greenberg et al., 2007 and Domitrovich et al., 2007 for comparison) and by other senior leaders in the area of low-income children’s socioemotional development (see for example, Izard, Trentacosta, King, Morgan, & Diaz, 2007).

Was there evidence from the federally funded research initiatives of significant impact of interventions on children’s relationships with teachers? Building on their hallmark program of observational research across large samples in preschool and elementary school contexts, Pianta et al specifically targeted teacher-student relationships as a key socioemotional outcome for their web-based intervention, with evidence of improved teacher-student relationship using observational measures (see below). Similar findings of program impact on the teacher reports of the quality of teacher-student relationship have been informally discussed, but not yet submitted for publication from Project REDI and CSRP. These findings (should they be robust to sensitivity checks using alternative model specifications) would suggest that teacher-child relationships are modifiable. Additional analyses are also currently underway in both the REDI and CSRP labs to detect whether improvements in teachers’ relationships with children are bidirectionally related to children’s improvements in self-regulation (the teams are constrained from making causal claims regarding those linkages, however; see Raver et al., submitted, for further discussion).

## **Children’s behavior problems**

While most of the studies in the ISRC consortium have highlighted children’s reductions in their risk for manifesting behavior problems, only two of the seven teams have submitted evidence of significant impact of intervention in this domain. These two studies include Project REDI, reporting reductions of children’s aggression by teachers ( $d = -.28$ ) and by parents ( $d = -.13$ , at trend level of significance) (Bierman et al., in press-a). These findings are similar to those yielded by the CSRP team, suggesting significant reductions in children’s externalizing and internalizing problems as reported by teachers, and trend-level reductions in children’s observed aggressive disruptive behavior in the classroom (Raver et al., revised and resubmitted). Review of the PCER final report suggests that there were null impacts on children’s behavior problems in the pre-Kindergarten year, with point estimates of program impact using the SSRS Problem Behaviors Scale) reported to be small in magnitude and signed in inconsistent directions. Of concern is the finding that one intervention (Project Approach) appears to have yielded evidence of negative impact on children’s behavior problems in the Kindergarten year, with children in the treatment group showing significantly higher numbers of behavior problems than the control group. It is important to highlight however that that finding has not been replicated in any of the other 20 studies in the two consortia.

## **Mechanisms of improvement in children’s socioemotional development through improvement in the quality and quantity of instruction**

How were these child-focused program impacts achieved? Consistent across all interventions reviewed was a clear emphasis on multi-day trainings for teachers, followed by extensive “coaching” support and attention to fidelity of implementation. Some studies (but not others) have also published findings of proximal improvement in classroom practices as a result of the implementation of the interventions planned. That smaller set of studies is reviewed below.

Findings from My Teaching Partner suggest that teachers who received web-based consultancy as well as web-based access to information on ways to improve instructional strategies made significant improvements in their classroom practices, as compared to teachers with access to web-based information, only (Pianta, Mashburn, Downer, Hamre, & Justice, submitted). Teachers in the treatment group were found to show significant gains in sensitivity, language modeling, and quality of instructional support to students, as compared to teachers in the control group. Effect size estimates are reported and therefore must be understood in terms of change over time: The investigators report unstandardized regression coefficients of  $B = .07$  to  $.09$  per unit of time (30 days). Briefly, this means that treatment group programs averaged  $.42$  to  $.54$  of a point gain (on the CLASS 7-point scale) relative to programs in the control group, in a six month period. Importantly, gains were substantially larger for programs with very high proportions of poor children enrolled in their classrooms (see figures).

Similarly, Project REDI targeted teachers’ generalized classroom practices and induction strategies as well as their use of SEL curricular lessons to increase the level of emotional support and contingency to children’s emotional and social experiences (Bierman et al., in press-b; Bierman, personal communication, May 2008). Teachers’ use of emotion coaching and improvements in overall classroom management and behavioral support were significantly improved by the REDI intervention (Domitrovich et al., revised and resubmitted). Importantly, results from the REDI team suggest that these changes in classroom processes were powerful predictors (and likely mediators) of children’s language and socioemotional gains (Bierman et al., presentation). From a congruent theoretical framework, CSRP aimed to improve children’s self-regulation and opportunities for learning by increasing teachers’ use of emotionally supportive classroom practices where teachers maintained clear, firm yet warm patterns of limit-setting (see Raver et al., 2008). In contrast to project REDI, no specific child-focused curricula on emotional language or self-awareness were specifically targeted in CSRP. Findings from the CSRP intervention suggested that classroom climate was significantly benefited ( $d = .52$  to  $d = .89$ ). CSRP findings of intervention impact on positive classroom climate support the hypothesized mechanism of influence for intervention-enrolled children’s observed gains in self-regulation, relative to their control group enrolled counterparts.

Findings from some of the PCER studies provide sparse but congruent evidence of improved emotionally supportive classroom processes as a result of intervention. The University of Virginia team, for example, targeted both teachers’ increased use of language-rich classroom activities and the complexity of the language that teachers use when conversing with children (Pence, Justice, & Wiggins, in press). Analyses of the impact of this intervention suggest that teachers made changes in their activities most quickly, but were able to improve the quality of their conversations (described as a “relational process”) with the children in their classrooms, also (Pence et al., in press). Ramey et al. (submitted) also primarily targeted teachers’ language and literacy instruction using two different levels of coaching (weekly and monthly) in the Building Language for Literacy intervention trial, but also collected independent observations of teachers’ time spent engaged in emotionally less supportive practices such as “placing restrictions on

children” and “negative/harsh treatment” of children. In the report included for this review, the investigators chose not to analyze whether difference between intervention conditions on these measures were statistically significant (see pp. 21), but inspection of the means on both measures suggests that point estimates of differences between the groups appear to favor treatment assigned classrooms.

## **Building relationships between teachers and intervention staff**

All the intervention models reviewed above (e.g., MTP, REDI, CSRP) as well as most other models in the ISRC that are currently analyzing their data for evidence of treatment impact (led by Fantuzzo, Kupersmidt, Odom, Sheridan) have relied on significant investments in “coaching” of teachers in supporting gains in classroom climate. Similar levels of investment in training and coaching were found in all studies reviewed from the PCER consortium (e.g., Ramey et al., submitted; Assel, Landry, Swank, et al., in press; Cosgrove, Fountain, Wehry, Wood, & Kasten, submitted; Klein, Starkey, Clements, Sarama, & Iyer, in press).

Across all interventions using “coaching” or consultation approaches in the ISRC consortium, levels of coaching were commensurate with levels used in the language- and literacy interventions in the PCER group (e.g. N Florida ELLM used two days of intensive training followed by 1 hour weekly coaching sessions across the school year while training for Pre-K Mathematics included 2 4-day trainings and 15 on-site coaching sessions). Comparison of models across all ISRC and PCER studies that employed coaching suggests several commonalities, including emphasis on “job embedded,” collaborative models (including cycles of modeling, observation and feedback) between teachers and coaching staff (see Cosgrove et al., submitted; Raver et al., 2008). In short, intervention staff focused substantial levels of effort in building trusting, collaborative relationships with teachers (see Brown, Knoche, Edwards, & Sheridan, submitted for case study).

With variations on this coaching and training model, multiple teams demonstrated significant improvements in teachers’ classroom practices (see above). Building of positive, supportive coaching relationship may be particularly important given that interventions may be asking teachers to be reflective, self-critical, and willing to take the risk of trying new approaches in the ways that they run their classrooms. In one study, for example, teachers in the treatment group reported increasing levels of efficacy in implementing language stimulation techniques over the school year (Justice et al., under review). Importantly, teachers in the treatment group were also found to report lower, rather than higher levels of self-efficacy and comfort when compared to teachers’ ratings of self-efficacy in an untreated control group. These findings, though drawn from a single intervention trial, are congruent with other studies that document the challenges that teachers face as well as the gains that they are capable of making in programs emphasizing professional development and quality improvement (see Li-Grining et al., submitted; Brown et al., submitted). Extensive focus group and evaluation surveys conducted by Pianta’s team suggest that teachers generally reported feeling supported by consultancy services, even when they are web-based (Whitaker, Kinzie, Kraft-Sayre, Mashburn & Pianta, 2007).

An obvious next question is whether there is a threshold level to the amount of coaching needed to support improvements in the quality and quantity of instruction. Ramey, Ramey, and Stokes (in preparation) raise this by pointing to contrasting models of “coaching” in weekly versus monthly delivery schedules, with no clear evidence that more frequent coaching yields substantially greater benefit than less frequent coaching. This represents an important new direction for future research.

## Checking to determine whether there were unanticipated benefits or drawbacks of early intervention for children’s socioemotional development

One fair question might be whether there are unanticipated “spillover” benefits from focusing on child language, literacy and math outcomes on children’s socioemotional outcomes. One hypothesis might be that children may gain increasingly strong regulatory skills through more cognitively demanding and engaging curricula, where the content of teachers’ lessons helps to entrain and strengthen children’s attentional and memory skills (see Doctoroff, Greer, & Arnold, 2006). A contrasting hypothesis might be that children might respond negatively to more cognitively demanding and firmly structured classroom practices and curricula, showing increased behavioral difficulty that might offset language, literacy, or math gains.

Several ISRC interventions used “hybrid” models combining foci on language/literacy as well as children’s socioemotional development and analyses of treatment impact will elucidate whether there were consistent benefits or costs to children’s behavioral development, across interventions (see interventions led by Pianta, Fantuzzo, Odom, Kupersmidt, and Bierman). Of the ISRC hybrid models tested, Project REDI provided data to support improvements, rather than decrements in children’s socioemotional development as well as in their language development (see above). Across 13 of the 14 interventions in the PCER evaluation, teachers in the intervention groups and teachers in the control group did not differ on the level of their students’ behavioral difficulty or social skills (using the SSRS; Gresham & Elliott, 1990). Again, these null findings should be interpreted with caution. The one exception was that children in the Learning Approaches treatment group were found to fare less well on socioemotional measures than were children in the control group, as rated by kindergarten teachers (see above). With that exception noted, there was no clear evidence of negative consequences for teacher-child interaction. Nor is there evidence for negative behavioral or emotional consequences for children’s socioemotional development, in almost all studies where teachers were extensively trained and monitored to implement significantly more cognitively demanding interventions.

Another way to explore this question is to consider whether teachers’ training, time, or curricular focus on academically focused outcomes might inadvertently lead classrooms to become too tightly structured, overly cognitively demanding, or somehow less emotionally or behaviorally supportive. Descriptive data from many of the non-experimental studies submitted for this review, however, suggest that the risk of preschool classrooms becoming overly cognitively demanding is relatively low. For example, descriptive work by the Howes & Fuligni team (Fuligni, revised and resubmitted) as well as work by Justice et al. (under review) on the preschool activity contexts and preschoolers’ exposure to language suggests that relatively low percentages of class time are spent engaged in instructional effort. Similarly, Massey, Pence, Justice and Bowles (2008) report that teachers’ use of more cognitively challenging questions is limited to approximately 11% of their utterances directed to the low-income children in their classrooms (pp. 12). While speculative, it does not appear that those classrooms included in this broad range of studies were already too tightly paced or cognitively demanding, prior to implementation of the intervention. Put another way, there may be significant regulatory benefits, and possibly fewer regulatory “costs” to raising the “bar” for teachers’ structure and pacing of cognitively demanding material in classrooms serving low-income children.

The PCER 14-study evaluation offers limited but important opportunity to examine this question: Data on the quality of teacher-child interaction were collected three times during the school year

across all 14 studies (as rated by observers using Arnett scales) (Preschool Curriculum Evaluation Research Consortium, 2008). Overall, statistically significant evidence of beneficial “spillover” effects in improving the classroom climate were found for the Creative Curriculum intervention, where treatment-assigned teachers were observed to be less detached and more positive in spring than were teachers in control group classrooms. Though non-significant, evidence from seven of the exclusively literacy/language oriented curricula demonstrated point estimate differences between treatment and control groups that were in the right direction (e.g., with point estimates of effect sizes equal to .38 or higher) (see Preschool Curriculum Evaluation Research Consortium, 2008, pp. xliv). In sum, measured indicators of classroom quality across all studies but one suggest that placing higher demands on teachers’ instructional practices using either language/literacy or “hybrid” intervention models did not lead to measurably negative impacts and in one case (mentioned earlier), the implementation of these interventions led to clear benefits regarding the socioemotional climate of the classroom.

## **Directions for future research in promote children’s readiness for school**

### **The role of child, family, classroom, and context characteristics as moderators**

Increasingly, randomized trials have been analyzed with attention to moderating roles of “person” and “place,” where interventions may fit the needs of some children, in some contexts more than the intervention might for other children, in other contexts (Gorman-Smith & Tolan, 1998). The role of moderators was explored in some studies reviewed here, but not in others, and they represent a very promising direction for future research.

A small number of studies considered the role of child characteristics, such as child gender, race/ethnicity, English-language-learner status, and risks for self-regulatory or expressive language difficulty. For example, children at higher levels of behavioral and cognitive risk (e.g. those children who are more temperamentally or neurocognitively prone to high levels of shyness, impulsivity, or distractability) might be expected to benefit more greatly or less greatly from interventions (see Bierman et al., in press-a for review). Yet this review suggests that few of the socioemotionally-oriented, “hybrid,” or cognitively-oriented interventions (in ISRC and PCER) considered whether intervention impacts were greater or smaller for children with greater proneness to regulatory skill or difficulty. One exception was the nonexperimental finding that children with greater proneness to shyness had significantly more difficult time establishing positive relationships with teachers in nonexperimental analyses of one PCER- funded intervention (Justice et al., under review). Importantly, child temperament moderated relations between children’s language skills and student-teacher relationship, where children who were temperamentally prone to anger and had low expressive language abilities were at particularly high risk of conflictual relationship with their preschool teachers (Justice et al., under review). Additional findings of moderation of intervention impact by child risk were found for Raver’s team for observational measures of child behavioral problems (Raver et al., revised and resubmitted). In future, it will be important to carefully consider whether program impacts are larger or smaller for children with differing profiles of strength versus risk.

Family level risk may also be important and parsimonious way to consider fit of different intervention models for families with substantially differing economic and psychosocial resources. Findings by Pianta’s team of clear, larger benefit of the MTP program for serving very high-poverty classrooms as compared to programs serving proportionally fewer poor children highlights the importance of

including family-level income poverty and related risks in models. A third important set of moderators are those of program type and program resources. For example, an intervention targeting the emotional climate of classrooms may be difficult to implement in settings that are chaotic or disorganized, or under-resourced (see Raver et al., 2008 for review). In contrast, programs that have mental health consultants on staff, on-site personnel to address teacher training, quality improvements, etc. may already be sufficiently resourced that they are likely to show little, if any benefit of additional services implemented through our intervention efforts. In short, it is important to include some observable indicators of level of program resources as covariates and as moderators, to detect whether programs with higher organizational capacity are able to benefit from intervention more so than others (see Assel, Landry, Swank, & Gunnewig, 2007 for examples of heterogeneity of child level program impacts across program type).

### **The importance of socioemotional measures in study analyses**

Past reviews have highlighted the importance of including socioemotional measures as well as cognitively oriented measures when benchmarking intervention impact (e.g. Raver & Zigler, 1997). There are several key benefits (highlighted earlier) for including socioemotional measures at both child- and classroom levels, even when interventions are targeted toward children’s language and literacy. The inclusion of child social skills and behavior problem measures in the PCER evaluation and some individual PCER studies (e.g., Klein et al., in press) helps to rule out concern, for example, that there may be iatrogenic sequelae from the introduction of interventions targeting language and literacy. Similarly, the inclusion of children’s language and math skills in interventions that target only classroom socioemotional processes offers the opportunity to test whether there are costly tradeoffs (in terms of lower instructional time) or unanticipated benefits (in terms of children’s language gains) when focusing program improvement efforts on socioemotional processes. This cross-domain integration of measures at child- and classroom levels represents an important area of future collaboration and future research.

### **The importance of modeling cluster-randomized status in study analyses**

From a methodological standpoint, the impact of a number of these interventions on children’s socioemotional development was difficult to interpret for this review because of variability in the ways that data were analyzed and reported. A substantial number of studies provided careful, sophisticated analyses of program impact, using Intent-to-treat analyses, multi-level modeling (e.g., HLM), and clear description of model specification so that the role of cluster-randomized status to treatment versus control groups could be clearly identified. In contrast, a smaller number of studies limited their reports to analyses of program fidelity as a predictor of child-level or classroom-level outcomes, effectively reintroducing selection bias into designs that were initially randomized. Future research in this area would be substantially strengthened by a tiered reporting process, whereby intention-to-treat (ITT) analyses and treatment-on-treated/ dosage analyses could both be encouraged.

## **Summary**

At this early stage of review, most research teams have only recently wrapped up final stages of data collection and completion of preliminary data analyses. Few research teams have completed the full set of ITT analyses that are needed to be able to determine the individual and collective impacts of preschool intervention on children’s socioemotional outcomes (A “full set of ITT analyses” would include tests of moderation and sensitivity checks regarding whether program impact estimates are sensitive to model specification). With that caveat in mind, preliminary review of the current set of

published and unpublished papers suggests clear evidence for the benefits of several intervention approaches in supporting low-income children's socioemotional development across their preschool year. Findings of improved classroom instructional processes and improved classroom emotional climate across both types of interventions suggest that interventions using teacher training and coaching models yielded substantial improvements in program quality. Children in treatment groups were found to show lower behavioral problems, increased self-regulatory skills, and greater prosocial skills with peers and with teachers, than their counterparts in control group classrooms, in a smaller number of interventions. As these trials are completed, they are likely to make a major contribution to our knowledge of the ways that scientists and policy makers can best support the school readiness of our nation's low-income children.

## References

- Arnold, D. H., Brown, S. A., Meagher, S., Baker, C. N., Dobbs, J., & Doctoroff, G. L. (2006). Preschool-based programs for externalizing problems. *Education & Treatment of Children, 29*, 311–339.
- Assel, M. A., Landry, S. H., Swank, P. R., & Gunnewig, S. (2007). An evaluation of curriculum, setting, and mentoring on the performance of children enrolled in pre-kindergarten. *Reading and Writing, 20*, 463–494.
- Bierman, K. L., Domitrovich, C. E., Nix, R., Gest, S., Welsh, J. A., Greenberg, M. T., et al. (in press-a). Promoting academic and social-emotional school readiness: The Head Start REDI program. *Child Development*.
- Bierman, K., Nix, R. L., Greenberg, M. T., Blair, C., & Domitrovich, C. (in press-b). Executive functions and school readiness intervention: Impact, moderation, and mediation in Head Start REDI program. *Development and Psychopathology*.
- Blair, C. (2002). School readiness: Integrating cognition and emotion in a neurobiological conceptualization of children's functioning at school entry. *American Psychologist, 57*, 111–127.
- Brooks-Gunn, J., Duncan, G., & Aber, L. (Eds.). (1997). *Neighborhood poverty: Context and consequences for children (Vol. 1)*. New York: Russell Sage Foundation.
- Brown, J. R., Knoche, L. L., Edwards, C. P., & Sheridan, S. M. (submitted). Professional development: A case study of early childhood programs in the Getting Ready Project.
- Campbell, S. B., Shaw, D. S., & Gilliom, M. (2000). Early externalizing behavior problems: Toddlers and preschoolers at risk for later maladjustment. *Development and Psychopathology, 12*, 467–488.
- Conduct Problems Prevention Research Group (2002). Using the Fast Track randomized prevention trial to test the early-starter model of the development of serious conduct problems. *Development and Psychopathology, 14*, 925–943.
- Cosgrove, M., Fountain, C., Wehry, S., Wood, J., & Kasten, K. (submitted). Randomized field trial of an early literacy curriculum and instructional support system.
- Diamond, A., Barnett, S., Thomas, J. & Munro, S. (2007). Preschool program improves cognitive control. *Science, 318*, 1387–1388.
- Diamond, A., & Taylor, C. (1996). Development of an aspect of executive control: Development of the abilities to remember what I said and to “Do as I say, not as I do.” *Developmental Psychobiology, 29*, 315–334.
- Doctoroff, G. L., Greer, J. A., & Arnold, D. H. (2006). The relationship between social behavior and emergent literacy among preschool boys and girls. *Journal of Applied Developmental Psychology, 27*, 1–13.
- Dodge, K. A., Pettit, G. S., & Bates, J. E. (1994). Socialization mediators of the relation between socioeconomic status and child conduct problems. *Child Development, 65*, 649–665.
- Domitrovich, C. E., Cortes, R. C., & 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., Gest, S. D., Gill, S., Bierman, K. L., Welsh, J. & Jones, D. (revised and resubmitted). Fostering high quality teaching with an enriched curriculum and professional development support: The Head Start REDI program.
- Duncan, G. J. (2003). Modeling the impacts of child care quality on children's preschool cognitive development. *Child Development, 74*, 1454–1475.
- Duncan, G., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., et al. (2007). School readiness and later achievement. *Developmental Psychology, 43*, 1428–1446.
- Fantuzzo, J., Bulotsky-Shearer, R., McDermott, P. A., McWayne, C., Frye, D., & Perlman, S. (2007). Investigation of dimensions of social-emotional classroom behavior and school readiness for low-income urban preschool children. *School Psychology Review, 36*, 44–62.
- Fuligni, A. (revised and resubmitted). Children's experiences in early childhood programs for low-income children: Influence of program type and curriculum use. *Early Education and Development*.
- Gorman-Smith, D., & Tolan, P. (1998). The role of exposure to community violence and developmental problems among inner-city youth. *Development and Psychopathology, 10*, 101–116.
- Graziano, P. A., Reavis, R. D., Keane, S. P., & Calkins, S. D. (2007). The role of emotion regulation in children's early academic success. *Journal of School Psychology, 45*, 3–19.
- Greenberg, M. T., Riggs, N. R., & Blair, C. (2007). The role of preventive interventions in enhancing neurocognitive functioning and promoting competence in adolescence. In D. Romer & E. F. Walker (Eds.), *Adolescent psychopathology and the developing brain: Integrating brain and prevention science* (pp. 441–462). New York: Oxford University Press.
- Gresham, F. M., & Elliot, S. N. (1990). *The Social Skills Rating System*. Circle Pines, MN: American Guidance Services.
- Hamre, B. K., & Pianta, R. C. (2001). Early teacher-child relationships and the trajectory of children's outcomes through eighth grade. *Child Development, 72*, 625–638.
- Howse, R. B., Calkins, S. D., Anastopoulos, A. D., Keane, S. P., & Shelton, T. L. (2003). Regulatory contributors to children's kindergarten achievement. *Early Education and Development, 14*, 101–119.
- Izard, C., Trentacosta, C., King, K., Morgan, J., & Diaz, M. (2007). In G. Matthews, M. Zeidner, & R. Roberts (Eds.), *Emotions, emotionality, and intelligence in the development of adaptive behavior: Knowns and unknowns. Series in affective science* (pp. 127–150). New York: Oxford University Press.
- Justice, L. M., Cottone, E. A., Mashburn, A., & Rimm-Kaufman, S. E. (under review). Relationships between teachers and preschoolers who are at risk: Contribution of children's language skills, temperamentally-based attributes, and gender. *Journal of Speech, Language, and Hearing Research*.
- Klein, A., Starkey, P., Clements, D., Sarama, J. & Iyer, R. (in press). Effects of a pre-K mathematics intervention: A randomized experiment. *Journal of Research on Educational Effectiveness*.
- Lengua, L. J. (2002). The contribution of emotionality and self-regulation to the understanding of children's response to multiple risk. *Child Development, 73*, 144–161.
- Li-Grining, C. P. (2007). Effortful control among low-income preschoolers in three cities: Stability, change, and individual differences. *Developmental Psychology, 43*, 208–221.

- Li-Grining, C. P., Raver, C. C., Smallwood, K. M., Sardin, L., Metzger, M. W., & Jones, S. M. (submitted). Classroom quality and teacher support in Head Start classrooms: The role of teachers' psychosocial stressors. *Early Education and Development*.
- LoCasale-Crouch, J., Konold, T., Pianta, R., Howes, C., Burchinal, M., Bryant, D., et al. (2007). Profiles of observed classroom quality in state-funded pre-kindergarten programs and associations with teacher, program, and classroom characteristics. *Early Childhood Research Quarterly*, *22*, 3–17.
- Magnuson, K., Ruhm, C., & Waldfogel, J. (2007). The persistence of preschool effects: Do subsequent classroom experiences matter? *Early Childhood Research Quarterly*, *22*, 18–38.
- Magnuson, K., & Duncan, G. (2003). Parent- versus child-based intervention strategies for promoting children's well-being. In A. Kalil & T. DeLeire (2004), *Family investments in children's potential: Resources and parenting behaviors that promote success. Monographs in parenting* (pp. 209–235). Mahwah, NJ: Lawrence Erlbaum Associates.
- Massey, S. L., Pence, K. L., Justice, L. M., & Bowles, R. P. (2008). Educators' use of cognitively challenging questions in economically disadvantaged preschool classroom contexts. *Early Education and Development*, *19*, 340–360.
- McClelland, M. M., Cameron, C. E., Connor, C. M., Farris, C. L., Jewkes, A. M., & Morrison, F. J. (2007). Links between behavioral regulation and preschoolers' literacy, vocabulary, and math skills. *Developmental Psychology*, *43*, 947–959.
- McClelland, M. M., & Morrison, F. J. (2003). The emergence of learning-related social skills in preschool children. *Early Childhood Research Review Quarterly*, *18*, 206–224.
- McDermott, P., Green, L. F., Francis, J. M., & Stott, D. H. (1996). *Preschool Learning Behaviors Scale*. Philadelphia: Edumetric and Clinical Science.
- McDermott, P. A., Leigh, N. M., & Perry, M. A. (2002). Development and validation of the Preschool Learning Behaviors Scale. *Psychology in the Schools*, *39*, 353–365.
- O'Connor, E., & McCartney, K. (2007). Examining teacher-child relationships and achievement as part of an ecological model of development. *American Educational Research Journal*, *44*, 340–369.
- Preschool Curriculum Evaluation Research Consortium (2008). Effects of preschool curriculum programs on school readiness (NCER 2008–2009). Washington, DC: National Center for Education Research, Institute of Education Sciences, U.S. Department of Education.
- Pence, K. L., Justice, L. M., & Wiggins, A. K. (in press). Preschool teachers' fidelity in implementing a comprehensive language-rich curriculum.
- Pianta, R. C., Mashburn, A. J., Downer, J. T., Hamre, B. K., & Justice, L. (submitted). Effects of web-mediated professional development resources on teacher-child interactions in pre-kindergarten classrooms.
- Ramey, C. T., Ramey, S. L., & Stokes, B. R. (in preparation). Effective pre-K programs: Research evidence about program dosage and student achievement.
- Ramey, S. L., Ramey, C. T., Kleinman, B. E., Lee, L. M., Farneti, C. L., Timraz, N. M., et al. (submitted). The effects of curriculum and coaching supports on classrooms and literacy skills of prekindergarten/Head Start students in Montgomery County Public Schools.

- Raver, C. C. (2002). Emotions matter: Making the case for the role of young children's emotional development for early school readiness. *Social Policy Report, 16*, 3–6.
- Raver, C. C. (2004). Placing emotional self-regulation in sociocultural and socioeconomic contexts. *Child Development, 75*, 346–353.
- Raver, C. C., Garner, P., & Smith-Donald, R. (2007). The roles of emotion regulation and emotion knowledge for children's academic readiness: Are the links causal? In R. C. Pianta, M. J. Cox, & K. L. Snow (Eds.), *School readiness and the transition to kindergarten in the era of accountability* (pp. 121–147). Baltimore: Brookes Publishing.
- Raver, C. C., Jones, A. S., Li-Grining, C. P., Metzger, M., Smallwood, K., & Sardin, L. (2008). Improving preschool classroom processes: Preliminary findings from a randomized trial implemented in Head Start settings. *Early Childhood Research Quarterly*.
- Raver, C. C., Jones, S. M., Li-Grining, C. P., Zhai, F., Bub, K., & Pressler, E. (submitted). CSRP's impact on low-income preschoolers' pre-academic skills: Self-regulation and teacher-student relationships as two mediating mechanisms. *Child Development*.
- Raver, C. C., Jones, S. T., Li-Grining, C., Zhai, F., Metzger, M., & Solomon, B. (revised and resubmitted). Multi-component intervention targeting children's behavior problems in Head Start-funded preschool classrooms: A cluster-randomized controlled trial. *Journal of Consulting and Clinical Psychology*.
- Raver, C. C., & Zigler, E. F. (1997). Focus section: New perspectives on Head Start. Social competence: An untapped dimension in evaluating Head Start's success. *Early Childhood Research Quarterly, 12*, 363–385.
- Riggs, N. R., Greenberg, M. T., Kusché, 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.
- Rimm-Kaufman, S. E., Fan, X., Chiu, Y.-J., & You, W. (2007). The contribution of the Responsive Classroom Approach on children's academic achievement: Results from a three year longitudinal study. *Journal of School Psychology, 45*, 401–421.
- Whitaker, S., Kinzie, M., Kraft-Sayre, M. E., Mashburn, A., & Pianta, R. C. (2007). Use and evaluation of web-based professional development services across participant levels of support. *Early Childhood Education Journal, 34*, 379–386.
- Zaslow, M., Reidy, M., Moorehouse, M., Halle, T., Calkins, J., & Margie, N. G. (2003). Progress and prospects on the development of indicators of school readiness. In *Child and youth indicators: Accomplishments and future directions* (in press). Bethesda, MD: National Institutes of Health.