A McREL Report Prepared for

Stupski Foundation's Learning System

Our Kids

About McREL

Mid-continent Research for Education and Learning (McREL) is a nationally recognized, private, nonprofit organization dedicated to improving education for all students through applied research, product development, and service. Established in 1966, McREL now maintains a staff of around 110 in its Denver, Colorado, office.

This report is part of a larger set of reports prepared by McREL for the Stupski Foundation. The views, findings, conclusions, and recommendations expressed herein are those of the authors and do not necessarily express the viewpoint of the Foundation. Please e-mail any inquiries to Linda Brannan at info@mcrel.org.

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Executive Summary

This document is one of eight reports prepared to support the development of a new learning system, a development effort that is the first step in a major initiative undertaken by the Stupski Foundation. The Foundation endeavors to improve the life options of all students, especially underserved urban youth of color whom we refer to as "Our Kids," by fundamentally redesigning the education system. The report was created collaboratively by researchers from McREL and officers of the Stupski Foundation. Its purpose is to provide members of the Design Collaborative team with a review of key findings from the existing literature regarding critical research questions related to the Our Kids component of the Learning System. The authors summarize a review of research literature to help the Foundation and its partners identify key options encompassing innovation, development, and new research directions.

Research methodology

McREL researchers, in collaboration with Stupski Foundation staff members, generated the following research questions to guide this review:

1. Are there discernable differences in Our Kids' brain-based cognitive processes compared to their non-risk peers?
    a. If so, in what ways are Our Kids' brain-based cognitive processes different?
    b. How does the environment (home, school, community) in which Our Kids live influence individual differences in brain-based cognitive processes?
2. Are there discernable differences in Our Kids' approaches to learning compared to their non-risk peers?
    a. If so, in what ways are Our Kids' approaches to learning different?
    b. How does the environment (home, school, community) influence individual differences in Our Kids' approaches to learning?

These questions focused an extensive review of scholarly (i.e., peer-reviewed publications) and "fugitive" literature (i.e., reports self-published by reputable foundations, associations, and other organizations). In all, the research team reviewed 467 articles and summarized 48 of these. Data and conclusions from these reports have been synthesized into several key findings.

Key findings

Findings presented in the report fall into four areas: 1) brain-based interventions which ameliorate environmental risks experienced by Our Kids, 2) the contribution of social and emotional skills to the school readiness of Our Kids, 3) characteristics of early childhood programs that relate to positive long-term outcomes, and 4) differences in parenting practices that predict corresponding variation in academic achievement.

Environmental risk factors place Our Kids at risk for school readiness and subsequent school success

The following findings emerged from the research regarding risk factors for brain development:

- Experiences during the first years of life play a crucial role in brain development. Evidence supports that many crucial brain processes are shaped before children enter formal schooling (Hensch, 2005;

Knudsen, 2004; Kuhl, 2004).

- Too often, environments associated with multiple risk factors also fail to provide adequate cognitive stimulation: multiple-risk children are more likely to have fewer literacy resources in the home such as books, shared reading, and parent-child talk time (Lengua, 2002). Research consistently shows a relationship among cumulative exposure to risk factors, school readiness, and subsequent achievement. Combined exposure to risk factors is most commonly associated with low-socioeconomic (SES) and is most detrimental to school achievement. When multiple risk factors are present, their combined effect can account for as much as seven to eight points of achievement test score gaps between Caucasian, Hispanic, and African American students (using a 2005 gap estimation of 15–16 points) (Duncan & Magnuson, 2005).

Our Kids are less likely to enter school with social and emotional skills critical to school readiness

The following findings emerged from the research regarding the relation of social and emotional skills for school readiness:

- An established body of research suggests that school readiness requires not only basic knowledge skills like counting, language, and concepts of print, but also social and emotional skills (Belsky & MacKinnon, 1994; Entwisle & Alexander, 1993; Blair, 2002; Bierman, Torres, Domitrovich, Welsh, & Gest, 2009).
- In a seminal child development study, Pianta and Caldwell (1990) demonstrated that approximately 20 percent of preschoolers from ethnically and economically diverse backgrounds display moderate to clinically significant social and emotional difficulties. More recent research indicates that children from adverse environments score lower on standard behavioral assessments than children exposed to fewer risks in early childhood (Brinkman, Wigent, Tomac, Pham, & Carlson, 2007).

Closing the achievement gap will necessitate the enrollment of Our Kids in quality early childhood programs

The following findings emerged from the research regarding quality early childhood programs:

- Children enrolled in center-based childcare or preschool programs are more likely to be ready for school (Duncan & Magnuson, 2005).
- Black and Hispanic children are disproportionately enrolled in publicly funded preschools, such as Head Start. Additionally, Black children are more likely to attend lower quality programs (Neuman, 2003).
- Research suggests that improving equal access to quality center-based care will close the gap between Hispanic and White children as much as 26 percent; improving Head Start program quality could close up to 4–10 percent of the Black-White gap and 4–8 percent of the Hispanic-White gap (Duncan & Magnuson, 2005).

Learning takes place in the social environment, and changes in caregiving that stimulate environmental enrichment can positively impact cognitive outcomes for Our Kids

The following findings emerged from the research regarding the social learning environment of Our Kids:

- Cognitive and brain development occur within the context of social relationships. Caregiver-child interactions that are sensitive and responsive are related to better cognitive skills, social-emotional skills, and later school readiness.
- In general, differences in parenting practices account for 3 to 9 points of the standard gap in school readiness between children from low and mid-to-high socioeconomic status backgrounds (Brooks-

Gunn & Markman, 2005).

Recommendations

Based on these findings, six options are offered for how the Design Collaborative might proceed with its efforts.

Option 1: Executive function interventions

Scale-up and promote further investment in interventions targeting executive function (EF), a cognitive system which manages numerous processes requiring cognitive control, or mental effort. Over the last decade, researchers have developed brain-based attention training techniques that improve the ability of children to focus in the classroom and regulate externalizing behaviors (problematic behaviors such as aggression and/or hyperactivity). These advances hold promise for Our Kids, as low-SES children typically score below average on measures capturing classroom attention and productive learning behaviors (Mezzacappa, 2004). While researchers and practitioners are still perfecting the timing, duration, and intensity of these exercises, they present an opportunity for further research and design initiatives. Despite the inherent promise of brain-based EF interventions, the technological resources required to scale up brain-based EF interventions—particularly when delivered within an engaging video game environment—may be cost-prohibitive to early childhood centers with few computing resources.

Option 2: Research and design on environmental stress and children's brain development

Invest in research on and design of brain-based early childhood interventions. Potential benefits to this option include leveraging existing research and design that has shown to be promising in protecting against the potential negative environmental risks experienced by Our Kids. Possible challenges and drawbacks of this option include the speed of development to achieve a scalable design model as well as the difficulty and expense of neuro-imaging research involving children.

Option 3: Integrate evidence-based components of quality care centers

Invest in quality early childhood programs. Children enrolled in center-based childcare or preschool programs are more likely to be ready to enter school. The Design Collaborative might consider research delimiting elements of quality early childhood programs, such as student to teacher ratio, teacher qualifications, and preschool curriculum. There are many potential benefits to implementing a high-quality early childhood program that is readily accessible by all. Research has shown that simply improving Head Start program quality could close up to 4 to10 percent of the Black-White gap and 4 to 8 percent of the Hispanic-White gap (Duncan & Magnuson, 2005). Additionally, the Design Collaborative could leverage the growing federal policy support for improving early childhood education. Funding remains the greatest challenge to implementing a universal preschool program.

Option 4: Scaffold self-regulation in early childhood

Scale-up social and emotional skill curricula. Readiness for school requires not only basic knowledge skills like counting, language, and concepts of print, but also social and emotional skills. The Design

Collaborative should consider examining research demonstrating the importance of socio-emotional competence to academic achievement (Belsky & MacKinnon, 1994; Entwisle & Alexander, 1993; Blair, 2002; Bierman, et al., 2009). Interventions aimed at improving young children's social and emotional skills have shown numerous benefits, including lower juvenile delinquency and increased graduation rates. This line of work would be especially beneficial for Our Kids, given that approximately 20 percent of preschoolers from ethnically and economically diverse backgrounds display moderate to clinically significant social and emotional difficulties (Pianta & Caldwell, 1990) and consistently demonstrate lower scores on behavioral assessments than children who are not considered "at-risk" (Brinkman, et al., 2007). Potential challenges associated with this option lie in changing the focus of accountability. Targeting these important, and often underdeveloped, learning behaviors in disadvantaged children requires significant time inputs. As a result, exercises focused on social and emotional skill development are often pushed out of the core content curriculum.

Option 5:
Research and design on programs to support parent scaffolding of children's self-regulation

Adapt and scale up parent/caregiver support programs that teach scaffolding behavior, a research-based practice that helps adults provide targeted guidance to children in order to enhance learning. Cognitive and brain development occur within the context of social relationships. The extent to which caregiver-child interactions are sensitive and responsive has been shown to be related to better cognitive skills, social-emotional skills, and later school readiness. Parent-child social interactions are embedded within the context of cultural and socioeconomic factors (see Bronfenbrenner, 1999) and have been found to vary widely in families from low-income backgrounds (Hart & Risley, 1995). In general, it is estimated that differences in parenting practices account for 3 to 9 points of the standard gap in school readiness (Brooks-Gunn & Markman, 2005). Caregiver support programs that focus on improving Our Kids' early literacy experiences and social-emotional development are critical components of effective early childhood programs.

Option 6:
Parent support programs

Adopt and scale up parent support programs that support literacy development in the home. In addition to programs that support the development and application of effective parenting practices, programs that support home literacy activities engaging both parents and children have shown significant promise when targeted towards Our Kids.

Final thoughts

Data show investments in early childhood education for children from low-income families provide greater economic and social returns on capital than programs that target remedial workforce education for adults (Knudsen, Heckman, Cameron, & Shonkoff, 2006; Cunha, Heckman, Lochner, & Masterov, 2005). Research also demonstrates that there are sensitive periods in development when neural circuits are extremely vulnerable to environmental influence (Rice & Barone, 2000; Nelson, 2007). The concept of sensitive periods and neuroplasticity is more simply expressed this way: 1) Experience shapes brain development and behavior over time, 2) brain development and behavior patterns are more difficult to change as individuals get older, and 3) establishing the optimal experiences from the beginning is more

efficient and effective than compensating for and "fixing" things later.

The critical finding that children from low-SES backgrounds enter kindergarten with cognitive and emotional deficits that predict later gaps in academic achievement informed subsequent investigation into interventions that reduce this disparity. In general, research findings suggest that school readiness initiatives may be paramount and necessary in successfully addressing the achievement gap. Given that socio-emotional development is a key component of school readiness and later academic achievement, it would follow that the development of self-regulation and emotional skills should be incorporated into early childhood and early elementary education. Additionally, the primacy of parents as providers of critical, stimulating environments during early childhood suggests that a truly effective and comprehensive support program for Our Kids in early childhood necessitates parental involvement.

Introduction

Purpose of this document

This document is one of eight reports prepared to support the development of a new learning system, a development effort that is the first step in a major initiative undertaken by the Stupski Foundation. The Foundation endeavors to improve the life options of all students, especially underserved urban youth of color, whom we refer to as "Our Kids," by fundamentally redesigning the education system.

The report was created collaboratively by researchers from McREL and officers of the Stupski Foundation. Its purpose is to provide members of the Design Collaborative team with a review of key findings from the existing literature regarding critical research questions related to the Our Kids component of the Learning System and to offer recommendations for the development of this component. Together, the reports cover these topics:

- Assessment
- Curriculum
- Pedagogy
- Student Supports
- Systems Diagnostics
- Leadership
- College Readiness
- Our Kids

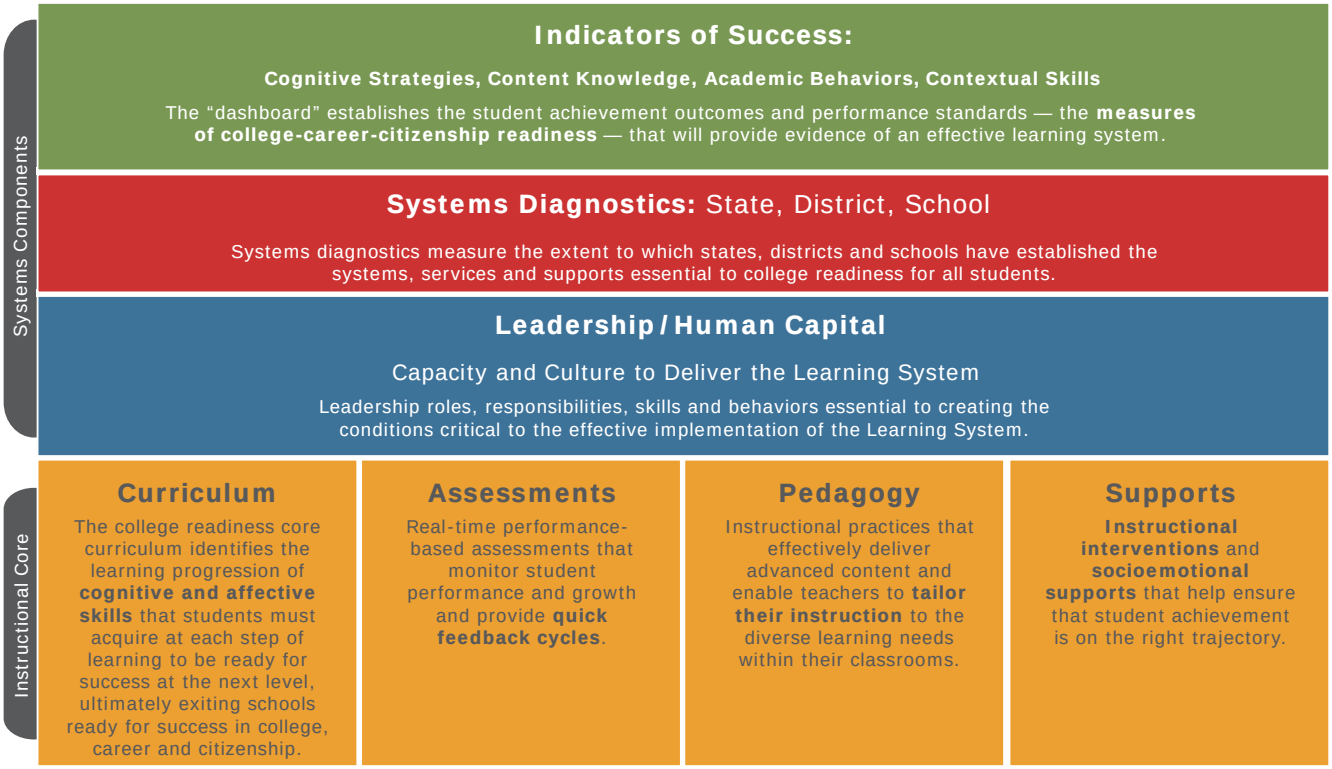
The first section of this report provides salient findings that emerged from the literature review. The second section offers a discussion of the findings along with several recommendations—framed as six key options—for how the Design Collaborative might proceed. A brief concluding discussion follows. Summaries of the studies and literature reviewed for this report are provided in a separate document.

About the Learning System

The Learning System is the product of the Stupski Foundation's extensive examination of research, best practices, and theories of action for improving education opportunities for all children. It is deeply rooted in the Foundation's mission to foster innovation in public school systems so that all students graduate ready for college, career, and success—as well as the notion that the United States' education system, in its current state, is incapable of accomplishing this goal. As stated on the Foundation's Web site, "The basic components of what public education systems need to teach all students to world-class standards, particularly those students for whom public schools are their only option, do not exist in any coherent, accessible or evidence-based way" (Stupski Foundation, n.d.).

Thus, the Foundation has focused its philanthropic efforts on supporting the "fundamental reinvention" of the American system of public education into one that prepares all children for the challenges of life, career, and citizenship in the 21st century. To accomplish this objective, the Foundation launched a multi-year, cross-sector collaboration among researchers and practitioners from inside and outside education to develop a new and comprehensive learning system. In its June 2008 *Strategy and Program Overview* (Stupski, 2008), the Foundation posited that this system includes seven components, shown in Figure 1 (see p. 8). The indicators of success are dependent on a definition of college readiness, which is addressed in the respective report. Although Our Kids is not an explicit component of the Learning System, it is the foundation for the work the Stupski Foundation is committed to in the education sector. As such, the populations of students of color and students of poverty warranted a separate report.

Figure 1: The Learning System



About "Our Kids"

The Stupski Foundation is committed to addressing the academic needs of underserved populations, in particular, students who are of color *and* in poverty (which comprises 42% of African American students and 37% of Hispanic students) (Duncan & Magnuson, 2005). Despite a dramatic rise in minorities enrolling in college (a 50% increase from 1995–2005), fewer minorities appear to be graduating. As shown in Figure 2 (see p. 9), in 2006, fewer minorities aged 25–29 reported having obtained an associate degree or higher than their older peers (aged 30 and over) (American Council on Education, 2008). This trend marks an important reversal in advances in educational opportunities for minorities and may mark the first time in history that a generation of students has demonstrated less educational attainment than its predecessors (American Council on Education, 2008).

Overview of methodology

McREL researchers followed a five-step process for translating findings into recommendations.

Step 1: Identification of key hypotheses

After conducting an initial survey of relevant literature, Stupski Foundation staff members identified the following hypotheses to guide the literature review for the Our Kids component:

If the risk factors Our Kids are exposed to in early childhood were ameliorated, their neurological development would be positively impacted, reducing the achievement gap.

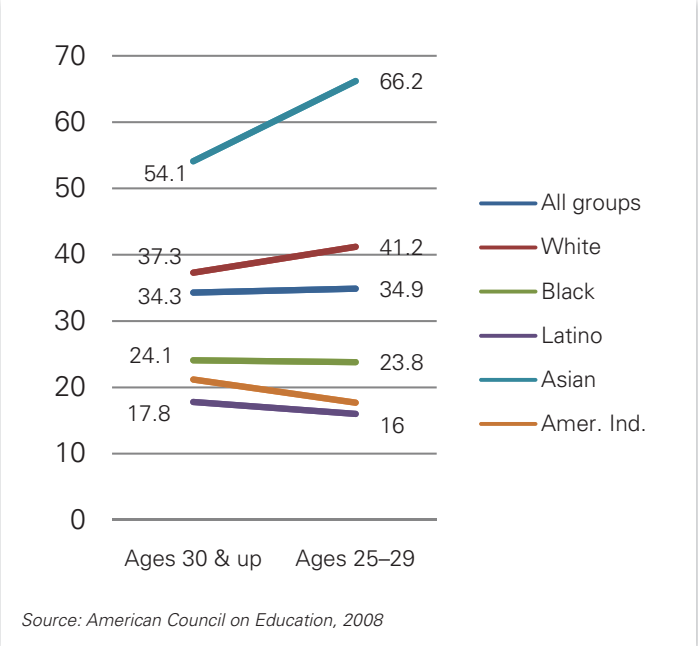
If the risk factors Our Kids are exposed to in early childhood were ameliorated, their approaches to learning would be positively impacted, reducing the achievement gap.

Step 2: Identification of research questions

McREL researchers, in collaboration with Stupski Foundation staff members, generated these questions:

1. Are there discernable differences in Our Kids' brain-based cognitive processes compared to their non-risk peers?
   a. If so, in what ways are Our Kids' brain-based cognitive processes different?
   b. How does the environment (home, school, community) in which Our Kids live influence individual differences in brain-based cognitive processes?
2. Are there discernable differences in Our Kids' approaches to learning compared to their non-risk peers?
   a. If so, in what ways are Our Kids' approaches to learning different?
   b. How does the environment (home, school, community) in which Our Kids live influence individual differences in their approaches to learning?

Figure 2: Percentage of U.S. adults with associates degree or higher, 2006



Source: American Council on Education, 2008

Step 3: Literature search

The two research questions guided a search for literature in several journal databases, including academic databases (JSTOR, ERIC, Academic Search Premier), university library databases (University of Illinois at Urbana Champaign, Indiana University at Bloomington), Web sites of research organizations or universities (Educational Testing Service, University of California, Berkeley), online journals or newsrooms (*Educational Leadership, Journal of Latinos and Education*), among other sources (U.S. Department of Education, Google Scholar, Institute of Education Sciences databases). Additionally, the team consulted internal staff for recommendations and received articles suggested by other conceptual teams. Finally, researchers systematically reviewed the Table of Contents of certain journals (e.g., *Child Development, Cognitive Science*) because of their relevance to the search topic.

Sources were searched by the following keywords:

- Achievement gap
- African American student
- At-risk students
- Bilingual education
- English-language learners
- Low-income students
- Poverty
- Environmental risk

Articles identified were skimmed with particular attention to research methods, outcomes, and recommendations for future study due to gaps in knowledge. We then searched references to other studies in these sources, looking for potential consensus or debate. Meta-analyses of particular topics yielded a wealth of additional sources. This search was an iterative process influenced both by the results of research reviewed and by the changing focus of our search area. The retrieved articles were wide ranging in their methodologies, content, and intended audience from meta-analyses to practitioner-focused journals. A preliminary search of the literature yielded 252 articles, 160 of which were coded and either recommended for inclusion in the literature review or removed because of insufficient rigor and/or relevancy to the conceptual area.

Based on findings from the preliminary search, the articles recommended for inclusion were categorized according to areas of influence on the learning approaches and cognitive brain-based processes of Our Kids. Secondary searches focused on underrepresented factors to determine if there were gaps in the literature. A secondary search yielded additional articles, which were coded and categorized according to the primary factors of influence on Our Kids.

During the writing process, articles were added that provided additional context (e.g., IES surveys, newspaper articles) or were suggested by quality assurance staff as significant authors who were not identified during the search process because their work focused on the general population of students rather than Our Kids. Additionally, as opportunity areas were expanded through team discussions and Stupski team leader meetings, additional articles and innovations were identified. Of the 467 articles reviewed during the initial literature search and later stages of the writing process, 375 were deemed topically relevant and coded within the literature base. Additionally, the team summarized 48 of the coded articles for inclusion in the annotated bibliography.

Step 4: Identification and cataloging of findings

The research team cataloged findings from the summarized articles using the following identifications:

- Counterproductive *orthodoxies* (conventional ways of providing education which may be impeding student success)
- *Unmet needs* (areas where students are not yet well served by the current system of education)

- *Next practices* (a program or practice that needs to be developed, adapted, invented, and tested in response to an unmet need)
- *Promising practices* (practices based on research but not supported by rigorous efficacy data)
- Current *best practices* (practices demonstrated by research to be effective in improving outcomes for students)

Step 5: Generation of recommendations

In the final phase, research team members collectively reviewed key findings from the literature review in light of the following questions:

- What are the critical unmet needs related to this component of the Learning System?
- What is missing in current practices within this component of the Learning System?
- What is working and why?
- What is *not* working and why?
- What are the biggest misalignments between research and current practice?
- What things should educators do differently in light of the research findings?
- Where is the knowledge base too inconclusive to guide education innovation?
- Where is more research needed to advance practice?

Responses to these questions were synthesized into recommendations, presented here as options for further action. These options include best or promising practices that should be *adopted* and scaled up or *adapted* to new settings or areas where there are gaps in practices that require new innovations to be *invented*.

Overview of the literature base examined

The key hypotheses described above guided our search for promising supports and interventions that compensate for the risk factors Our Kids are exposed to. Growing up in high-poverty neighborhoods has been associated with poorer academic achievement and, ultimately, higher rates of dropping out (Harding, 2003). A gap exists in many school readiness indicators—that is, measures capturing a child's pre-formal schooling—between low-socioeconomic status (SES) children and their low- to no-risk peers. When environmental risks are not ameliorated early in a child's life, the knowledge gap between low-SES and high-SES children continues to grow. For minority students, gaps in early childhood knowledge persist all the way into high school. Thus, the researchers focused literature searches around topics impacting the school readiness of low-SES children.

Initially, the Our Kids team, whose members have expertise in the problems facing at-risk students, brainstormed terms for searching. We agreed to limit our search to articles more recent than 1998, unless we identified a definitive piece in the field as noted by more recent researchers.

In summary, the literature reviewed and the findings that follow are derived from a variety of sources representing an array of research methodologies. In light of the difficulty of conducting experimental research on children, as well as the ethical considerations, the Design Collaborative will need to draw upon these data, but also professional wisdom—including a practical understanding of how to develop critical learning pathways for students, insights into the increasing demands of college and workplace environments, and cross-disciplinary examinations of promising practices in other fields (e.g., ongoing technological advances in software, simulation, and gaming technology). Such considerations should (and will) prominently influence the Design Collaborative's interpretation of our findings, as well as their adoption of options that will support Our Kids.

Findings

Our Kids are those students who depend on public education to obtain the skills and training to succeed in life. These students are least served by the current education system and are overwhelmingly represented by children of color and children of poverty. Most critically, Our Kids are more likely to be exposed to a number of risk factors than children from mid-to-high socioeconomic status backgrounds. Low-SES children are more likely to live in unstable, unstructured households; to be exposed to violence in early childhood; to experience corporal punishment; to encounter environmental and institutional stressors; to live in polluted neighborhoods; and to attend educational institutions deemed ineffective and underfunded (Evans, 2004).

Multiple scholars have attempted to isolate the factors mediating the impact of familial resources on child development (for an overview, see National Research Council, 2000). While the home environments of low- and high-SES children vary along a range of factors–for example, the average number of books in the home, or the duration and quality of parent-child interaction–it is too often difficult to distinguish the relative impact of various resource deficits on cognitive development and later achievement. For this reason, isolated interventions (e.g., initiatives to increase books in the home) are less likely to impact Our Kids than broad-based initiatives.

In summary, a large and growing body of research suggests that Our Kids enter school with academic deficits that prevent them from "catching up" barring sustained, intensive effort.[1]

Indeed, multiple scholars have pointed out that Our Kids must achieve a faster rate of learning than high-SES peers in order to reach similar levels of academic achievement in elementary school and beyond (Ferguson, 2001). As Our Kids are also statistically more likely to attend the nation's poorest schools and receive lower quality instruction, achievement gaps evident at school entry too often persist throughout formal schooling (Haskins & Rouse, 2005; Ferguson, 1998).Taken together, findings from developmental neuroscience and outcomes from long-term economic analyses suggest that children of color and children of poverty should receive interventions before they ever set foot in a school. Thus, in this report, we targeted our literature search to address interventions that provide support when children are most disposed to positive change—early childhood.

Environmental risk impacts Our Kids' learning outcomes

The number of stressors a child experiences predicts an increased risk for developmental delays and negative cognitive outcomes, particularly for those children growing up in impoverished environments (Bronfenbrenner, 1974; Huston, McLoyd, & Garcia Coll, 1994; Lengua, 2002). Too often, environments associated with multiple risk factors also fail to provide adequate cognitive stimulation: multiple-risk children are more likely to have fewer literacy resources in the home, such as books, shared reading, and parent-child talk time. Research consistently shows a relationship among cumulative exposure to risk factors, school readiness, and subsequent achievement. Slightly

[1]It is important to note that not all "risk" factors impacting success in typical American educational settings negatively impact cognitive development. As an example, the Design Collaborative might consider research on bi-and multi-lingualism. Developmental research indicates that knowledge of multiple languages can actually improve cognitive performance on some tasks (Bialystok & Martin, 2004; Carlson & Meltzoff, 2008). Thus, when nourished through effective bilingual or multilingual instruction, proficiency in multiple languages may benefit later academic achievement, a finding that dovetails with the recommendations of social commentators (see Nieto, 2002).

more than 50 percent of U.S. children are exposed to one or more risk factors and 15 percent are exposed to three or more (Duncan & Magnuson, 2005) (for a list of risk factors, see Table 1, below).

Combined exposure to risk factors is most commonly associated with low-SES and is most detrimental to school achievement. When multiple risk factors are present, their combined effect can account for as much as 7 to 8 points of achievement test score gaps between Caucasian, Hispanic, and African American students (using a 2005 gap estimation of 15–16 points). Evidence also suggests that exposure to multiple risk factors is more predictive of later achievement outcomes than genetic differences in intelligence. Turkheimer and his colleagues (2003) examined scores of 50,000 sets of twins on the Wechsler Intelligence Scale to understand the impact of environment on intelligence. While the authors found that most of the variation in children's IQ scores could be attributed to genetic differences in middle-class twins, exposure to an impoverished environment accounted for 60 percent of the variance in IQ scores among those children living in poverty.

Table 1. Risk factors for Our Kids

Risk Factors
• Poverty • Infant and child mortality • Low birth weight • Single parents • Teen mothers • Mothers who use alcohol, tobacco, or drugs • Transience • Child abuse and neglect • Lack of high-quality day care • Low-wage jobs for parents • Unemployed parents • Lack of access to health and medical care • Low parent education levels • Poor nutrition • Lack of contact with English as the primary language

Source: Hodgkinson, 2003

Low-SES children are three times more likely to experience excess hardship than middle- and high-SES children. While this relationship holds when researchers control for race and ethnicity, findings also suggest that African American and Hispanic children experience more hardships than their White

Table 2: Percent of children experiencing poverty and hardships by race and ethnicity

Characteristic	White	Black	Hispanic
Experiencing poverty	10	42	37
Experiencing Hardships			
Mother high school dropout	7	18	35
Single parent	15	50	24
No or low-prestige job	8	18	35
Low-quality neighborhood	5	23	21
Three or more siblings	11	12	18
Residential instability	13	12	13
Spanking	7	17	10
Few children's books	2	20	29
Low birth weight	6	15	8
Teen mother	10	22	19
Mother depressed	11	20	13
One or more hardships	52	87	81
Four or more hardship	4	29	18

Source: Duncan & Magnuson, 2005

counterparts (see Table 2). The prevalence of single-parent families, low birth weight, harsh parenting styles, and depressive symptoms is highest among African American children. Hispanic children are most likely to have mothers who did not complete high school and to have few children's books in their home (Duncan & Magnuson, 2005).

Environmental risk factors and brain development: The case for early intervention

Multiple policy interventions have targeted the various risk factors associated with low-SES households. In general, researchers have found that interventions aimed at increasing the socioeconomic resources available in a home (e.g., maternal work and education programs or residential mobility programs) are less successful in improving child academic outcomes than interventions that directly contribute to child cognitive development and health. Early intervention researchers advocate for policy focusing on the provision of a stimulating learning environment in early childhood (Duncan & Magnuson, 2005). Many researchers argue that early interventions and more academic opportunities in early childhood will have the greatest impact in reducing disparities between students when they enter school (Campbell, Pungello, Miller-Johnson, Burchinal, & Ramey, 2001; Barton & Coley, 2008).

The effect of environmental toxins on cognitive development

Developing brains need environments that are free of toxins and provide adequate nutrients (Tang, Akers, Reeb, Romeo, & McEwen, 2006; Weaver et al., 2004) (see Table 3, p. 16). Therefore, research demonstrating that children growing up in low-SES environments are more likely to be exposed to environmental factors disrupting normal brain development is of utmost concern (Lozoff et al., 1998).

Table 3. Conditions and substances that affect the developing brain

Needed for Normal Brain Development	Detrimental or Toxic
Oxygen	Alcohol
Adequate protein and energy	Lead
Micronutrients, such as iron and zinc	Tobacco
Adequate gestation	Prenatal infections
Iodine	Polychlorinated biphenyls (PCBs)
Thyroid hormone	Ionizing radiation
Folic acid	Parental cocaine
Essential fatty acids	Metabolic abnormalities (excess phenylalanine, ammonia)
Sensory stimulation	Aluminum
Activity	Methyl mercury
Social interaction	Chronic stress

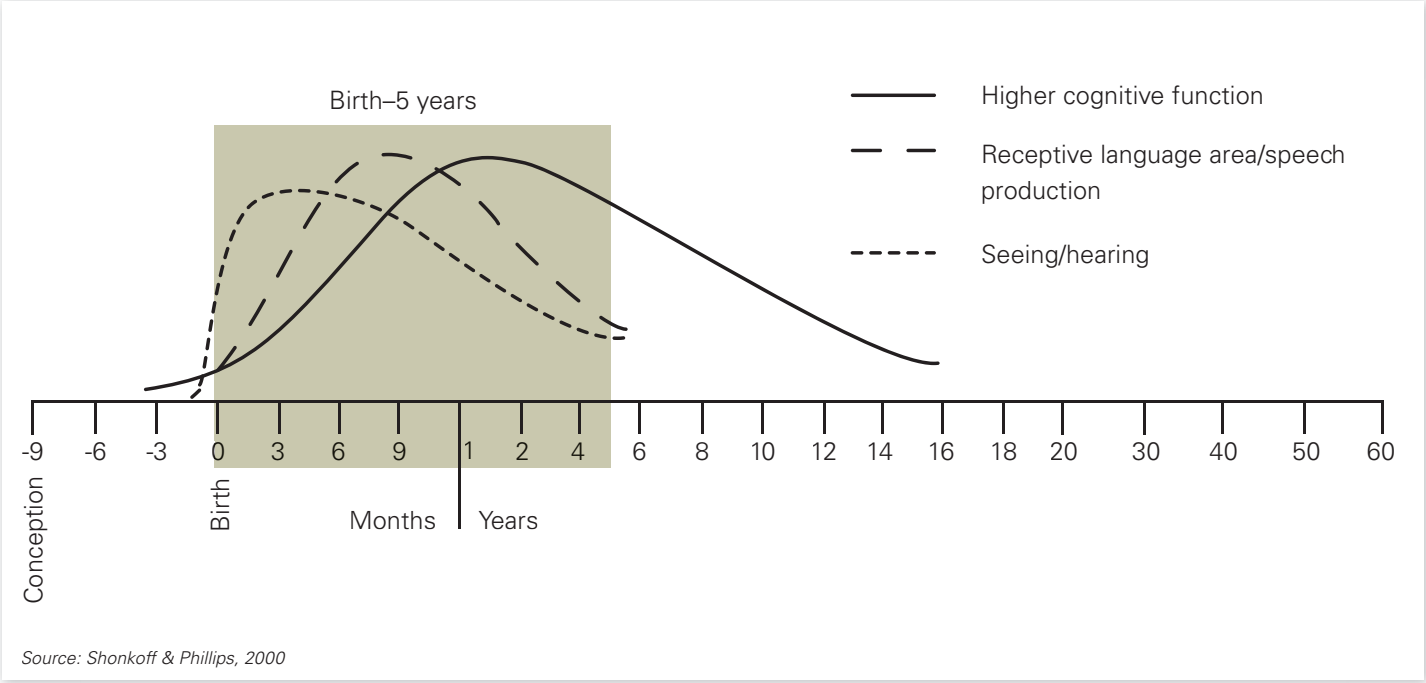
Source: Lozoff et al., 1998

The effect of environmental stimuli on cognitive development

The timing of and exposure to environmental stimuli deeply affects the architecture of a child's brain, providing additional support to the idea that interventions targeting Our Kids should begin in early childhood.

Environments that fail to provide sufficient stimulation contribute to less optimal brain functioning (Grossman et al., 2003), thereby jeopardizing later cognitive development (Rice & Barone, 2000; Levitt, 2003; Center on the Developing Child at Harvard University, 2006). Many of these crucial brain processes take shape before children enter formal schooling (Hensch, 2005; Knudsen, 2004; Kuhl, 2004); for example, different neural components develop at different sensitive periods and ages (see Figure 3 on next page). Low-level components that process sensory stimuli develop before or soon after birth, and higher level processes (e.g., language, face recognition and processing) are finalized in early childhood. In addition, relatively recent developments in brain imaging have allowed researchers to categorize age-specific patterns in neural activity related to school success, such as cognitive control, memory, learning, language, and reading (Noble, Norman, & Farah, 2005). Given these sensitive periods for neurological system development, it is important to deliver age-appropriate experiences for optimal brain development.

Figure 3: Sensitive periods in brain development



Source: Shonkoff & Phillips, 2000

Developing social-emotional skills and approaches to learning to improve school readiness

School readiness requires not only basic knowledge skills, such as counting, language, and concepts of print, but also social and emotional skills. Kindergarten teachers responding to survey questions rated social-emotional skills, such as curiosity, enthusiasm, and turn taking, as more important than knowledge of numbers and letters (Heaviside & Farris, 1993). Teachers in another study noted that students' problems following directions were more often a result of not being able to work in a group, which was a more common problem among minority children (Rimm-Kaufman, Pianta, & Cox, 2000). Although children must be able to follow directions and exert control over their impulses while in class, research indicates that approximately 20 percent of preschoolers from ethnically and economically diverse backgrounds display moderate to clinically significant social and emotional difficulties (Pianta & Caldwell, 1990). On average, children from adverse environments score lower on standard behavioral assessments than children exposed to fewer risks in early childhood (Brinkman et al., 2007).

An additional body of research demonstrates that self-regulated learning is an important component of social-emotional functioning, which is, in turn, predictive of academic achievement (Belsky & MacKinnon, 1994; Entwisle & Alexander, 1993). Pintrich (2000) describes self-regulation as "an active constructive process whereby learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation, and behavior, guided and constrained by their goals and the contextual features in the environment" (p. 453). The presence of self-regulation in preschool children strongly predicts later school achievement, as well as later development in the social and emotional domains (Blair, 2002; Raver & Knitzer, 2002). When present, emotional problems are likely to cross over into other domains that impact a

child's ability to approach learning in an adaptive manner (Olson & Hoza, 1993; Pianta, Nimetz, & Bennett, 1997). Finally, self-regulation problems are predictive of later school problems like aggression, juvenile delinquency, and dropping out (Schunk, 2005). Research has shown that at-risk children are more likely to have poor self-regulation in early childhood. Thus, we argue that the development of self-regulation skills in early childhood would serve as a critical advantage to Our Kids.

Determining what characterizes high-quality early childhood programs

Children enrolled in center-based childcare or preschool programs are more likely to be ready to enter school, but there are racial and ethnic differences in the number of children enrolled in these programs, as well as differences in the quality of the programs.

Black and Hispanic children disproportionately enroll in publicly funded preschools such as Head Start (Neuman, 2003). Additionally, Black children are more likely to attend lower quality preschool programs (Duncan & Magnuson, 2005). Lower quality programs are considered to have a high pupil to teacher ratio, poor literacy environment (available books and resources), and teachers without specialized training in early childcare. Researchers have estimated that improving equal access to quality center-based care would close the gap between Hispanic and White children as much as an estimated 26 percent, and improving Head Start program quality could close up to 4–10 percent of the Black-White gap and 4–8 percent of the Hispanic-White gap (Duncan & Magnuson, 2005).

Gorey (2001) hypothesized that children participating in preschool programs would demonstrate better cognitive outcomes than their counterparts who did not receive preschool instruction, and that better-funded programs would demonstrate larger effect sizes than programs with fewer resources. As with previous research findings, the author determined that, while early childhood interventions were associated with a large initial jump in IQ (13 to 14 points on average), these differences diminished slightly over time. At age five, 69 percent of preschool participants scored higher on IQ tests than control group peers, and 74 percent scored higher on achievement tests. Seventy-four percent of children in the "most intensive" programs scored higher than those children in the control group at the five-year follow-up, while 80 percent outperformed the control group on achievement tests. At five years, treatment group participants' average IQ scores were nine points higher than those of control group participants. Though Gorey determined that children did not retain all of the initial cognitive benefits associated with preschool attendance, he found that participants benefited along other outcome measures. A smaller number of treatment group participants were

placed in special education programs (11% vs. 40% control) or retained (22% vs. 43% control), and high school graduation rates were higher in the treatment group (26% control vs. 48% treatment). Finally, preschool attendees were less likely to become welfare dependent, retain a low-SES classification in adulthood, or exhibit criminal activity that resulted in arrest or self-report criminal behavior.

Gorey's findings confirm multiple reviews of extant research indicating that preschool attendance has been associated with a mixed pattern of positive and null findings on later achievement test scores. More positively, preschool attendance uniformly predicts significant reductions in special education and grade retention (Gilliam & Zigler, 2001). Meta-analyses from the past 25 years find that preschool education produces an average immediate effect of about half a standard deviation on cognitive development in the short term (3 to 4 years beyond preschool) (Camilli,Vargas, Ryan, & Barnett, in press; Gorey, 2001; Nelson, Westhues, & McLeod, 2003; Ramey, Bryant, & Suarez, 1985), or the equivalent of seven or eight points on an IQ test. This change represents movement from the 30th to the 50th percentile on a standard achievement test. Estimated effects are smaller for social and emotional skills but still meaningful in practice (Camilli et al., in press; McKey et al., 1985; White & Casto, 1985). On many measures, a half standard deviation is enough to reduce by half the school readiness gap between children in poverty and the national average. Long-term effects of preschool education have been shown into elementary school and beyond on outcomes such as grade repetition, special education placement, and graduation (Barnett, 2008).

Comparing early childhood educational providers

Several studies have isolated the impact of early childcare environment on later academic and cognitive outcomes. The smallest effects on children's development stem from ordinary childcare; family day care homes show no effect on cognitive development. Small, short-term effects are most often found from childcare centers (NICHD, 2002). Longitudinal studies suggest that the more time children spend in childcare centers, the more negative effects they exhibit; however, when children attend higher quality programs, the negative findings are attenuated (NICHD, 2003; Love et al., 2003). For example, greater childcare quality is associated with higher vocabulary scores through grade 5 (an effect size of .06) (Belsky, et al., 2007).

Much of the support for early childhood programs comes from rigorous studies of three comprehensive center-based programs:

- *The Abecedarian Project* was an intensive intervention that enrolled children in a full-day, full-year program from infancy through kindergarten. Class sizes were small (3:1 for infants and 6:1 for preschoolers), and families received home visits from teachers during the first three years of child enrollment.
- *The High Scope/Perry Preschool* was an intense, full-day, full-year program targeting three- and four-year-old children at risk for failure in preschool classes. Teachers conducted weekly home visits and used a curriculum designed to support self-regulated learning. This program also had a low teacher-child ratio (less than 6:1).
- C*hicago Preschool Program* was slightly less intense and provided low-income children with half-day preschool, kindergarten, and a follow-on elementary school component. The preschool program had a certified teacher and an assistant in each classroom of 18 children and relatively strong parent outreach and support.

All three programs significantly reduced grade retention and the use of special education services and increased high school graduation rates. Additional long-term outcomes included

lower rates of criminal activity, higher work force earnings, lower rates of teen parenting, and reduced rates of drug use and mental health problems (Issacs, 2008).

International results support U.S. findings that quality childcare results in both short-term improvements in children's learning and behavior and long-term improvements, such as reduced crime rates into adulthood (Raine, Mellingen, Liu, Venables, & Mednick, 2003). For instance, a Latin American study found that childcare attendance increased test scores through 3rd grade; decreased school failure; increased educational attainment; and had positive effects on attention, class participation, and discipline (Berlinski, Gailiani, & Gertler, 2006; Berlinski, Galiani, Manacora, 2008). Several studies in the United Kingdom, similar to those performed by National Institute for Child Health and Human Development (NICHD), found small but positive effects on cognitive development several years beyond preschool and weak effects on social development and behavior (Goodman & Sianesi, 2005; Melhuish, Phan, Sylva, Sammons, & Sitaj-Blatchford, 2008; Sammons et al., 2005).

Social environment and brain development: The primacy of the home environment

All other factors being equal, the extent to which caregiver-child interactions are sensitive and responsive predicts later cognitive development and the acquisition of social-emotional skills critical to school readiness. Parent-child social interactions exist within the context of cultural and socioeconomic factors (see Bronfenbrenner, 1999) and vary widely in families from low-income backgrounds (Hart & Risley, 1995).

African American and Hispanic or low-income parents are less likely to attend a school event or to volunteer to serve on a committee (Barton, 2003). Additionally, African American and Hispanic mothers demonstrate, on average, differences in the ways that they nurture, discipline, teach, and use language compared with Caucasian mothers. Additional differences arise when researchers consider the type and quantity of stimulating cognitive materials in the home—African American and Hispanic households have, on average, fewer materials that contribute to a stimulating learning environment than Caucasian households. In general, differences in parenting practices account for an estimated 3 to 9 points of the standard gap in school readiness (Brooks-Gunn & Markman, 2005).

Exposure to language differs widely between low-SES and high-SES children. A seminal study found that children in professional families hear an average of 2,153 words per hour, whereas children in the lowest SES households hear an average of 616 words per hour (Hart & Risley, 1995; see Table 4 on page 21). By kindergarten, the difference in numbers of words heard between

low- and high-SES children could be as many as 32 million words over the course of a year. Parents in low- and high-SES households also varied in use of vocabulary, discourse topics, kinds of utterances, reactions to their children's utterances, and emotional tone. Parents of high-SES children were more likely to respond to children and extend an interaction after a child's initiation, whereas children in low-SES homes heard, on average, twice as many prohibitions as affirmations.

The literacy environment of the home accounts for between 12 and 18 percent of the variation in children's language ability. Thus, Whitehurst (1997) argues that parental literacy programs could be effective in boosting language acquisition within at-risk populations. Citing evidence of the importance of parental involvement in early literacy, researchers suggest that interventions should combine formal schooling with efforts to increase parental engagement in the learning process (Bennett, Weigelb, & Martin, 2002). Recommended strategies include providing additional educational opportunities for the parents of low-SES students and incorporating family literacy training into traditional preschool models (Hanson, 2008).

Table 4: Utterances heard by low- and high-SES children

	Prohibitive statements/ hour	Affirmatives/ hour	Total utterances/ hour	Estimated total utterances at kindergarten
Low-SES Families	11	5	616	13 million
High-SES Families	5	32	2,153	45 million

Source: Hart & Risley, 1995

Discussion & Recommendations

The recommendations and options presented here are derived from the findings reported in the previous section. This discussion was shaped by the research team's understanding of the current "state of play" in this component of the system. In some cases, the authors responded to insights from literature and knowledge outside of education-related fields. In addition to the questions described in Step 5 of the Overview of Methodology (see p. 11), these questions were used:

- What current practices have a strong enough evidence base that they should be *adopted* and scaled up?
- What current practices show enough promise in certain contexts that they might be *adapted* for use in settings for Our Kids?
- Where are there sufficient unmet needs and lack of promising practices to warrant the *invention* of new practices?

These options for further action are not necessarily mutually exclusive. The Design Collaborative might ultimately choose a path that integrates several of them. Nonetheless, pursuit of any particular option presents opportunity costs. To help the Design Collaborative weigh these costs, advantages and disadvantages for each option are presented. The recommendations reflect findings from the literature and the expertise of team members. The following recommendations provide the greatest opportunity to make the most significant impacts in the lives of Our Kids and, consequently, increase the likelihood that Our Kids will achieve post-secondary success.

Option 1: Executive function interventions

Recent evidence suggests that socioeconomic status may influence neurological development, particularly within developing areas of the prefrontal cortex associated with language and cognitive control (see Noble et al., 2005). The term "executive function" may be defined as a prefrontal cognitive system which manages numerous processes requiring cognitive control or mental effort (Jones, Rothbart, & Posner, 2003; Posner & Rothbart, 2000). Executive functions underpin cognitive tasks that are critical precursors of school readiness and later academic achievement, including attention, planning, and cognitive flexibility (Blair & Diamond, 2008). Perhaps unsurprisingly, skills that recruit components of executive function are more predictive of school readiness than IQ or entry-level mathematics and reading skills (see Blair & Razza, 2007; McClelland, Morrison, & Holmes, 2000). Executive function skills have also been associated with academic success over the longer term. Conley (2007) cites self-monitoring, self-control, persistence, and self-regulation—all of which require high-level executive functioning—as important components of college readiness. A growing body of evidence suggests that poverty negatively influences the development of age-appropriate executive skills (Farah et al., 2006; Kishiyama, Boyce, Jimenez, Perry, & Knight, in press), thereby underscoring the importance of delivering interventions that target these functions within impoverished student populations.

In recent years, promising interventions have targeted executive functioning through the training of executive attention. The development of executive functions, in general, and basic attention skills, in particular, is important because they both have repercussions for higher levels of learning and the internalization of rules regulating behavior. Attention skills are especially important for the regulation of emotions and high-level reasoning. Mezzacappa (2004) has demonstrated

that children exposed to SES-related risk factors scored lower than their non-risk peers on standard assessments of attention-related cognitive processes. Rueda and colleagues (2005) assert that it is possible to develop attention skills using video games. The authors conducted a series of experiments to explore age, IQ, and gene-related differences in executive attention in 49 four-year-olds and 24 six-year-olds. Children assigned to the treatment group completed five days of training in executive attention-related activities over a three-week period, while children in the control group either came into the lab for two days of pre/post assessments or spent five days in the lab watching unrelated videos. During each testing session, researchers collected electroencephalogram (EEG) data capturing neural activity in various regions of the brain from a subsample of children. The researchers found, over the course of the experiment, significant changes in neural activity and improved attention skills in treatment children. The researchers also found some improvement in a subtest that captured differences in working, or short-term, memory. Though this research was conducted with a small sample of children, findings from the study suggest that executive attention skills are at least somewhat malleable in young children.

Potential benefits of this option

Interventions targeting executive functions constitute a particularly fertile area for future inquiry. Such interventions hold promise for Our Kids because they directly impact ongoing cognitive development and organization in areas that serve as the foundation for academic success. Whereas traditional early childhood educational experiences available to Our Kids tend to focus on content-specific academic preparation—in other words, the "letters and numbers" approach—EF interventions target the cognitive precursors of self-regulation, socio-emotional development, school readiness, and academic achievement.

Potential challenges and drawbacks of this option

While promising, the research base for brain-based EF interventions is still developing. For the most part, findings associated with EF interventions have not yet been replicated on a large, diverse population of children, and researchers are still in the process of perfecting successful measurement instruments for various executive functions. Additional experimentation to establish the optimal timing, duration, and intensity of EF interventions is needed. At the time of this writing, no brain-based EF or attention-training protocol has been developed for large-scale use by a preschool population. Finally, executive function interventions require significant technological resources that may be lacking in many of the early childhood facilities accessible to Our Kids.

Option 2: Research and design on environmental stress and children's brain development

The relationship of stress to the function of the hippocampus is an area of brain-based research that could benefit from further research. The hippocampus is an area of the brain associated with the storage and acquisition of new memories and is, therefore, critical to learning (Squire, Haist, & Shimamra, 1989). Development research indicates that childhood exposure to a chronically stressful or abusive environment can lead the endocrine system to produce irregular levels of the stress hormone cortisol (Carlson & Earls, 1997). Similar research with adults and animals suggests that the presence of high levels of cortisol correlates with adverse hippocampal functioning (Bremner et al., 1995; Bremner et al., 2000; Tanapat, Galea, & Gould, 1998). Therefore, stress-induced hippocampal reduction may lead to learning difficulties (Squire, Haist, & Shimamra, 1989; Sapolsky, 1992). However, research has yet to establish a link between stress and reduced hippocampal function in children. Given that Our Kids are more likely to experience environmental stressors, more research into how environmental stress impacts learning and memory might aid in the design of educational curricula that target specific brain regions underlying cognitive skills.

Recent research may inform educational curricula and/or interventions targeting children who have been exposed to stressors in early childhood. Of primary interest is the extent to which delivery of interventions later in development can compensate for previous damage, and which mechanisms will help accomplish this. A growing body of research in this area suggests that the provision of enriching environments during later periods of development may repair the impact of previous stress on the hippocampus, though findings have been limited to experimental rodent populations (Francis, Diorio, Plotsky, & Meaney, 2002; Yiang, et al, 2007; Wright & Conrad, 2008). Extant data has also led researchers to theorize that the neural systems regulating behavioral stress responses are hierarchical, suggesting that later developing systems can compensate for lower levels damaged within the system (Francis et al., 2002).

Additional experimentation is needed to determine the degree to which environmental enrichment can alter or reverse the effects of stress on hippocampal development in small children and adolescents. While researchers have long established that clinical interventions can reduce salivary cortisol in children exposed to early adverse environments—a primary indicator of individual stress response—the impact on such interventions on hippocampal development is not well understood (Fisher, Gunnar, Chamberlain, & Reid, 2000; Wolf & Buss, 2008).

Potential benefit of this option

While not as developed as the body of research considering the development of executive function in low-SES children, nascent research into the impacts of environmental stress on hippocampal development suggests that future brain-based interventions in this area will be of significant merit to Our Kids.

Potential challegenes and drawbacks of this option

Several factors hinder research into hippocampal development in the presence of environmental risk. Since brain imaging research involving young subjects is costly and difficult to conduct, sample sizes in most published studies have been small.

Additionally, treatments for children exposed to early environmental trauma will most likely require costly individualized diagnoses and treatment plans. At present, the vast majority of early childhood facilities available to Our Kids do not

incorporate mental health services. Methods of delivery for mental health services vary, and service quality outcomes are mixed. Our Kids may be better served by a "bundled" service model, in which comprehensive student support services are provided through a single point of access.

Finally, researchers have yet to agree on the timing and duration of interventions targeting the hippocampus. While some research has focused on very young children, other studies have demonstrated positive post-intervention outcomes in adolescent children.

Option 3: Integrate evidence-based components of quality care centers

Regardless of the type of center, responsive care giving—that is, care giving typified by adults who adapt their interactions after identifying and understanding child needs—is important throughout early childhood but most crucial in the first two years of life. Early exposure to responsive care giving positively impacts the development of later language skills (NICHD, 2000). Thus, less verbal stimulation and support at childcare centers is associated with poorer performance on measures of language skills.

High-quality care giving has been associated with characteristics such as small group size and low child-to-adult ratios, regardless of child age. When the child-adult ratio is low, caregivers are better able to respond in a caring manner (NICHD 2000; Clarke-Stewart, Gruber, & Fitzgerald, 1994). When caregivers receive training, their care giving is more positive (Berk, 1985). There is much debate regarding the correlation between teachers' education level and child performance outcomes (Early et al., 2007), but many empirical studies have concluded that higher levels of education relate to increased classroom "quality" and child outcomes (Barnett, 2008; Burchinal, Cryer, Clifford, & Howes, 2002; Howes, Whitebook, & Phillips, 1992). Additionally, well-organized, stimulating care environments have also been associated with a higher quality of care.

Potential benefits of this option

A number of cost-effectiveness studies have helped elucidate the benefits associated with additional funding of early childhood programs (for an excellent review of programs and methods, see Reynolds & Temple, 2006). High returns on investment have been associated with both high- and low-intensity childcare programs, including programs that target high-needs children. This line of research provides convincing evidence that a scaled, large public preschool program would lead to measurable economic benefits. The Design Collaborative might leverage this research to gain the support of leading national business organizations to support universal pre-kindergarten.

While it is challenging to replicate the highly intensive nature of the model programs described in the findings above, the long-term benefits for at-risk children would outweigh the costs by more than two to one if outcomes were half as large as those associated with model programs (Aos, Lieb, Mayfield, Miller, & Pennuci, 2004). The Chicago Child-Parent Centers started with federal Title 1 funding in 1967 provide one example of a large-scale, less intensive public program that has established significant, positive child outcomes.

Potential challenges and drawbacks of this option

The research on what constitutes the "ideal" childcare program should be examined with caution. Children's experiences in preschool programs vary considerably due to different policies surrounding early childhood requirements (Early et al., 2005). Differences exist in operating schedules, teacher qualifications, class size and ratio, auxiliary services (e.g., health and social services, parenting education), monitoring and accountability, actual teaching practices, and effects on children's learning and development. Teacher qualifications in state pre-K programs range from little more than a high school diploma to a four-year college degree with specialized training in early childhood education. With such wide program variation, the effects on children vary widely.

Funding challenges have prevented the implementation of high-quality early childhood programs in many regions. Given that teacher training, low student-to-teacher ratio and literacy rich resources are associated with better child outcomes, it is reasonable to expect that more funding must be invested. Ensuring adequate funding alone will not ensure that universal preschool programs will be effective in diminishing the existing achievement gap, however; policymakers must also introduce measures to compensate for the various barriers to enrollment for disadvantaged children.

Option 4: Scaffold self-regulation in early childhood

Scaffolding Early Literacy (SEL) is a program developed by Mid-continent Research for Education and Learning (McREL). The SEL program, based on a curriculum called Tools of the Mind, delivers professional development for early childhood teachers on language and self-regulation. Self-regulation, a critical component of school readiness, is the ability of children to adjust and regulate their social and cognitive behavior in response to feedback in order to set and meet goals. Specific SEL tasks contribute to children's ability to attend to new information and to remember on purpose. Self-regulation is a focus area in the SEL curriculum because of its overall effect on the multiple dimensions of school readiness (Bodrova & Leong, 1996).

In the SEL classroom, most activities incorporate a self-regulatory component. For example, a teacher might encourage children to use private speech or external mediators during a literacy or oral language activity. Specific SEL activities include dramatic play, where children practice making the rules and then following them by regulating their own and their playmates' behaviors (Bodrova & Leong, 2003; Vygotsky, 1977), and make-believe play, during which children's self-regulation and oral language develop. An additional component of the program requires children to develop "play plans," which encourage children to discuss what they will do in classroom centers with their peers and to represent it through drawing, (scribble) writing, or dictation to the teacher. Play plans help children progress from behaviors that are reactive and impulsive to those that are deliberate and thoughtful. A recent study found that after

two years of participating in an SEL program, children from a low-SES urban environment outperformed a control group of children on four tests of executive function, an important predictor of self-regulation (Diamond, Barnett, Thomas, & Munro, 2007). Future research may ascertain the long-term effects of SEL on children's academic attainment; however, the current findings show promise for developing the self-regulation skills necessary for school—and eventually, college—readiness.

Potential benefits of this option

Self-regulation enables children to inhibit actions based on the directions of others and internalize those rules in order to regulate themselves. While this ability is important in its own right, self-regulation has been shown to attenuate negative adjustment in children exposed to adverse environmental circumstances in early childhood (Lengua, 2002). Thus, self-regulation is a protective factor within the multiple-risk context experienced by Our Kids. Recent research conducted by Diamond et al. (2007) demonstrates that the Tools of the Mind curriculum discussed in the preceding paragraphs has a positive impact on executive function skills recruited for self-regulation. The Design Collaborative would be wise to invest more time in research and design to develop a method to adopt and scale up such interventions as Tools of the Mind.

Potential challenges and drawbacks of this option

Although study results are promising, future research into curricular interventions targeting cognitive control should incorporate more extensive and rigorous designs to better ascertain the effects of the intervention on a large, diverse population of children. Additionally, it is not known what the long-term benefits are of self-regulation interventions. Finally, current accountability requirements in school districts, which have trickled down to the preschool classroom, may make it challenging for programs to build in time to target social-emotional skills not measured on standardized tests.

Option 5:
Research and design on programs to support parent scaffolding of children's self-regulation

Optimally, parents create a "scaffold" to support children in increasing their skills and knowledge to reach a higher stage of independent functioning (Behrend, Rosengren & Perlmutter, 1992; Wertsch, McNamee, McLane, & Budwig, 1980). This scaffold, or "other-regulation," enables children to gradually learn to take more regulatory responsibility so that their cognitive monitoring can be transferred from "other" to self-regulated performance during independent tasks (Rogoff, 1990; Rogoff, Mistry, Goncu, & Mosier, 1993; Rogoff & Wertsch, 1984; Wertsch, 1979). Through appropriate

parental guidance and instruction, children learn which aspects of their environment they should direct attention to in order to gather relevant information. However, Jacobvitz & Sroufe (1987) suggested that intrusive maternal behavior in parent-child interactions might interfere with children learning to regulate their own responses to situations. Hubbs-Tait and colleagues (2002) have also published research suggesting that parent intrusiveness may hinder children's performance in independent tasks.

Additional studies indicate that parent efforts to (a) emphasize scaffolding behaviors in the home and (b) encourage children to solve problems independently at an early age could enhance later reasoning and mathematical ability (Assel, Landry, Swank, Smith, & Steelman, 2003). In a classic study, Lewin, Lippitt, & White (1939) demonstrated that children whose parents delivered developmentally appropriate levels of control had children who displayed more persistence at assigned tasks than children whose parents were under- or over-controlling, providing poor scaffolding of self-regulation. Ryan (1993) proposes that when parents or teachers apply appropriate scaffolds that promote the development of self-regulation, children are more likely to internalize values and goals and are therefore less likely to require external regulation for compliance. Ultimately, the goal of parents and educators is to facilitate children's independent task performance, a necessary skill for a successful transition into the school setting. Given that research has found that scaffolding training for early childhood teachers improves children's self-regulation, literacy, and executive function, future studies should focus on parent training programs that incorporate these practices.

Potential benefits of this option

Statistical studies demonstrate that children growing up in impoverished, multiple-risk settings are also more likely to have mothers demonstrating less warmth, on average, than mid-to-high SES mothers (Ackerman, Izard, Schoff, Youngstrom, & Kogos, 1999). Longitudinal research has demonstrated that minority and teenage mothers score lower on standardized assessments of maternal warmth (Brooks-Gunn, Klebanov, Liaw, & Duncan, 1995). Interventions that assist and support low-SES mothers in the development of nurturing parent-child interaction have been found to positively impact child learning experiences. The Design Collaborative should consider the research on training parents in responsive care giving and scaffolding. Emphasizing these behaviors in the home (rather than during direct classroom instruction) and encouraging children to independently solve problems at an early age would most likely enhance the levels of reasoning and achievement in Our Kids.

Potential challenges and drawbacks of this option

When considering the literature on parenting behaviors and child outcomes, the Design Collaborative should note that it may be difficult to distinguish parental impact from the confounding effects of genetics, family-social dynamics, caregiver educational backgrounds, economic circumstances, and other variables that may impact child development. Additionally, research has shown that home-based programs alone are not enough. To significantly affect child achievement outcomes, center-based programs with a separate emphasis on parent training should be considered.

Based upon their analysis of data from the Early Childhood Longitudinal Study (ECLS-K), the National Urban League Policy Institute argues that interventions should combine formal schooling with efforts to increase parental engagement in the learning process (Hanson, 2008). Should the Design Collaborative consider this option, it is also recommended that strategies incorporate

family literacy training into traditional preschool models.

Option 6: Parent support programs

While parent interventions focused on scaffolding offer one specific avenue for in-home interventions, a large number of existing in-home programs focus on literacy, combining more traditional parenting instruction with improved access to critical resources and support. Following our review of the literature, we have selected two programs for discussion based on their exemplary practices and outcomes: The Nurse-Family Partnership program and AVANCE, a program for Latino parents. While these programs focus on in-home activities, other researchers have called for school-based initiatives (see, for example, Noguera, 2001 and Warren, 2005). While the authors of this paper feel such initiatives have merit, we have limited our discussion to programs that impact children during critical developmental periods in early childhood. In addition to our discussion of specific, ongoing initiatives, we have also included a general discussion of best practices in literacy-specific programs.

The Nurse-Family Partnership program

Research indicates that children in low-SES environments are more likely to have a caregiver with mental health problems. Children's emotional development is highly influenced by parental mental health, particularly maternal depression. Children of depressed mothers are at heightened risk for psychopathology in childhood, including affective (i.e., mood) disorders, behavioral problems, difficulties in school performance, and poor peer relationships (Coghill, Caplan, Alexandra, Robson, & Kumar, 1986; Downey & Coyne, 1990; Erickson, Sroufe, & Egeland, 1985; Ghodsian, Zajicek, & Wolkind, 1984; Grunebaum, Cohler, Kaufman, & Gallant, 1978; Orvaschel, Welsh-Allis, & Weijai, 1988; Redding, Harmon, & Morgan, 1990). Additionally, infants of depressed mothers display reduced brain activity in the left frontal brain region, an area that plays a role in the experience of positive emotions, such as interest (Tucker, 1981). Perhaps unsurprisingly, research has shown that mothers who suffer from depression tend to be less responsive to their infants and display greater negative affect, or propensity towards irritability and unhappiness (Cohn, Campbell, Matias, & Hopkins, 1990).

The Nurse-Family Partnership program is a promising program that focuses on providing mental and general health support for first-time mothers typically within at-risk populations. This program is an evidenced-based community health program delivered by registered nurses whose goals are to 1) improve pregnancy outcomes through preventive health practices, prenatal care, diet and nutrition, and reduction of alcohol, drugs, and other toxins; 2) improve child health by helping parents provide care; and 3) improve the

economic self-sufficiency of families through future planning services, continuing education and employment services. The program's success is attributable to several components:

- Mothers view the nurses as trusted and competent professionals and as a consistent "life line."
- Outreach typically begins during the first trimester and continues throughout the first two years of life.
- Nurses come to the homes of the mothers, thereby eliminating barriers such as transportation or previous experiences that may otherwise prevent mothers from seeking help.
- There is accountability and monitoring of the program. The partnership personnel enter data from each visit into a national Web-based system in order to monitor that the program is being implemented with fidelity.

Results from a randomized controlled trial found significant and persistent positive program effects on mothers and children up to 15 years after they were in the program:

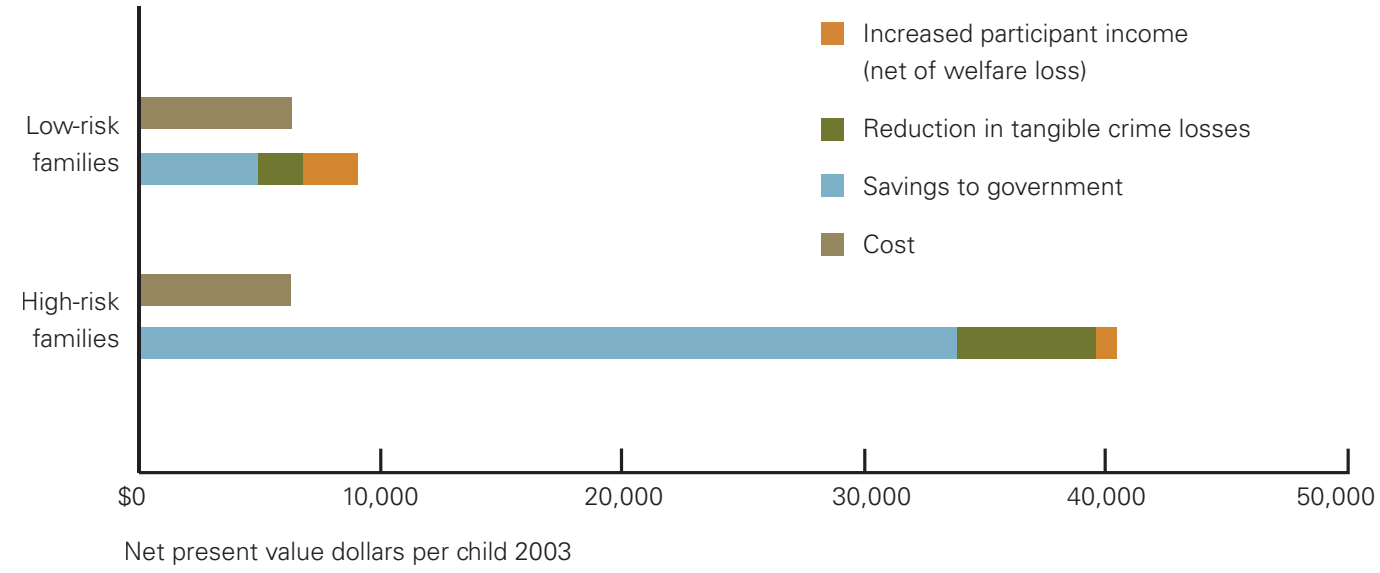
- 48% reduction in child abuse and neglect
- 56% reduction in emergency room visits for accidents and poisonings
- 59% reduction in arrests at age 15
- 67% reduction in behavioral and intellectual problems at child age six
- 72% fewer convictions of mothers when the child reached age 15

Additionally, the program appears to be cost effective. An independent analysis by the RAND Corporation (see Figure 4, below) found that, for every dollar invested in the Nurse-Family Partnership, society received a return of $5.70.

AVANCE

Early education and intervention professionals are increasingly encountering children and families

Figure 4. Cost-benefit analysis of Family-Nurse Partnership program



Source: Karoly, Kilburn, & Cannon, 2005

from culturally diverse backgrounds. Latinos represent the largest and fastest growing minority group in the United States (U.S. Census Bureau, 2003). Nationally, Latino parents' participation and children's enrollment in early childhood education and early intervention services is lower than that of parents from other racial and ethnic backgrounds (NCES, 2000a). On average, Latino children enter kindergarten academically behind their peers, and the gap grows wider as children get older. Prior to entering kindergarten, Latinos are less likely to recognize letters of the alphabet, participate in storybook activities, count up to at least 20, and are more likely to scribble rather than write or draw (NCES, 2000b).

One organization that has shown success in reaching Latino parents is AVANCE, a nonprofit that helps immigrant children and families break the cycle of poverty through lessons in early childhood development, parent skills, adult literacy, and healthy marriages. A typical AVANCE parent program consists of 27 lessons taught over a month-long period covering the role of parents in various aspects of child development, including cognitive, physical, social, and emotional growth. The program emphasizes language development and effective discipline. In one class, parents learn to make toys that teach preschoolers skills and concepts through play. Additionally, parents learn how to access support through a community resources class. AVANCE also provides services that encourage parent participation, including transportation and childcare during class. Classes targeting fathers are offered in the evenings, while all parents are also offered classes in English as a Second Language, General Education Development (GED), and other college-level subjects. AVANCE works in urban and rural communities predominantly composed of low-income Mexican-American families and targets families with children under age four in its core program.

A 1991 study by the Carnegie Corporation of New York (Johnson & Talker, 1991) demonstrated significant changes in AVANCE participants' knowledge, attitude, and behavior. In another study (Rodriguez, 1993), 94 percent of the children of AVANCE participants graduated from high school, and 64 percent of the women who obtained a GED from AVANCE went on to attend college or a technical program. A randomized controlled trial examined the effectiveness of the AVANCE Parent Child Education Program and found that AVANCE program mothers provided a more organized, stimulating and responsive home environment; had more developmentally appropriate toys; initiated more social interactions; talked more with their children; and encouraged more child verbalizations. In self-assessments, AVANCE program mothers also reported more nurturing attitudes towards their child, a greater sense of parental efficacy, increased parental knowledge and skills, and enhanced knowledge and use of community resources.

Best practices in home literacy initiatives

In a meta-analysis of family literacy interventions, the authors reviewed 16 studies of 1,340 families to determine the impact of specific family-child reading activities on emergent literacy (Senechal & Young, 2008). The authors found that parental interaction and involvement positively influenced emergent literacy, with an effect size of .65. Variability in the effect sizes of individual studies (ranging from .07 to 2.02) led the researchers to examine the impact of intervention design on literacy outcomes. They categorized studies according to three typical patterns of intervention: 1) parents read to the child, 2) parents listened as their child read, or 3) parents worked with their children on specific pre-literacy and literacy skills using activities prescribed by the intervention. The third intervention style was associated with the largest effect size (1.15), while studies in which children listened to their parents read were slightly less effective (yielding an effect size of .52), and studies in which children simply read to their parents showed no significant effect on child literacy outcomes.

These results provide important insight into effective strategies for educators who want to increase parental involvement in early literacy efforts. The researchers' findings suggest that caregiver involvement can positively influence the development of emergent literacy in young children, particularly when those caregivers receive training in specific, targeted reading activities.

Potential benefits of this option

Parent support programs offer several benefits. Programs focusing on improving parent-child interactions directly impact the cognitive development of enrolled children while also addressing sources of environmental risk in the home. Additionally, when implemented effectively, such programs improve parents' access to critical resources as well as to parent-training components that increase their own employment prospects. Increased resources are likely to lead to greater environmental stimulation at home, resulting in improvements in child cognitive and social-emotional development.

Potential challenges and drawbacks of this option

When considering parent training programs, the Design Collaborative should consider the professional development and advanced training that will be necessary for early childhood educators to interact with diverse populations. A national survey of 117 state administrators of early childhood programs in 48 states and Washington, D.C., gathered information on the enrollment of Latino children and families. Early childhood program administrators reported that the most urgent challenges in serving the Latino parent population were lack of Latino or bilingual staff and lack of sufficient preparation and training (Buysse, Castro, West & Skinner, 2004). Currently, the research in this area is limited; however, the preceding study suggests that it will be necessary in the future to increase the professional development and standards of early childhood educators to include culturally specific content. Our Kids have diverse linguistic and educational needs; thus, early childhood professionals need advanced training which will allow them to address a wide array of cultural circumstances.

An additional challenge with any parent outreach program is participation. Particularly among the parents of Our Kids, multi-shift work weeks, unpredictability or changes in employment status, and high mobility rates can make participation in parent training programs difficult, if not impossible. The Design Collaborative will need to consider culturally sensitive designs to strengthen instructional training, as well as methods to encourage attendance and participation such as childcare and incentives.

Finally, the most effective parent-training programs currently serving Our Kids seek to connect parents with multiple resources, including inexpensive, accessible health care; literacy materials and training; job skills that improve workplace earnings; and training in parenting strategies that improve child outcomes. Successful programs often connect parents to multiple community partners in order to effectively leverage resources, which could prove difficult to replicate nationally.

Challenging orthodoxy to implementing options: Parental leave policies in the United States

Research has found that working 30 hours or more per week in the first nine months of a child's life is associated with lower school readiness scores as measured by the Braken School Readiness assessment. This finding was consistent even after researchers controlled for the quality of childcare, the quality of the home environment, and maternal sensitivity (i.e., a mother's ability to perceive, interpret, and appropriately adapt to infant behavior) (Brooks-Gunn, Han, & Waldfogel, 2002). Current parental leave policies in the United States allow for a maximum of three months of unpaid leave. However, of those eligible for leave, few can actually afford to get by without earned income and return to work much sooner than recommended by research. The current leave policies under the Family Medical Leave Act (U.S. Department of Labor, 1993) are in conflict with a large body of evidence supporting the importance of early mother-child interactions for later cognitive and social readiness. Additionally, such policies raise concerns about the potential harmful effects of questionable out-of-home experiences on the youngest of children (Waldfogel, 2001). If parent intervention programs are to be most effective, parents and caregivers must have opportunities to provide these experiences.

Compared with other industrialized nations, the United States provides the least amount of parental leave following childbirth. Most industrialized nations generally provide some degree of compensation during this time (compared to the United States, where the leave is unpaid). Other advanced industrialized nations who are members of the Organization for Economic and Community Development provide, on average, 10 months of subsidized leave. Extending the coverage and length of the current leave provided under the Family and Medical Leave Act (U.S. Department of Labor, 1993) to at least 10 months and providing universal and paid coverage would allow time and economic security for new mothers to focus on developing a strong bond with their infant, nurturing their relationship, and promoting subsequent healthy development (Waldfogel, 2001).

Final Thoughts

Our Kids are more likely to enter kindergarten trailing their mid-to-high SES peers, and are more likely to have difficulty taking advantage of the instruction they receive. Both circumstances contribute to a pervasive and troubling national achievement gap (Juel, 1988; Neuman & Celano, 2006; Stanovich, 1986). The recommendations and options outlined in this report focus on early childhood initiatives, as national interest has highlighted the prevalence of children entering kindergarten without requisite readiness skills to take advantage of the kindergarten curriculum (Apthorp, Clemons, & Douglas, 2007; Chernoff, Flanagan, McPhee, & Park, 2007; McREL, 2007). The Design Collaborative should consider the following in the design of a comprehensive learning system for Our Kids:

- Findings from a large number of neurological and economic studies suggest that interventions targeting Our Kids in early childhood will provide the greatest return on societal investment.
- Early care programs, in order to produce positive effects on children's behavior and later reductions in crime and delinquency, should be designed to develop the whole child, including social and emotional development and self-regulation.
- Parent support programs that reinforce center-based practices are needed to ensure children acquire the cognitive and social skills to enter formal schooling at the same level as their non-risk peers.
- Research on "promising practices" in early childhood program structures suggests that high-quality programs have small class sizes, employ well-educated teachers, and provide them with adequate pay. Despite the promise associated with these findings, additional research is needed to ascertain the long-term impact of each component.

The Design Collaborative is encouraged to examine converging evidence in the fields of economics, neuroscience, and developmental psychology, which points to the primacy of early childhood as a period for the development of skills that will greatly influence outcomes later in life. When taken together, extant research in human capital formation, brain architecture and development, and our nascent understanding of gene-environment interaction make a compelling argument that early intervention is our best hope for leveling the playing field. In this view, prevention, rather than remediation, should be a primary policy focus for at-risk children.

Many interacting systems within a child's environment influence development. We suggest that each system be addressed in a systematic, comprehensive plan to address the achievement gap between Our Kids and the general population of American schoolchildren. This suggestion is supported by the bioecological framework, which has origins in developmental psychology (Bronfenbrenner, 1974, 1999). This framework includes two categories of influence, "proximal" (close to the child) and "distal" (away from the child). The proximal or "close to" category includes factors which have a direct impact on the child, such as teacher-child interaction, parental education values, amount of reading in the home, and daily nutrition. The distal or "away from" category includes environmental factors that have a less direct impact, such as home, neighborhood, and school. A single factor, either proximal or distal, does not cause a specific child

outcome; instead, there are complex interactions between children and their environment. We suggest that all systems, such as family, school, parental workplace, social networks, and the greater community come together to affect child development and achievement outcomes. Such comprehensive approaches will also more adequately address the needs of children exposed to multiple risks in both categories, especially if taken during early childhood. Comprehensive and early approaches will best prepare Our Kids for school entry and reduce SES-based disparities in achievement.

We acknowledge that the effects of poverty extend beyond early childhood; however, our intention is to present support for early intervention.[2] Research has demonstrated that achievement gaps begin in early childhood, making early intervention critical, if not crucial (Haskins & Rouse, 2005). Despite the documented importance of providing access to high-quality early childhood programs for closing the achievement gap, in 2006–2007, only 38 states and the District of Columbia had funded pre-K programs, spending more than $3.7 billion (Barnett, et al., 2008). This is inconsistent with evidence from cost-benefit analyses and neuroscience research that clearly demonstrates the value of investing in early childhood interventions in order to yield the greatest returns in social capital.

[2]To avoid duplication of effort, McREL researchers intentionally limited the scope of review and analysis for this report to innovations and practices specifically targeting early childhood. The Student Supports review in this set of reports targets programs and services needed to provide a safety net for Our Kids when interventions are not delivered in early childhood. Readers may want to consult the Student Supports report to identify ways to weave the direct teaching of important affective skills into the curriculum.

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Appendix

Literature review method

In June 2008, the Stupski Foundation created a conceptual framework for the reinvention of American education. The framework identified seven essential components and focused on delivering 21st century college readiness for all students, but especially for "Our Kids," children of color and poverty. The Foundation explained that "graduating all students from high school with the knowledge and skills that qualify them as 'college ready' is the most meaningful and measurable way to increase life choices and options for all children, but most especially children of color and poverty" (About the Foundation, para. 3).

The Learning System includes four core teaching and learning components: Curriculum, Assessments, Pedagogy, and Supports. Surrounding these components, are three organizational components necessary to support the core: Leadership/Human Capital, Systems Diagnostics, and a Dashboard of College Readiness Indicators (College Readiness Learning System, n.d.).

The Foundation envisions convening a Design Collaborative, a cross-sector group of researchers, practitioners, and designers from inside and outside education, to "define, develop and continually improve" (Design Collaborative, n.d.) all of the components. To orient Design Collaborative members to the accumulated and maturing knowledge base related to each of the components and to children of color and poverty, the Foundation contracted with Mid-continent Research for Education and Learning (McREL). McREL conducted eight literature reviews—one on each of the components plus one on Our Kids—to identify and integrate theories and philosophical perspectives, issues, scientifically based research practices, unmet needs, and innovations relevant to designing one or more of the system components to accelerate learning for Our Kids.

This Appendix contains a description of the review method, including a general explanation of McREL's approach and descriptions of the particular procedures used for each phase of the review: identification of key hypotheses and research questions, literature search, identification and cataloguing of finds, and generating and communicating recommendations.

McREL's overall approach

Since the primary users of the reviews are the members of the Design Collaborative, the qualitative, iterative approach taken for the literature reviews sought to achieve the multiple goals of identifying emerging ideas, counterproductive orthodoxies, and promising practices relevant to the reinvention of the Learning System. Thus, eight research teams were assembled, each with one or more researchers familiar with the respective topic areas.

Qualitative approach. A *qualitative approach* shares several practices with those of *systematic reviews*, including comprehensive searches and transparency to reduce bias, but it differs with respect to inclusion/exclusion criteria. Systematic reviews emphasize explicit and a priori inclusion/exclusion criteria and criteria for evaluating the methodological quality of individual studies, carefully limiting the sources of evidence to support inferences about cause and effect relationships (Cooper, Hedges, & Valentine, 2009). The qualitative approach emphasizes diverse sources and types of evidence and knowledge to support a broader base of inferences (Pope, Mays, & Popay, 2007; Suri & Clarke, 2009).

The qualitative approach is particularly well-suited to the review's purpose and audience because the Design Collaborative needs both empirical studies and other literature to identify possible innovations for the current education system. An assumption underlying the Foundation's work to fundamentally reinvent American education is that the current system fails to deliver college readiness for all students, especially Our Kids. This assumption is supported by research indicating that students of color and in poverty have low high school and college graduation rates, and research from the last two years shows that college graduation rates for minority and poor students have further declined (American Council on Education, 2008). Therefore, a priority for the Foundation's work is to identify innovations that have not yet been studied, with the intent to evaluate their effectiveness. Literature specific to innovations is found outside the traditional scientific or academic journals.

Inclusive approach. McREL researchers adopted an inclusive approach, searching for and including phenomenological reports describing the experiences of Our Kids in and out of school and documenting the challenges and successes of their teachers and educational leaders. The researchers included literature on innovative, emerging models and untested ideas, as well as reports on mature, well-specified models with experimental evidence of effectiveness. Relevant quantitative research literature included correlational and experimental studies and meta-analytic reviews. Narrative reviews of research were included, as were policy briefs and position papers produced by opinion leaders and professional organizations. Literature sources included the World Wide Web, peer-reviewed journals, and practitioner magazines. Each document was identified by type of literature and evaluated in terms of the quality of the supporting evidence. Care was taken to draw only those inferences appropriate to the quality of the evidence.

McREL researchers judged the quality of the evidence in the context of the type of literature or study design and in relation to its relevance to answering particular questions. Guidance from Pope, Mays, and Popay (2007) on conducting reviews in the field of health research supports this approach:

> The inclusion of diverse sources of evidence in a review does not mean abandoning the rigor of a systematic review, but it does mean judging the quality of evidence in context and defining the relevance of evidence to answering specific questions, rather than defining some forms of evidence as intrinsically, and universally, of lower quality than others. (p. 1)

Each research team followed the five or six phases of any review process relevant to a quality knowledge synthesis (Cooper, Hedges & Valentine, 2009; Suri & Clarke, 2009). Table 1 (see p. 63) provides a side-by-side comparison of the phases of a systematic review of research (Cooper, Hedges & Valentine, 2009), a qualitative review (Suri & Clarke, 2009), and McREL's approach to this review.

Each team began by drawing from pertinent philosophical and theoretical literature and preliminary discussions with the Foundation to formulate hypotheses and research questions. Each team conducted extensive searches to find as much relevant literature as possible in order to include literature from the scientific and academic journals as well as literature from harder-to-find, cutting edge innovators. Additionally, teams revisited databases and alternative sources to purposefully search for additional literature written by authors identified by one or more stakeholders or to fill conceptual gaps that became apparent during the identification and cataloguing of findings and generating and communicating recommendations phases.

The phased process was iterative (Cooper, 2009) reflecting new understanding and insights as the search, analysis, interpretation, and discussions between component teams and between the Foundation and McREL progressed toward conceptual clarity and the exhaustion of new search hits. The number of documents included in each team's review was extensive, and the types of literature varied representing the experiential knowledge of a diverse group of stakeholders, including researchers, teachers, administrators, program developers, and leaders and scholars at the local and national levels.

Team approach. Teams were composed of researchers and practitioners with different areas of expertise. Teams met weekly, and team leaders from across teams met biweekly. Meetings were used to update other individuals and teams and share resources, pose and address questions, challenge assumptions, provide guidance on interpretation of evidence, open up new areas of consideration, clarify boundaries and overlap between system components, consider alternative perspectives, and develop connected understanding.

Identification of key hypotheses and research questions

McREL teams began by clarifying terms, relationships, and the conceptual scope of each review. Teams read and discussed a document produced during the Foundation's strategy definition process, *Research Guide for CRLS: Outline of Research Questions for Each Component of the CRLS* (n.d.). Included in this Guide were preliminary questions for each literature review. Teams previewed relevant literature, confirmed that the questions could be answered by the extant knowledge base, and posed additional questions when important issues related to accelerating learning for students of color and poverty were identified in the literature but missing in the Guide. The revised set of questions for each system component and Our Kids was reviewed and refined during ongoing dialogue between the Foundation and McREL.

Table 1: Phases of a literature review

Phase	Cooper, Hedges & Valentine (2009, p. 8)	Suri & Clarke (2009, p. 414)	McREL's approach
1	Problem formulation	Drawing from pertinent philosophical and theoretical discussions	Identification of key hypotheses
2		Identifying an appropriate purpose	Identification of research questions
3	Data collection	Searching for relevant evidence	Literature search
4	Data evaluation	Evaluating, interpreting, and distilling evidence	Identification and cataloguing of findings
5	Analysis and interpretation	Constructing connected understanding	Generating and communicating recommendations
6	Public presentation	Communicating with an audience	

Literature search

Multiple searches were conducted in a phased approach to identify as much literature as possible related to each system component and Our Kids. Teams conducted searches using multiple bibliographic databases: Academic Onefile, Academic Search Premier, Educators Reference Complete, ERIC, JSTOR, Proquest, and PsychInfo. Teams also conducted manual searches of journal and book tables of contents and reference lists of articles. Additional searches were conducted specifically to identify recent experimental and other research and reviews on the efficacy of interventions for accelerating learning of students of color and poverty. These searches were conducted by visiting the U.S. Department of Education What Works Clearinghouse Web site (http://ies.ed.gov/ncee/wwc/reports/) and the Campbell Collaboration Library of Systematic Reviews Web site (http://www.campbellcollaboration.org/library.php). Relevant documents were identified on state education agency (SEA) Web sites, and SEA officials were interviewed or named as seminal authors or sources of models that had been developed and implemented to monitor and accelerate learning of Our Kids.

Each team identified and used key terms and synonyms relevant to the topic for searching. Searches were conducted for literature published in the most recent 10 years (1998–2008); however, works by seminal authors and other recommended literature were included from outside these years. The search landscape varied for each team based on the topic and relevant sources; for example, while What Works Clearinghouse was a relevant source for the Pedagogy team, it was not a relevant source for the Leadership/Human Capital team. Internal review of search records and results led to additional leads on sources. Searching continued until all recommendations had been implemented and/or few new hits were identified.

Identification and cataloguing of findings

A coding protocol was developed and implemented to categorize the literature. Each team used the same protocol, adding categories and decision rules, as needed to organize the particular literature relevant to their topic. Each team leader and one or more members of each team were trained on the decision rules in the coding protocol and provided follow-up support to resolve uncertainties in its application. Team leaders periodically conducted quality assurance reviews of completed coding sheets and updated the protocol as needed during weekly team leader meetings or discussions with the Foundation. The coding protocol included identifying the following information:

The coding protocol included identifying the following information:

- Full APA reference citation
- Category of literature (i.e., primary and secondary relevance)
- Type of literature (e.g., quantitative study, policy brief, program description)
- Locale
- Outcome
- Grade level
- Program or innovation name and description
- Main findings or points
- A recommendation for or against summarizing and including the selection in an annotated bibliography

In addition, component teams added to the protocol by categorizing relevance to particular parts of their conceptual model or concept map.

Guidelines were developed and used by teams to identify counterproductive orthodoxies, unmet needs, next practices, promising practices, and best practices based on type of literature and quality of evidence. These were defined in the following ways:

- *Counterproductive orthodoxies*: Conventional ways of providing education which may be impeding success of Our Kids
- *Unmet needs:* Areas where Our Kids are not yet well served by the current system of education
- *Next practices:* A program or practice that needs to developed, adapted, invented, and tested in response to an unmet need related to accelerating learning for Our Kids
- *Promising practices:* Practices based on research but not supported by rigorous efficacy data from randomized controlled trials
- *Best practices:* Practices demonstrated by one or more randomized controlled trials to be effective in improving outcomes for Our Kids

The research team reviewing the college readiness component of the Learning System employed a slightly different process. Rather than using the categories above, this team reviewed literature on college readiness and categorized findings into four essential areas as defined by the Foundation and Conley (2007): cognitive strategies, content knowledge, academic behaviors, and contextual skills.

Component teams met weekly to discuss and categorize findings and to develop a conceptual map of the insights gained from the literature summaries and review. Teams used different conceptual mapping tools (e.g., SmartArt) to organize the insights (findings) and presented and discussed their respective maps at cross-team meetings. Features common across teams' concept maps were identified and a standard framework developed. Teams arranged findings onto the concept maps, identifying conceptual gaps and conflicting or discrepant findings, and returned to searching and reviewing to fill in the gaps and resolve or explain discrepant findings. The conceptual maps served as an organizing framework for report construction.

Generating and communicating recommendations

Working collaboratively, component teams drew conclusions from the insights (findings) derived from the review and identified potential options and recommendations for each component of the system. Teams used an iterative process of identification, reviewing for validity against the knowledge base, and further refinement until they determined they had identified the most promising options and that each was informed by the existing knowledge base.

Team leaders used the outcomes of team discussions and cross-team discussions, literature summaries, and the researcher's own review and integration of the literature to write a draft report of the findings. Draft reports were reviewed by knowledgeable internal experts and revisions in search strategies, interpretations of findings, and/or conclusions were made. Revised reports were reviewed by the Foundation and other outside reviewers prior to final revisions and production.

Although the wide-ranging literature searches produced reports on extensive baseline information related to Our Kids and each system component, the reports are living documents. As living documents, they bridge the creative and scientific enterprises of the past and present, and we envision the need to return to some of them for updating, extending, and drilling-down in the future.

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