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PK-3: An Aligned and Coordinated Approach to Education for Children 3 to 8 Years Old

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Abstract

The United States is as known for its high-quality universities as for its poor-quality public schools. Many states are taking steps to improve the likelihood that their children will succeed in grades K-12 by providing funding for pre-kindergarten (PK). More than $2.4 billion dollars is spent on these programs, and the number of children participating in these programs exceeds those in Head Start and will likely increase. Given the current spending on these early childhood education programs, research should contribute to informing how to maximize the dollars spent on them. Research indicates that while there are positive outcomes for children participating in early intervention and PK programs, just participating in one year of early educational programming may not be sufficient to buffer many children from future failure. In fact, many early childhood programs have been attacked because of the lack of long-term benefits sustained into the elementary school years and beyond.

Drawing from research, we put forth an approach to education (PK-3) that may enable children to maintain gains made in early education and early intervention programs. A PK-3 Approach to education proposes voluntary, universal access to PK for 3- and 4-year-olds, followed by mandatory full-school-day kindergarten. Social and pedagogical experiences from PK through third grade are aligned across grade levels and aligned with the learning experiences research indicates children require based on their developmental capabilities. Teachers who are prepared to provide high-quality experiences across PK through third grade are a necessary component to this approach to education. This alignment necessitates a master plan that intentionally lays out clear expectations for children at each grade level, aligns these expectations with classroom experiences that facilitate reaching the expectations, and multiple forms of assessment that provide information on whether or not children are progressing toward the expectations set out for them throughout the years from PK through third grade.

Social Policy Report

From the Editor

Research has clearly and consistently shown that third grade is a transition point for long-term success in school. By third grade, children either have the literacy and math skills they need for continued schooling and they feel some engagement in or connection to school, OR they are missing these skills and feel alienated, which puts them on a path to school failure. Obviously it is children's school experiences before third grade, in first and second grade as well as preschool, that lead to their status at third grade. Recognizing these important research findings, in this article, Bogard and Takanishi describe the need for increased attention to the front end of education to ensure school readiness and educational achievement for all children. They describe what the first 5 years of schooling should look like.

In particular, these authors describe a pre-kindergarten through third grade (PK-3) Approach that includes the alignment and coordination of standards, curriculum, instruction or pedagogy, and assessment for children aged 3 to 8 years. Preschool is too often disconnected from the beginning of school, especially in regard to standards, curriculum, and developmentally informed and responsive instruction. We also need clearer criteria for success at each level. This article effectively reviews the literature documenting the important and often long-term effects of good preschool and uses that literature to discuss what a coordinated, aligned PK-3 curriculum should look like.

It is perhaps easier to describe what early PK-3 should look like than it is to achieve that coordination. That involves agreement and cooperation across different sectors of the educational community. It also involves setting some national standards that align what children learn in PK-3, not one set of standards for preschool and another for early grade school. Neither of these goals is easy to achieve. Thankfully, organizations such as the Foundation for Child Development in New York City, of which the second author is president, are stepping up to the plate in addressing these challenges. We hope this SPR contributes to that goal as well.

It is important to address the PK-3 Approach for reasons of social equity as well as to increase the chances of school success for a large portion of our children. Affluent private schools usually begin with pre-kindergarten and assure this coordination of curriculum that leads to success by third grade. It is, therefore, mainly less affluent public school students that suffer from the lack of coordination, alignment, and consensus. Furthermore, although many children now attend kindergarten and pre-kindergarten, about 40% are in half-day kindergarten and pre-kindergarten is far from universal. The needed work addressed in this SPR, of addressing the unfinished business of the front end of education, is essential if the US is to remain the land of opportunity as it often boasts and really aims to leave no child behind.

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PK-3: An Aligned and Coordinated Approach to Education for Children 3-8 Years Old

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The challenge of maximizing returns on current public investments in educational programs for young children is the next research and policy frontier in education reform. The number of states investing in pre-kindergarten (PK) programs for 4-year-olds has grown over the past two decades. In 1987, the number of states funding PK was 26 (Marx, 1987, as cited in Haskins, 1989); today, 38 states have some form of funding for PK education (Barnett, Hustedt, Robin, & Schulman, 2004). The price tag on these programs is more than $2.4 billion dollars (Gilliam & Zigler, 2004). The number of children participating in these programs exceeds those in Head Start and is likely to increase. Indeed, PK is becoming so prevalent that some states are beginning to grapple with the issue of how PK fits into the larger landscape of K-12 education (NGA Task Force on School Readiness, 2005). Evidence supporting the need to restructure the current K-12 education system to integrate the learning experiences of children 3 to 8 years old (i.e., spanning the period from PK through third grade) will be presented in this report.

A new approach to educating young children from pre-kindergarten through third grade (PK-3) proposes aligning standards, curriculum, and assessment practices across the early grades into a coherent plan that takes into account the developmental characteristics and abilities of children in this age span. PK-3 includes aligning teacher preparation and ongoing professional development with children's developmental capacities and having appropriate expectations for both cognitive and social outcomes, which are consistent with what is learned in the classroom.

A PK-3 Approach to education does not view early intervention, PK programs, and overall school readiness as magic bullets that inoculate young children from educational failure (e.g., Brooks-Gunn, 2003; Zigler & Styfco, 1993). Instead, PK-3 suggests that early educational experiences should be integrated with kindergarten and elementary education. Schools should be structured in such a way that all children have learning experiences that build on those in previous years and connect closely with those to come.

To address the question of maximizing and sustaining public investments in early intervention and PK programs, researchers and policymakers have identified program quality, targeted versus universal coverage, transition activities from PK to kindergarten, and teacher qualifications as key issues. Some attention has focused on the timing of these programs, that is, whether to start at birth or at age 3 rather than age 4. Far less attention, however, has been paid to dosage effects: whether one or more years is necessary to sustain gains made in PK programs, the impact of full-school-day PK and kindergarten versus half-day, and their continuity with the learning experiences in early elementary school grades (Entwisle, 1995).

Sustaining PK's Impact: The Importance of Elementary Schools

A knowledge base that can inform policies regarding early education exists (Ramey & Ramey, 1998) and indicates that quality programs can reduce grade retention and special education placement while increasing school achievement and social skills (Barnett, 1995; Ramey & Ramey, 1998; Yoshikawa, 1995; Raver & Knitzer, 2002). Economic analyses also indicate that it is cost-effective to invest in the early years (Heckman, Layne-Farrar, & Todd, 1996; Rolnick & Grunewald, 2003; Barnett, 1996; Reynolds, Temple, Robertson, & Mann, 2002; Masse & Barnett, 2002). However, Heckman and Masterov (2004) caution against investments made only in PK programs. They recommend that these investments must be complemented by investments during the elementary school years to maximize successful outcomes for children: "The new economics of the life cycle recognizes that the childhood is a multistage process where early investments feed into later investments. Skill begets skill; learning begets

A New Elementary School for American Children

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There is little doubt that providing early learning and educational experiences that are *intended* to contribute to children's development of academic, social, and task-oriented skills (or their precursors) is an overarching goal of social and educational policy in the United States today (Barnett, Robin, Hustedt, & Schulman, 2003; Committee for Economic Development, 2002). How to construct delivery systems for the equitable distribution of such experiences, how to ensure the training and expertise necessary to support the value of such experiences, and how to evaluate the extent to which this delivery system is actually responsible for growth in children's skills are individually and collectively a challenge for scientists and policymakers. The review by Bogard and Takanishi advances two central principles—the role of alignment and integration at both structural and process levels and the need to map aligned resources onto children's developmental needs and capacities.

Bogard and Takanishi and others (Council for Chief State School Officers, 2002; Gilliam & Zigler, 2001) propose a reconceptualization of the very loose and poorly aligned collection of opportunities for learning that are offered to children during the years 3-8. Center-based and family child care, care at home in the family, Head Start, publicly funded pre-K (PK) programs, kindergarten, and the primary grades of elementary school are each part of this system (U.S. Census Bureau, 2001). Children's experiences in these settings are regulated by states, the Federal government, localities, and private markets. One product of this informal system is a distribution of children's competencies that mirrors the inequities in their opportunities to learn (West, Denton, & Germino-Hausken, 2000). Yet learning occurs in all these places—children can receive rich, intense, and focused instruction every evening when read a bedtime story or when grocery shopping or when interacting with child care providers or Head Start teachers. Broadly speaking, this informal system of opportunity has functioned like a "school" for many years for children in the United States (U.S. Census Bureau, 2001).

But in the last 15 years, the informal, unintentional nature of learning that takes place in this school has been challenged by expectations from families, governments, and communities that children must meet a set of performance standards. In every way that K-12 education is pressured by accountability, this early childhood school is under the same set of expectations (Blank, Schulman, & Ewen, 1999; Brown & Scott-Little, 2003). Like it or not, American society expects children between 3 and 5 to learn some letters and numbers; to learn to attend, cooperate, and follow directions; and to carry on simple conversations (West et al., 2000). This loosely organized and distributed system of early childhood opportunity is now being asked to *intentionally* contribute to children's skill growth in ways that are measurable. Concepts of alignment and integration (and the subordinate aspects of curriculum, training, etc.) are facets applicable to any grade level or aspect of K-12 school reform. By directly addressing these issues in the 3-8 age range, Bogard and Takanishi are implicitly recognizing that *there is a new American primary school, and it starts at 3.*

One more point is relevant to the issues raised by Bogard and Takanishi. Regulations typically focus on structural features of schooling, such as teacher education, class size, or curriculum. However, in most studies where the contribution to children's performance of structural features of schooling are assessed relative to process features—what teachers do in classrooms with children—process features are what tend to be more robust predictors (e.g., NICHD ECCRN, 2003). And there is not a very strong association between structural and process features (e.g., Pianta, Howes, Burchinal, Bryant, Clifford, Early, & Barbarin, in press), which suggests that training and support systems that focus on what teachers do in classrooms, how they teach a curriculum, and how they speak and interact with children may be more productive approaches to program design, implementation, and regulation precisely because of their attention to the mechanisms of schooling that appear responsible for children's learning.

In short, Bogard and Takanishi raise important points about the nature and quality of opportunities for children's learning provided in contemporary American society. Policies that promote and ensure alignment, integration, access, and quality are but a specific reflection of a more broad recognition: that school starts at 3.

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learning" (Cunha, Heckman, Lochner, & Masterov, 2005; p. 80). Although research shows there are benefits that are achieved by investing in PK and early intervention programs to put children on a more equal footing as they enter kindergarten, research also indicates that cognitive gains made in PK are not sustained for some children throughout the elementary school years (McKey et al., 1985; Currie, Garces, & Thomas, 2002; Brooks-Gunn, 2003). Thus, creating an intentionally aligned educational system for children 3 to 8 years old based on their developmental characteristics and abilities could be a major factor in sustaining public investments in education.

Whereas alignment of PK experiences with the early elementary grades was proposed 30 years ago (Zigler, 1978), little relevant research has yet been conducted to test its efficacy. In the late 1960s and early 1970s, there were programs to extend the impact of PK programs for low-income children into the elementary grades, including Project Follow Through, Project Developmental Continuity, and the National Head Start Public School Early Childhood Transition Demonstration Project. Evaluations of the impact of these efforts are limited, though, due to variability in program implementation and methodological problems (Kagan & Neuman, 1998; Ramey et al., 2000; Zigler & Muenchow, 1992). Despite a growing number of studies on the impact of PK experiences in the past few decades, research has typically not focused on the extent to which elementary schools coordinate children's PK experiences with pedagogical approaches in K-3. Evaluating the effectiveness of an aligned approach to educating children 3 to 8 years old requires an examination of school district and school level organization and policy, principal leadership, and classroom processes not only within each grade (e.g., PK), but also across grade levels—PK through third grade.

Recent work investigating variables related to the long-term success of PK programs points to the importance of the learning opportunities, as well as the family support services available in kindergarten and elementary school (Reynolds, 1994; Whitehurst et al., 1999; Currie & Thomas, 2000). For example, Reynolds, Ou, and Topitzes (2004) examined the contribution of variables linking PK participation to later educational attainment and juvenile arrest among 1,404 children who attended Chicago Child-Parent Centers (CPC) from 3 or 4 years old through second or third grade. The most significant factor in predicting these outcome variables was attendance in high-quality elementary schools following PK participation. Other significant factors included student mobility, literacy skills at Kindergarten entry, and parent involvement. The CPC Longitudinal Study highlights the promise of *aligned and coordinated,* high-quality PK *and* early elementary experiences in maximizing benefits from early childhood investments.

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Alignment and Coordination From PK-3

A fundamental premise of *alignment and coordination* of experiences across PK-3 grade levels is that children require age-appropriate, systematic, and coordinated experiences, taught by skilled professionals, from 3 to 8 years old. Alignment implies a lining up of standards, curricula, and assessments for children in grades PK-3, and coordination reflects an ongoing effort by skilled teachers and strong leadership to achieve the effective education of children in this age range. Coordination also implies a shared vision of specific goals to be accomplished within a certain time frame. Alignment and coordination can be achieved through legislation on school organization, curricula, assessment tools and practices, and through teacher education. PK-3 alignment and coordination is operationalized as follows:

(1) A sequenced curriculum based on research about the developmental characteristics and learning of children within each year and across grade levels. For example, what happens in first grade in reading is based on what the child learned in kindergarten and on what the child will be learning in second grade. Aligned curricula across successive grades could lead to better outcomes for children. Research by Pianta and colleagues indicates that children spend a disproportionate amount of the school day in routine versus learning activities. Aligned curricula, while different in content for each grade level, may decrease routine time if children are familiar with the structure of activities. While there is evidence from case studies that indicates aligned curricula across grades is a component of high-performing schools (www.just4kids.org/jftk/index.cfm?st=US&loc=home), the impact of aligned curricula deserves more attention from researchers;

(2) A set of principles to guide, and a set of instruments to assess children's learning—what they should learn, how they learn, what they have learned—over this age span. This set of instruments should be matched to the curriculum offered in the classroom. Hershberg (2005) notes that the US is the only developed nation where the federal government does not specify standards to be met by children at different ages, nor does it play a role in coordinating educational standards, curricula, and assessments.

(3) Teachers who are prepared to educate children from 3 to 8. They must be knowledgeable about the developmental characteristics of children throughout this age span, and this knowledge should contribute to their implementation of a sequenced curriculum and their use of appropriate pedagogical techniques and assessments. Teachers use assessments to guide their instruction by providing small group or individualized instruction to children who need assistance in a particular area (Connor, Morrison, & Katch, 2004). Teachers may stay with the same group of children over 2 to 3 years. Alternatively, teams of teachers may

move with groups of children over a period of years; and

(4) A set of principles that views PK through third grade as a coherent, first level of publicly supported education, in the same way we think about a coherent middle school or high school education. This set of principles should be mapped out in a school-wide or school district strategic plan.

A Theoretical Framework for PK-3

The following theoretical framework draws from developmental, educational, and evaluation research providing evidence for what children need to succeed in school. The research review presented provides a broad empirical base for: (1) a developmental case for focusing on children between the ages 3 to 8 years old, and the potential value of aligned and integrated learning experiences during this period; (2) how schools can be organized to support children's learning (e.g., integration of PK classrooms and experiences into elementary schools); and (3) the components of PK-3 classroom quality that are important for child outcomes. Other areas of research that are useful to informing a PK-3 approach to education are highlighted.

> Within the PK-3 framework, these high-quality learning environments would be staffed with responsive teachers who are specifically trained to work with children in the age span 3 to 8 years old.

3 to 8 Years—A Time for Building Fundamental Learning Skills. The PK-3 Approach focuses on children 3 to 8 years old for both policy-relevant and developmental reasons. From a policy perspective, the PK-3 Approach focuses on children 3 to 8 years old because in the current wave of education reform, children face their first major academic reckoning in the third grade. Schools are organized so that third grade children typically take their first standardized tests in reading and math, the results of which are likely to have serious consequences, including grade retention or special education placement, both of which influence future educational opportunities.

In New York City, for example, a policy to end social promotion in the third grade means that children who do not pass the city's standardized reading and math tests are at risk for grade retention in grade 3. This policy was implemented in 2004, even though research indicates that grade retention does not help children from large urban school systems succeed in future years. Specifically, a large-scale study of a grade retention policy in Chicago Public Schools indicated that grade retention does not help children advance academically and may actually hurt their future academic prospects (Nagaoka & Roderick, 2004). The researchers argue that investing in the years prior to third grade could prevent the need for both social promotion and grade retention.

The costs of grade retention and special education placement are rarely discussed, but have been found to be relatively large in comparison to a preventive approach, which would include PK and full-day kindergarten for children. For example, in the 2001-02 school year, grade retention of 22,343 children in grades K-3 in North Carolina cost $170 million (Early, 2003). North Carolina spent $4,819 per child to attend PK, versus over $7,000 per child in K-12 in the 2003-2004 academic year (Barnett, et al., 2004). Therefore, in discussions about how to maximize public dollars for education, investing in the early years as a preventive measure may actually reduce costs in the long run by reducing the need for costly intervention in the third grade (i.e., grade retention) as well as in middle and high school.

From a developmental perspective, research over the past 20 years has identified a number of social and academic competencies that children require prior to third grade to succeed in school. Children must develop the motivation, sustained attention, and self-regulation necessary to both solve problems and to have the social skills to engage in complex interactions with teachers and children, and for managing conflicts (Hart & Risley, 1995; Zigler, Abelson, & Trickett, 1982; Raver & Zigler, 1997). In several of these areas, children 3 to 4 years old typically show advances that

indicate they are ready for school-based activities with other children (Campbell, 2002). Specifically, most children this age begin to exhibit greater self-control, including emotional regulation, the ability to play cooperatively with others, and an awareness of social conventions such as following rules. Cognitively, 3- to 4-year-old children begin to form more complex sentences, are better able to make themselves understood to others, and have the attentional capacity to focus on problem-solving (Snow, Burns, & Griffin, 1998).

In particular, 3-year-olds are able to use language to express their emotions, relationships, and other abstract thoughts or experiences (Campbell, 2002). They rely increasingly on language to communicate, and a rich language environment becomes ever more important for their future literacy development, including reading and writing (Butler, March, Sheppard, & Sheppard, 1985; Bishop & Adams, 1990; Share, Jorm, Maclean, & Matthews, 1984). Spira, Bracken, and Fischel (2005) found that among a sample of first graders who were poor readers, those who showed the greatest improvement by fourth grade had stronger oral language skills in kindergarten as measured by the Adaptive Language Inventory. Moreover, research indicates that children raised in language-poor environments have lower cognitive outcomes than children exposed to language-rich environments (Scarborough, 1989; Hart & Risley, 1995).

Evidence for the importance of aligned curricula extending into third grade comes from research on children's literacy development. Children who do not attain literacy skills, including reading and writing, by third grade struggle to catch up in future years (Snow, 1991; Snow, Burns, & Griffin1998). Felton (1998) found that students who were poor readers in third grade did not improve their skills by eighth grade. Instead, the majority of poor readers remained in the 10th percentile compared to their better reading peers by the end of eighth grade. Thus, third grade may be an important turning point for the development of more complex forms of literacy.

A Developmental Basis for Alignment. Based on developmental theories indicating children are more likely to engage in learning when they have positive, high-quality relationships with adults (Piaget, 1964; Ainsworth, et al., 1978), we hypothesize that high-quality, consistent, and predictable relationships with teachers across the years from PK to third grade will facilitate and promote children's learning and, thus, can influence achievement. Within the PK-3 framework, these high-quality learning environments would be staffed with responsive teachers who are specifically trained to work with children in the age span 3 to 8 years old. Moreover, such teachers will understand that children 3 to 8 years old develop at varying rates and, based on their training, will be able to support individual children's needs.

Alignment of high-quality experiences for children across grades 3-5 has been related to positive outcomes for children (Sanders & Rivers, 1996). Specifically, controlling for second grade achievement, children who had highly effective teachers over three successive years scored in the 96th percentile for math achievement in fifth grade, whereas children who had non-effective teachers for those same 3 years scored in the 44th percentile. In a similar vein, consistently positive teacher-child relationships in PK and kindergarten have been found to be related to positive child outcomes, both academic and social (Pianta, LaParo, Payne, Cox, & Bradley, 2002; Vandell & Corasaniti, 1990).

Research indicates that children who develop warm and supportive relationships with their teachers and who have positive social interactions with peers have better academic and social-emotional outcomes in both PK and in future years (Raver, 2002). For example, controlling for family characteristics such as parenting style and socioeconomic status, Pierce, Hamm, and Vandell (1999) found that among first graders in after-school programs, those in programs rated as emotionally positive exhibited better social skills than those children in less positive programs. In addition, staff negativity in these programs was significantly related to poorer academic outcomes, and negative peer interactions were associated with internalizing and externalizing behaviors.

Three points by Raver (2002) underscore the connections

among emotional development, forming positive social relationships at school, and academic outcomes. First, children who are disruptive are less likely to draw positive attention from teachers, resulting in less individual instruction. Second, children who react negatively to their peers will be less likely to work collaboratively with other students and gain support from them. Third, children who develop negative relationships with teachers and peers will be more likely to withdraw from school.

It is clear from this body of research that early experiences in relationships in multiple contexts are critically important. Early relationships guide expectations about future relationships; children's experiences of consistent, responsive, high-quality interactions within and across years, or within and across grades, can influence school success. Positive, high-quality relationships lead children to feel more confident in exploring their environment, resulting in greater opportunities for learning and social interaction (Piaget, 1964; Ainsworth, Blehar, & Waters, 1978).

Structural, Process, and Alignment Components. The PK-3 Approach is organized within a theoretical framework that includes the importance of both structural and process components in schools and classrooms (NICHD, 2002), as well as alignment and coordination of experiences for children both within and across grade levels. The structural component literature has found that variables such as class size, teacher-child ratios, and teacher preparation are associated with children's social and academic outcomes (NICHD, 2003a; Pianta, et al., 2002; Zill et al., 2003). The process component literature has found that factors such as teacher sensitivity, the quality of teacher-child interactions, and teachers' satisfaction with their jobs are also associated with child outcomes (NICHD, 2003b; Pianta, et al., 2002; Marcon, 1999; Stipek, Feiler, Daniels, & Milburn, 1995).

In a comprehensive review, Wang, Haertel, and Walberg (1990) created six categories from 228 items that have been linked to children's learning and rated the categories in order of importance to academic and social outcomes. The category with the strongest relation to outcomes was "Program Design Variables." This category included curricular and instructional characteristics, including alignment between curriculum, instruction, assignments, and evaluation, and size of instructional group (e.g., whole class, small group, individualized instruction). "Out-of-School Contextual Variables" ranked second and included socioeconomic level of the community, peer group aspirations, parental involvement in homework, and student participation in extracurricular activities. The third category was classroom instruction and climate variables including classroom routines, management, instructional style, and overall classroom climate. Variables associated with these more proximal component categories were more influential in children's learning than distal variables including district and state policies related to teacher licensure, fiscal variables, and textbook policies. Future research should explore the relationship between structural, process, and alignment components across various school environments to understand how these components interact to influence child outcomes.

Generally, structural components can be mandated through legislation and regulations, and process components are related to teacher preparation, teacher instructional style, and quality of teacher-child interactions. Embedded within structural and process components is the possibility of alignment. For example, a school may have a PK and full-day kindergarten program, which are two structural components, but the teachers in each program may not communicate to pedagogically align and coordinate what they do on a weekly or monthly basis. Thus, the structural components may be present, but there is a lack of alignment between the programs. Hypothetically, this lack of intentional alignment and coordination of activities does not maximize learning experiences for children.

Research indicates that currently educational experiences are not aligned for most children from grades PK to third grade. Low correlations of classroom quality across grades PK, Kindergarten, and second grade show a lack

of consistency in the PK-3 process components (Peisner-Feinberg, et al., 2001; NICHD, 2004). Variability in classroom quality within schools reveals a lack of unifying vision and planning for how children's' experiences connect, overlap, and build on earlier stages even within the same school (Pianta, et al., 2002; NICHD, 2002, 2004).

Thus, although PK experiences are important to develop certain foundational skills, these gains may not be sustained if not followed by aligned and integrated experiences in kindergarten through third grade. For example, kindergarten teachers should build on the skills learned in PK and teach new skills that are appropriate for children at that age. This progression of building on what has been learned and integrating new experiences should continue from one grade to the next. This alignment can occur in a number of ways. For example, a team of teachers could stay with a class of children for at least 2 years to develop this kind of integrated experience. An intentional PK-3 Approach provides systematic ways for stable teams of PK-3 teachers to develop and communicate about standards, curricula, and assessments.

Variability in classroom quality within schools reveals a lack of unifying vision and planning for how children's experiences connect, overlap, and build on earlier stages even within the same school.

While there is a sound theoretical basis for a PK-3 Approach to education for children 3 to 8 years old, research is lacking that investigates the types and levels of various forms of this approach and its impact on child outcomes. The following review highlights specific structure and process components that have been studied and their relationship to child outcomes. This research forms the foundation for future studies examining the proposed combinations of components that comprise a PK-3 Approach to education.

Key Findings From Longitudinal Studies That Inform a PK-3 Approach

A selected review of longitudinal studies provides key lessons from decades of research on specific components related to young children's future success in school and in life. These findings can begin to guide the formation of a new first level of education for children starting in PK through third grade. Criteria for including studies in this review were the relevance of the sample and variables examined for informing educational policy for children 3 to 8 years old. First, the core studies that form the basis for the review had to be longitudinal and provide information about how school and family environments affect children over time. Second, the age of the sample had to be somewhere between 3 to 8 years old during some part of the study. Third, academic/cognitive and social/emotional competence needed to be assessed as outcome variables for children as both domains are important for children's school success (Shonkoff & Phillips, 2001; Raver & Zigler, 1997; Raver, 2002). Finally, the studies chosen had to employ methodologically rigorous designs so that conclusions drawn from the research are valid and can inform education policy. Taken together, these findings provide a map for designing effective, integrated programming that responds to the needs of children 3 to 8 years old. This review will also inform a research agenda that can begin to examine the combination of components important for academic and life success. (see Appendix A for a summary of the studies selected). It should be noted that only Perry Preschool and Abecedarian are random assignment studies.

PK-3 components that are informed by the current body of literature include: timing, dosage, classroom quality, domains targeted, populations served, and teacher preparation and compensation. Timing refers to the age at which children have the opportunity to participate in a program as well as the number of years of program duration. Research on the effects of the dosage of programs, including both the length of the school day and school year, is summarized. Program quality includes research findings on process and structural components important for educational achievement. Findings on the type of domains targeted including social, emotional, and

academic skills are reviewed. Recent research on the effects of universal PK coverage versus targeting populations at-risk for educational failure provides information on who should be served by early education programs. Research related to teacher characteristics is summarized in the final section.

Timing. Timing of early educational experiences is important, especially given research that finds there is inequality in levels of school readiness among children as they enter kindergarten (Lee & Burkham, 2002; Walston & West, 2004; Cuha, et al., 2005), and that these inequalities grow between ethnic and socioeconomic groups throughout first grade (Rouse, Brooks-Gunn, & McLanahan, 2005; Reardon, 2003). The period from birth to 8 years old is an important period in children's educational development (Shonkoff & Phillips, 2000), and research shows that programs targeting children within these years can produce positive long-term outcomes (Schweinhart et al., in press; Reynolds, 1994; Horacek, Ramey, Campbell, Hoffmann, & Fletcher, 1987). Even though evaluation studies of these early childhood programs found significant long-term effects on school outcomes, each program differed with regard to when the intervention began and ended (Perry Preschool = 3- and 4-year-olds; Abecedarian = 4 months to kindergarten, with a small number served through third grade; Chicago Child Parent Centers = 3 years old through third grade).

Economic analyses of Perry Preschool, Chicago Child Parent Centers, and Abecedarian all indicate that it is wise to invest in the early years. Specifically, a cost-benefit analysis of the Perry Preschool project estimates that for every dollar spent on the program, there was a $7 savings to society through increased employment and reductions in crime when participants were 27 years old (Barnett, 1996). An analysis of the Chicago Child Parent Centers had similar findings. The pre-K program provided a $7.14 return for every dollar spent by increasing individual economic well-being and tax revenues, reducing remedial education and expenditures to the criminal justice system, and the extended program (4-6 years) resulted in a $6.11 return (Reynolds et al., 2002). The most recent follow-up of Perry Preschool participants at 40 years old indicates a return of $17 for every one dollar spent on the PK program (Schweinhart, et al., in press). Masse and Barnett (2002) found an overall benefit of $3.78 for each dollar invested in children who participated in the Abecedarian Project. An analysis of these evaluation studies have shown that early investments (0-8 years old) produce larger returns in comparison to investments made in adolescence and/or early adulthood without early investments (Heckman & Masterov, 2004). Heckman theorizes that early investments act in a multiplicative way. In essence, investing in foundational skills early in life makes learning in future years more efficient.

Dosage of programming across school years and with regard to the length of the school day is integral to both maximizing the potential learning opportunities during the school year and to maintaining gains from one grade level to the next, especially for low-income or otherwise at-risk children.

Dosage. Dosage of programming across school years and with regard to the length of the school day is integral to both maximizing the potential learning opportunities during the school year and to maintaining gains from one grade level to the next, especially for low-income or otherwise at-risk children. For example, in a study examining the impact of the number of days low-birth-weight children attended an early childhood program in the second and third years of life on cognitive outcomes, the authors found that more days of attendance resulted in significantly higher performance on vocabulary skills. These effects, while attenuated at age 5 and 8, persisted (Hill, Brooks-Gunn, & Waldfogel, 2003).

There is evidence of added benefits of extended early intervention for at-risk students from PK through third grade in contrast to just PK alone, leading to lower school remediation and dropout rates, as well as higher reading and math achievement (Reynolds, 2003). In addition, the

Early Childhood Reform: Is This the Key to Success for All?

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Creating a seamless educational experience for children, their families, and teachers in early childhood is a reform goal worth pursuing. Twenty states have proposed increased investments for pre-kindergarten (PK) programs for the 2006 fiscal year. This political support is a subtle sign of society's increasing awareness of the significance of quality early learning opportunities. Curriculum coherence targeted for 3-8 year olds may create a much needed bridge of experiences from community-based programs such as Head Start into formalized education settings, as well as increase the quality of preschool programs for low-income and educationally disadvantaged children. The developmental gains of quality PK experiences tend to "fade-out" when the post-program environment does not provide continuous, enriching developmental opportunities. By establishing an infrastructure to support continuous developmental experiences, the educational and economic benefits of early intervention programs will grow—an advantage for all stakeholders. PK through 3rd grade (PK-3) is a unique developmental timeframe that has been burdened recently by an overemphasis on standards-based performance in the higher grades. In this unintended consequence of the pursuit of a worthy academic goal, there are lessons for all educational reformers who follow.

Children enter learning environments with different combinations of experiences, background, and skills. Particularly in educationally disadvantaged communities, children and families require a variety of resources and supports if they are to have developmentally appropriate and comprehensive learning opportunities. Curriculum alignment models must be flexible enough to target the specific needs of a community while providing educational opportunities for student learning. Of particular concern are those educational contexts that are low-performing and less able to attract skilled professionals and support curriculum and instructional changes through ongoing, assessment based professional development. When such infrastructures for change are missing, how can the addition of this new approach meet the needs of at-risk school communities? Current "adequacy" lawsuits involving the NCLB law provide examples of how good policy does not translate to good practice without genuine multi-dimensional support.

Fourth grade testing has produced a focus on test preparation that has extended downward into kindergarten classrooms. The academic escalation effect is well- documented; kindergarten curriculum is shifting away from play and social adjustment activities to direct teaching of achievement skills. In many cases, teachers in PK-3rd grade are mandated by their district to implement curriculums that are aligned with the goals of NCLB. How will a model of curriculum alignment in early childhood influence these trends?

Curriculum alignment in the early grades can address many of the pressing issues for education by streamlining services and providing a consistent message to families, communities, and education systems—young children require a strong foundation to succeed in school. Will narrowing a curriculum in an effort to maintain alignment serve the diversity of educational needs in our country? Or will this be an opportunity for families, communities, and schools to develop partnerships defined by their own contextual needs? We need additional empirical support before we can fully explore the feasibility and potential effects of such a model across a variety of settings.

Abecedarian Project found positive cognitive and academic effects of participation in the kindergarten through second grade educational support program, in addition to the PK program throughout the elementary school years (Ramey, et al. 2000). While Reynolds and colleagues found that children attending the CPCs for a full 5-6 years (PK-3) benefited the most in terms of long-term academic success, it was not a randomized experiment. The Abecedarian project used a randomized experimental design. Unfortunately, its small sample size risks an increase in Type II errors, which means that significant differences between control and treatment groups may not have been detected at the age 21 follow-up (Campbell, Ramey, Pungello, Sparling, & Miller-Johnson, 2002).

Full-school-day participation in PK and kindergarten has been found to produce larger cognitive gains than half-day participation (Zill et al., 2003; Walston & West, 2004). These findings suggest that children attending full-day programs are better prepared for elementary education than those attending half-day programs. While recent studies indicate that all children gain from full-day participation, low-income and ethnic minority children show the largest increases in school readiness scores, which can contribute to reducing achievement gaps (Gormley & Phillips, 2005; Gormley, et al., in press; Walston & West, 2004).

Gains in achievement made during the school year can be significantly reduced during the summer months (referred to as "summer loss") for children in the early elementary grades (Alexander, Entwisle, & Olson, 2001). In particular, mathematics scores were susceptible to summer loss in a meta-analysis of 17 studies that compared these skills before and after summer break (Cooper, Nye, Charlton, Lindsay, & Greathouse, 1996). Similar findings were found for spelling. Findings of loss for other academic skills showed mixed results.

Summer loss is greater for economically disadvantaged children from PK through the elementary years than for their more affluent counterparts. Henry and colleagues (2003b) found that while all children lost some educational advantages in the months between the end of PK and the beginning of kindergarten, low-income children suffered the greatest losses. Evidence of summer loss for children in the early elementary grades was found in the Beginning School Study in Baltimore City schools (Entwisle & Alexander, 1992). The extent of summer loss was related to free meal eligibility. Non-subsidized students made small gains over the summer months, whereas subsidized students lost ground. During the winter months when school was in session, economically disadvantaged students fared as well if not better than their more advantaged counterparts, emphasizing the benefits of an educational program. These results suggest that a lack of educationally stimulating environments for lower income children 4 to 8 years old over the summer months when school is not in session can be detrimental to sustaining their educational progress (Cooper, et al., 1996).

Program Quality. Program quality is measured by the presence of process and structural components that have been linked to child outcomes. In the classroom, process quality, as indicated by the match between teacher practices and children's developmental needs for positive interactions, leads to better achievement and emotional and behavioral outcomes (Pianta, et al., 2002; NICHD, 2003b; Henry, et al., 2003b). Program quality may also be dependent on the overall school climate. A supportive and positive school environment for teachers and children has been shown to be related to higher achievement among students (Zill et al., 2003).

Structural components such as small class size and low child-to-adult ratios from PK to third grade were hypothesized to contribute to positive child outcomes in the Chicago Child Parent Centers (Reynolds, 2003). A high ratio of adults to children (1:10) in the classroom is a structural component in many evaluation studies of early childhood interventions found to be linked to positive behavioral and achievement outcomes (Schweinhart, Barnes, & Weikart, 1993; Zill et al., 2003; Gormley & Phillips, 2005; Reynolds, 2003; Henry, Gordan, Henderson, & Ponder, 2003a; NICHD, 2003a). Studies examining the impact of class size on child outcomes indicate a complex picture related to academic and social out-

comes (NICHD, 2004). Studies reviewed in this report found associations between positive child outcomes and class sizes ranging between 20-25 students in PK through third grade. Various class sizes within this range were related to social and academic outcomes. More research is needed to determine the ideal number of students in the classroom and the related staffing patterns that are most likely to influence child outcomes at each grade level and for various populations of children.

How teachers implement a curriculum is key to student outcomes (Zill et al., 2003; Henry et al., 2003a; Stipek et al., 1995; Marcon, 1999). Specifically, elements of teacher instructional style, which are associated with cognitive outcomes include individualized attention to student needs, engaging students, providing meaningful feedback, and positive interactions with children (Reynolds, 1994; Peisner-Feinberg et al., 2001; NICHD, 2003a; Schweinhart, et al., 1993; Zill et al., 2003). Teachers who take children's interest and input into account and build on them have students with higher cognitive and language scores in PK. This type of instructional style in PK is also associated with lower rates of juvenile delinquency among students as they reach adolescence (Schweinhart, Weikart, & Larner, 1986; Reynolds, Temple, Robertson, & Mann, 2001). Teachers characterized as highly effective use their assessments of students to guide their practices in the classroom, using small group and individualized instruction as appropriate (Connor, et al., 2004).

Domains. Both cognitive skills and social skills contribute to increase the likelihood that children will succeed in school (Raver & Knitzer, 2002; Raver & Zigler, 1997). Some studies have pointed to the importance of the role of parents in PK-3 programs for their children (e.g., NICHD, 2003b; Peisner-Feinberg et al., 2001; Barbarin, et al., in press). A focus on cognitive skills is related to achievement and cognitive outcomes (Campbell & Ramey, 1994; NICHD, 2003a; Reynolds, 2003). A focus on school readiness skills in the early years, while maintaining a basic literacy and mathematics curriculum for older children, is associated with long-term academic success in school (Campbell, et al., 2002).

Social skills are related to educational outcomes in the elementary school years and should be an integrated part of educational programming (Zill et al., 2003; Peisner-Feinberg, et al., 2001; Raver & Zigler, 1997). Spira et al. (2005) found that behavioral and social attributes of children in kindergarten helped to predict later literacy achievement. Children who showed poor classroom behavior and ability to get along with peers were less likely to improve their reading skills by fourth grade than children who displayed positive social and behavioral skills.

Social and emotional development in the early years can contribute to adult worker productivity. For example, economist James Heckman emphasizes investing in social-emotional skills early on as a cost-effective way to increase the quality and productivity of the labor force. These human capital investments emphasize motivation, perseverance, and self-control, hypothesized to be integral ingredients to success in the workplace. Therefore, early investments in both cognitive and non-cognitive abilities could be important for building a firm foundation for future productivity (Heckman & Masterov, 2004).

The pathways through which parents influence their children's academic outcomes are not clear. Whereas it is hypothesized that family economic resources (Barbarin, et al., in press), parent education level and employment, parental choices, maternal mental health, and parenting practices mediate the effects of programs on child outcomes, this is an understudied and poorly understood topic (Brooks-Gunn, Berlin, & Fuligni, 2000). Parent support (e.g., parent support groups; parent education; parent resource rooms) and parent involvement are believed to be important and are typically included in early intervention and education programs for young children. Some research that has examined the impact of specific kinds of involvement and support activities find positive effects, although firm conclusions cannot be made because of the lack of randomized experiments. For example, in 3 studies, parent involvement in PK activities was linked to emerging literacy skills and

cognitive and general knowledge gain scores and negatively related to problem behaviors (Zill et al., 2003; Reynolds, 2003; Henry et al., 2003b). Thus, parent involvement and support services could be important components of a PK program that contributes to children's well-being, and its role should be further examined as a part of a PK-3 Approach.

Populations Targeted. Low-income children are at greatest risk for educational failure (Duncan & Brooks-Gunn, 1997) and have, therefore, been the main focus of many early education interventions. Recent research shows, however, that all children can benefit from high-quality, cognitively stimulating early education programs (NICHD, 2003a; Henry et al., 2003b; Gormley, et al., in press; Pianta, et al., 2002). Using three Woodcock Johnson Achievement scales measuring pre-literacy skills, the Tulsa, Oklahoma, universal PK program showed positive effects for all participating children regardless of income or ethnicity. Statistically significant effects were found on three scales for children eligible for free lunch and on two scales for reduced-price lunch status and full-price lunch children. On a district-wide assessment, Hispanic and low-income children gained the most from the program.

More research is needed on the potential impact of high-quality, aligned programming in reducing achievement gaps. Challenging the idea that universal programs may actually increase achievement gaps (e.g., Ceci & Papierno, 2005), universal access to high-quality educational programs will more likely result in reducing current gaps by providing lower income children with quality education, similar to the education their more affluent counterparts currently receive (Rebell, 2005). As stated by Amy Wilkins (2005) of the Education Trust, "universal" must not be equated with "uniform." Services should be tailored to the population the education program is serving. All children have similar requirements for development, but given language and disabilities, the programs have to adapt upon the basic core. For instance, low-income children will need a different combination of services than middle-income children (Barbarin, et al., in press). English language learners should have services tailored to their specific needs, which will differ from English speakers. However, all children can benefit from a good early education program.

Teacher Preparation and Compensation. Although some studies find no significant relationship between the number of years teaching and child outcomes (e.g., Henry, et al., 2003a; Pianta, 2003), others find that teachers who have some graduate school education or specialized training in early childhood education are more likely to have their classrooms rated as high quality than teachers with no graduate school education (Zill et al., 2003; Pianta, et al., in press). Teacher certification and a bachelor's degree were related to fewer behavior problems and higher school readiness scores for 3-year-olds attending Head Start. Darling-Hammond, Holtzman, Gatlin, and Heilig (2005) found that fourth and fifth grade teachers in Texas who were certified were more effective in stimulating student achievement gains in reading and mathematics over multiple years than non-certified teachers. In addition to coursework in teaching and learning and instructional methods and strategies, certification included coursework in human development, multicultural education, education of special needs students, and classroom management. Certification requirements differ across states, which could be why teacher certification is not related to child outcomes in all studies. Future research should examine specific elements of teacher preparation and requirements for certification when assessing their relationship to student outcomes.

Certification requirements differ across states, which could be why teacher certification is not related to child outcomes in all studies.

In the Head Start FACES study, the relationship between teacher education and PK classroom quality was mediated by teachers' attitudes and knowledge about early childhood development, which suggests that teachers with more education or relevant certification may be enrolling in courses related to child development or early childhood education.

Taken together, these findings indicate that specialized training in early childhood education or child development may be necessary in addition to a bachelor's degree to make a difference in classroom quality (Pianta, et al., in press).

Teacher education, certification, and compensation in PK are important areas for future research given recent findings on their relationship to child outcomes. In the Head Start FACES study, PK teacher compensation was significantly linked to cognitive and social-emotional gains for children (Zill, et al., 2003). Tulsa UPK teachers are required to have at least a bachelor's degree and Early Childhood Education certification and are compensated on par with K-3 teachers. Although more research is needed on variables such as the type of degree, quality of training program and certification requirements, and professional development activities and their relationship to child outcomes, some early childhood education researchers acknowledge that a bachelor's degree is a good starting point for improving classroom quality, and additional training or certification in early childhood development and/or education may be better for children attending PK (Barnett, et al., 2004). Since over one-third of public elementary schools now have PK programs, and some findings indicate that children with PK teachers with advanced education have better outcomes and higher quality classroom experiences than children with teachers who have less education, PK teacher qualification and compensation should not be ignored in educational policy discussions.

Children's experiences from PK to kindergarten and kindergarten experiences to first through third grades should be linked.

A PK-3 Approach

While limitations of research to inform educational programs for children 3 to 8 years old exist, a new approach to education is offered based on what we glean from current research on children's development and education. The fundamental premise of the PK-3 Approach is that children benefit from an aligned educational program, taught by skilled professionals, from age 3 through age 8—from PK through third grade. It is likely that when all of the following components work together as an integrated whole, children and society will reap the maximum benefits from investments made in early education.

Structural and process components are considered (NICHD, 2002) with alignment elements embedded within each one of these categories. References to examples of programs or places where some of the components are currently being implemented or advocated are in parentheses.

Structural components are regulated by appropriate administrative agencies through policies and guidelines and provide the foundation for children's learning experiences.

- Voluntary, universal full-day PK (Georgia & Oklahoma)
  - Participation is not dependent on family income
- Mandatory full-school-day kindergarten (Arkansas)
- Well-prepared teachers for PK through third grade classrooms
  - Minimum bachelor's degree + Early Childhood Education Certificate (Oklahoma)
  - *P*K-3 teacher certification (New Jersey Abbott schools)
  - Ongoing, in-service, professional development (New York City Public Schools)
- Reduced class size (20-25 children) with a staff-child ratio in the classrooms 1:10 in grades PK through third grade (Chicago Child-Parent Centers)
- Parent involvement activities that are school-based: parent resource room, participation on field trips, parent-teacher meetings to discuss the child's progress (Chicago Child Parent Centers). While the Perry Preschool and Abecedarian programs included a home visiting component, PK-3 proposes involving parents in their children's education by bringing them and their family into the elementary school (National Association of Elementary School Principals-NAESP, 2005).
- Extended programs: After school and summer pro-

grams provide continuity in programming and academic support for children who do not have access to learning opportunities during these times (Schools of the 21st Century).

● A system that connects low-resource families to necessary supports and resources (Head Start, Chicago Child-Parent Centers)

● Single and clear governance structure for PK through third grade

◦ The public school system (Chicago Child-Parent Centers)

◦ The state department of education (Oklahoma for Universal PK)

● Alignment of standards, curricula, and assessments within grades and across grades from PK through third grade (Individual schools across the United States as highlighted on the website: www.just4kids.org/jftk/index.cfm?st=US&loc=home)

◦ Children's experiences from PK to kindergarten and kindergarten experiences to first through third grades should be linked. Transition activities are not sufficient. Transition practices are usually one-time activities such as teachers exchanging student records and PK classes visiting kindergarten classrooms. Alignment practices, on the other hand, involve an intentional organization of educational experiences that will enable children to advance to the next level in school.

● Alignment involves a master plan and continuing professional development of teachers within grade levels and across grade levels. Teachers communicate on a regular basis what children are doing and what the expectations are within grade level and across grade levels, culminating in practices that build on what the child has learned, and preparing them for what they will be learning.

◦ The same curriculum, incorporating sequentially more complex material across grades, is implemented for each subject area. The curriculum provides children with classroom experiences that allow them to achieve or exceed standards children are supposed to meet throughout the year, and the assessments measure how well children grasped concepts taught in class. Concepts taught in class are based on the standards children are supposed to meet at each grade level. Assessments feed back into instruction and guide teaching practices.

● Accountability system that tracks classroom practices and school policies and relates them to child outcomes to improve classroom quality (Montgomery County, Maryland; for other examples refer to www.just4kids.org/jftk/index.cfm?st=US&loc=home)

◦ Best practices are replicated, and poor practices are eliminated, leading to improved child outcomes.

Process components involve daily interactions that influence children's learning and can be developed through teacher and principal preparation programs and ongoing, in-service professional development.

● Integration of children from diverse backgrounds and English Language Learners (ELL) including dual language classes (Takanishi, 2004)

● Strong principal leadership to ensure fidelity of implementation of a well-aligned program from PK through third grade (NAESP, 2005)

● Supportive and positive environment for teachers and high teacher satisfaction with their jobs (Gilliam, 2005)

● High-quality instruction (Pianta, 2003; Wang, et al., 1990)

◦ Engaging classroom activities that maximize learning time and reduce time spent on routine activities and disciplinary actions

◦ Responsive teacher-child interactions that incorporate building on children's interests

◦ Appropriate balance of large and small group activities

◦ Significant amount of individual attention (e.g., providing evaluative feedback)

In sum, educational programs that combine the necessary structural, process, and alignment components are likely to provide the infrastructure for successfully educating children.

Although the research base investigating the impact of various combinations of components proposed in the PK-3 Approach on child outcomes is limited, recent case studies comparing schools that have high achievement outcomes to schools with average outcomes, serving similarly disadvantaged populations, point to the importance of the alignment of educational experiences for children (www.just4kids.org/jftk/index.cfm?st=US&loc=home). Schools that have clear expectations for children at different grade levels, and align those expectations with what is taught in the classroom, and use assessments to guide instruction are deemed high-quality schools. These schools also tend to have professional development meetings both within and across grades to ensure children are provided a set of educational experiences that are hierarchal in nature, enabling them to proceed to higher grade levels.

The set of principles underlying the organization of the "set of educational experiences" are typically mapped out in a school-wide strategic plan. One or two elements are not sufficient. For example, a school may have a consistent curriculum across grade levels, but the curriculum may not be aligned with assessment practices. A school with only one of these components may not be able to organize itself in a way that will align the experiences of children from PK through third grade.

Summary

An aligned set of educational experiences from PK through third grade has the potential to impact large numbers of children and save public dollars by reducing grade retention and special education placement while increasing college attendance and future earnings. Therefore, it is important to expand research from focusing on one grade level to investigating how learning experiences are systematically organized across grade levels and their impact on child outcomes. The alignment of district, school, and classroom policies with the PK-3 Approach is also an area ripe for exploration, including research investigating the extent to which state policies are actually implemented in the classroom (for a study on the degree of alignment between state PK policies and classroom implementation, see Gilliam, 2005).

If public schools are to be a great equalizer, it will be important for research and policy to focus attention on how schools can be best organized to achieve maximum gains from public investments in early education. These investments are now being recognized as contributing to the economic competitiveness and social equality of the US as well as to individual prospects. Getting the most from these early investments is the next policy and program challenge in education reform aimed to narrow social inequalities in the US.

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See Appendix on Pages 22 and 23.

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Appendix A — Part I				
Program/study (sample year)	**Duration**	**Ages Served**	**Curriculum**	**Domains targeted and/or assessed**
Perry Preschool (1962-1967)	Part-day preschool 5 days/week w/home visits	3- to 4-year olds	High-quality child-centered, comprehensive, and integrated curriculum (High/Scope)	Intellectual, social, emotional
Abecedarian (1972-1977)	Full day, 8 hours/day, 5 days/week for 50 weeks/year	Infants averaged 4.4 months—kindergarten; 25 kids had a follow-on program through third grade	Cognitively stimulating developmental curriculum for infants; preschool focusing on language and pre-literacy; follow-on program focused on parent participation in school	Cognitive, healthcare, and family supports; follow-on program emphasized home school connection
FACES-Head Start (2000)	Full day vs. half day	3- to 4-year-olds	91% of HS teachers used either a single curriculum or a combination of curricula; 59% used either High/Scope or Creative Curriculum; and 41% used another curriculum	Emotional, social, cognitive, health, nutrition, psychological, family supports, parent involvement
Georgia (GA) UPK (1996-2001)[a] (2001-2002)[b]	Full-day UPK, at least 6.5 hours	4-year-olds	Journey, Once Upon a Time, High/Scope, and other approved curricula were chosen by teachers	Cognitive, language, social, emotional, communication skills, classroom quality
Tulsa, OK UPK (2000-2001)	Full day vs. half day	4-year-olds	No mandated curriculum or pedagogical principles; required to use state report card to keep track of cog., lang., beh., and soc. skills	Motor, language, cognitive/general knowledge, social/emotional
Child-Parent Centers (1986)	Full day	3- to 8-year-olds (PK-3rd graders)	Child-centered individualized attention; enriched learning environment focusing on basic skill attainment in language and math	Social, cognitive, and academic skills including special education placement, grade retention, reading and math achievement, and dropout; parent involvement, delinquency, arrests
NICHD Study of Early Child Care (1990s)	>=10 hrs. participation in care/week for >=6 mos.	4.5-year-olds	Quality of care varied across settings	Child cognitive, social, and emotional outcomes; caregiver training, quality of caregiving environment
Cost, Quality, and Outcomes (1990s)	Enrolled in full-time care or education	PK through 2nd graders	Quality of classrooms varied	Teacher sensitivity and interactive style; child reading, math, language tests, social outcomes; maternal education

Appendix A — Part II (cont.)			
Program/study (sample year)	**Sample size and characteristics**	**Teacher and classroom variables**	**Cost-Benefit**
Perry Preschool (1962-1967)	123 African American children with low IQ, low income, low parent education in small town in Michigan	Child centered teaching style with high teacher:child ratios	$17 savings for every $1 investment
Abecedarian (1972-1977)	111 African American children with low maternal IQ, low SES, single parents in rural North Carolina	Teacher:child ratios (ranged from 1:3 for infants to 1:6 for 5-year-olds); extensive in-service training; low turnover	$3.78 return for a $1 investment
FACES-Head Start (2000)	2,800 low income children from 43 sites representative of all HS children nationwide, their parents, teachers, and classrooms	39% of teachers in the study have at least a BA and 74% have a CDA certificate; an average of 5.4 children per 1 adult in the classroom (HS requires 10:1 ratio w/class size=20)	
Georgia (GA) UPK (1996-2001)[a] (2001-2002)[b]	[a]3,639 preschoolers attending GA UPK; [b]630 preschoolers from GA UPK, Head Start, and private programs	GA UPK teachers must have at least a HS diploma and specialized training in ECE; 88% have BA vs. 13% in HS & 25% private	
Tulsa, OK UPK (2000-2001)	3,558 children from diverse socioeconomic and racial/ethnic backgrounds	Teachers have at least a BA+ECE cert.; pay = K-3 teachers; 1:10 teacher-child ratio and class size = 20	
Child-Parent Centers (1986)	1,106 Black & 115 Hispanic CPC K graduates (Hispanics dropped from analyses because only 5% of sample) and matched controls-all living in low income neighborhoods in Chicago	Teacher aides in every classroom; smaller class sizes (17 PK; 25 K-3) than in the regular public schools (~35 K-3)	$7 savings for every $1 investment; $6.11 return for extended program
NICHD Study of Early Child Care (1990s)	813 non-poor children; 11% African American, 13% Hispanic from select sites; average maternal education 14.4 yrs	Caregiver quality varied across settings	
Cost, Quality, and Outcomes (1990s)	733 in year 1 PK; 499 year 2 PK; 399 kinder.; 345 2nd grade; English speaking; 30% non-white; from 4 states	Teacher quality varied across classrooms	

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