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Literacy and Language Outcomes of Balanced and Developmental Approaches to Early Childhood Education: A Systematic Review

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Abstract

This systematic review of research on early childhood programs seeks to identify effective approaches, both specific programs and types of programs, capable of improving literacy and language outcomes for preschoolers. It applies consistent methodological standards to determine the strength of evidence supporting a wide variety of approaches, which fell into two main categories: Balanced approaches, which include phonemic awareness, phonics, and other skills along with child-initiated activities, and developmental approaches that focus on child-initiated activities with relatively little emphasis on pre-reading or other skills. Study inclusion criteria included use of randomized or matched control groups, evidence of initial equality, and study duration of at least 12 weeks. Studies had to use valid measures of literacy and language outcomes that were independent of the experimental treatments. 32 studies evaluating 22 programs met these criteria. Balanced programs had the strongest evidence of positive literacy and language outcomes at the end of preschool and on follow-up measures. Programs with a more developmental focus had less evidence of positive outcomes. The findings support a conclusion that early childhood programs that have a balance of skill-focused and child-initiated activities enhance both literacy and language outcomes better than do programs without a focus on phonemic awareness, phonics, and other skills.

Key words/phrases: early childhood programs, approaches to preschool, emergent literacy, Head Start, systematic reviews

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The education of young children who are at risk of school failure is widely recognized as an important factor in determining future school success. It is now well established that the quality of support children receive during the early years is strongly linked to their health, education, and economic outcomes as adults (Camilli, Vargas, Ryan & Barnett, 2009; Chambers, Cheung, & Slavin, 2006; Chambers, De Botton, Cheung, & Slavin, 2013; Coghlan, Bergeron, White, Sharp, Morris, & Rutt, 2009; Waldfogel & Washbrook, 2010). There is also robust evidence to suggest that the right sort of early intervention is particularly beneficial for disadvantaged children (Carneiro & Heckman, 2003; Karoly et al. 2005) and highly cost-effective (Heckman & Masterov, 2007).

Policy makers around the world have responded to this evidence by introducing a range of initiatives (see OECD, 2006). In the U.S., President Obama made expanding preschool opportunities for three- and four- year-olds a top priority. In the United Kingdom, Sure Start, introduced in 1999, has sought to bring together childcare, health advice, parent support and early education in a comprehensive service for young children and their families (see Belsky & Melhuish, 2007). In fact, England has now introduced educational provision for two-year-olds who live in the poorest of families.

Theoretical and Historical Background

From the beginning, preschools have had a primary emphasis on socialization and general cognitive development. In the transition from home to school, children were encouraged to play, sing, build with blocks, and do art, dress-up, and drama. The theories of Piaget (1952) and Vygotsky (1987) strongly reinforced the idea that cognitive and social development were the

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appropriate goals of early childhood education and that self-chosen activities, interactions among children, and experience with make-believe, construction, art, and music were the key to cognitive and social development. Approaches of this kind are usually called "developmental" models.

In the 1960s, as part of the behaviorist movement that was asserting itself at the time, Bereiter & Engelmann (1966) threw down a major challenge to the longstanding traditions of early childhood education. In their view, the goal of early education is not only to stimulate intellectual development, but to explicitly teach reading, math, and other skills. They noted the findings of evaluations of preschool provision (compared to no preschool) in which IQ scores were increased at the end of preschool but fell back to pretest levels a year or two later. Rather than worrying about IQ, they argued, go directly to the target skills. They created and evaluated in a small experiment an approach later called Direct Instruction (DI), in which preschoolers were taught in groups of 4-7. Children participated in structured lessons on reading, arithmetic, and language concepts, and then engaged in semi-structured writing, drawing, reading-readiness, music, and snack activities. Teachers were asked to use very specific methods and very simple, direct language. The children in the initial Beretter & Engelmann (1966) study achieved remarkable gains, on average, over a two-year period, both on an IQ measure and on measures of reading, arithmetic, and spelling.

The Bereiter & Englemann study, and subsequent research, set off an extraordinary debate, with strong feelings on both sides. David Weikart (1995) and Lawrence Schweinhart (Schweinhart & Weikart, 1998) demonstrated long-term positive impacts of a developmental model, the Perry Preschool, in comparison to no preschool experience, but they also claimed that in the long run the Bereiter-Engelman model, compared to their High/Scope approach, led to

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higher rates of delinquency and other negative social outcomes (Schweinhart, Barnes, & Weikart, 1993). However, the Perry Preschool was an extremely intensive approach that could not be replicated in ordinary schools. Long-term evaluations of ordinary Head Start programs, which generally implement developmental approaches, have found that initial effects tend to fade out within a few years (Camilli et al, 2009; Darrow, 2009; Karweit, 1993).

Until the 1990s, the debate about early childhood was dominated by the differing claims of the two extreme positions. In practice and in academia, the developmental argument clearly prevailed. Head Start centers and preschool programs in public schools overwhelmingly used, and most still use, programs consistent with the developmental view, and DI has been relegated to a fringe position. However, partly in response to disappointing evaluations of ordinary Head Start approaches (see Camilli et al., 2009) and partly in response to increasing pressure on elementary schools to increase reading and math achievement, particularly for children living in poverty, some schools have reverted to using directive teaching methods more suited to older children, including sitting in rows and completing worksheets.

New approaches to early childhood education began to appear in the 1990s; approaches that balance the teaching of early literacy skills with the language and socialisation skills of developmental models. In some cases developers have created complete preschool models that incorporate teaching of phonemic awareness, phonics, alphabet, writing, and math, with traditional creative play, art, music, drama, and story time. In other cases, developers have created supplemental skills-based approaches that add to any developmental model well-planned activities focused on literacy, language, and sometimes numeracy objectives. Taken together, the supplement and the developmental activities form a balanced approach. Balanced programs vary

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a great deal, but most teach literacy skills primarily through rhymes, songs, games, and interactive reading with children.

There has been a great deal of very high-quality research on the outcomes of alternative approaches to early childhood education, but this research has not been thoroughly reviewed. Evaluations of early childhood programs have generally shown at least short-term positive effects of early education, in comparison to no services (Camilli et al., 2009; Gilliam & Zigler, 2000; Gorey, 2001). In recent decades, the research questions have begun to shift to ask what kinds of preschool program are most effective for young children. In particular, debate revolves around the question of whether teaching phonemic awareness, phonics, and other skills to preschoolers will have long-term negative effects, particularly on the development of language and socialization outcomes. This review examines the evidence supporting alternative approaches and specific programs capable of being used in early childhood education.

The focus of this article is on evidence for the effectiveness of various preschool programs provided in group settings on children's language and literacy outcomes. Language and literacy skills are the cornerstones of success in school and in life (Carneiro & Heckman, 2003). The aim of this review is both to assist educators and policy makers in deciding on the types of programs most likely to benefit the children they serve and to inform researchers about the current evidence on preschool programs to guide further research. The scope of the review includes regularly scheduled group programs that educators might consider adopting to prepare their children for success in elementary school and beyond. It focuses on the main approaches teachers and schools might emphasize, not on smaller targeted interventions such as shared reading (e.g., Mason, Kerr, Sinha, & McCormick, 1990; Piasta, Justice, McGinty, & Kaderavek, 2012; Wasik & Bond, 2001; What Works Clearinghouse, 2005; Whitehurst et al., 1994), and

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vocabulary development (e.g., Pollard-Duradola et al., 2011; Neuman, Newman, & Dwyer, 2011).

Only a few reviews in the past decade have made comparisons among different types of preschool interventions (Chambers, Cheung, & Slavin, 2006, Chambers, De Botton, Cheung, Slavin, 2013; Coghlan et al., 2009; Darrow, 2009). The review by Chambers et al. (2006) compared traditional, academic, and cognitive-developmental early childhood programs and found that academic programs generally produced better immediate and mid-term cognitive outcomes. However, cognitive-developmental programs were found to produce better long-term educational and social adjustment outcomes.

In a meta-analysis of the effects of early childhood curricula on children's receptive and expressive vocabulary, Darrow (2009) evaluated 17 early childhood curricula and concluded that taken together, programs did not differ from their respective control groups on vocabulary development by the end of preschool, nor at the end of kindergarten. Nor could she determine the impacts of particular programs.

The Centre for Excellence and Outcomes (C4EO) in the UK (Coghlan et al., 2009) presented findings from a rapid review of research since 2000 on approaches to improving outcomes for children in the early years. They found strong evidence that implementing focused and sustained system-level strategies for remediating child and family poverty can significantly improve outcomes for young children.

The purpose of this review is to place the findings of studies of early childhood programs intended to enhance school readiness on a common scale, to provide educators and policy makers with meaningful, unbiased information that they can use to select approaches most likely to benefit their children's school readiness. It also updates the evidence, particularly in light of

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the findings of an extraordinary set of studies, funded by the U. S. Department of Education, called the Preschool Curriculum Evaluation Research (PCER, 2008), as well as other research that has added substantially to the number and quality of studies of outcomes of alternative preschool approaches. To make the review most useful to educators and policy makers, it emphasizes large studies done over significant time periods that used standard individually-administered measures. Such studies generally evaluate programs as they are used in practical, larger-scale implementations, rather than in the hothouse conditions characteristic of the Perry Preschool evaluation (Schweinhart et al., 1993) and the Abecedarian Project (Ramey & Ramey, 1998), among others. It also identifies common characteristics of programs likely to make a difference in children's literacy and language outcomes.

Method

This review uses a form of meta-analysis called best evidence synthesis, designed for use in reviewing literatures in which there are relatively few studies evaluating each of many programs (see Slavin, 2008). Best-evidence syntheses apply consistent standards to identify unbiased, meaningful information from experimental studies, discuss the evidence for each program, and pool effect sizes across studies in substantively justified categories. The method uses standard meta-analytic techniques (Cooper, 1998; Lipsey & Wilson, 2001), with adaptations described later in this section.

Methodological Issues Unique to Early Childhood Education

There are several problems characteristic of research on child outcomes of early childhood programs that are important to understand. First, many outcomes of early education are difficult to measure with young children, so it may be that impacts of a given approach may not be detected at the end of a four-year-old program but might show up on related measures a

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year or two later, not because of a "sleeper effect" but because a true but difficult-to-measure impact became measurable in later years. For example, difficult-to-measure impacts on general vocabulary might show up in reading comprehension or reading vocabulary assessments in the primary grades. In fact, a five-year study by Lipsey, Farran, Hurley, Hofer, & Bilbrey (2009) randomly assigned preschools to *Bright Beginnings*, *Creative Curriculum*, or control conditions for one year; and found modest literacy effects for *Bright Beginnings* (ES = +0.18) and none for *Creative Curriculum* (ES = -0.11). Yet third-grade state reading tests for the children remaining in the same schools showed positive follow-up effects for *Bright Beginnings* (ES = +0.27) and *Creative Curriculum* (ES = +0.16).

Secondly, studies of early childhood programs are particularly susceptible to bias due to use of measures inherent to the experimental treatment, or overly aligned with the treatment group's objectives but not the control group's objectives (see Slavin & Madden, 2011, on this topic). For example, imagine that an experimental treatment for four-year-olds emphasizes a specific list of vocabulary words, and then the assessment consists of a subset of these words, which the treatment group would have heard far more than the control group. As one example, Neuman, Newman, & Dwyer (2011) evaluated a vocabulary intervention called *World of Words*, or WOW. Averaging across three units over the course of a year, the mean effect size for "word knowledge" for a subset of target words was +0.40 ($p<.001$). However, on the treatment-independent Woodcock-Johnson Picture Vocabulary test, the difference was an effect size of +0.07 (n.s.). In a study by Pollard-Duradola et al. (2011), the effects of a vocabulary intervention on a researcher-developed receptive vocabulary measure focusing on target words was +1.56. On PPVT, a treatment-independent measure, the effect size was +0.09. Such treatment-inherent measures are excluded in this review.

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Finally, preschool measures are always administered individually. Individual assessment can create opportunities for bias, especially if testers are the child's own teacher or other school staff who would be aware of the child's treatment assignment and might have motivations to make the program or their class or school look good on tests. For this reason, studies were rejected from this review if testing was done by the children's teachers or other persons who were not independent of the school or program.

Search Procedures

We conducted an exhaustive initial search to locate all studies that took place from 1990 to the present that have compared child learning outcomes of alternative approaches to early childhood education. The 1990 start date reflects the changes that have taken place in early childhood education, as preschool programs have become far more widespread and more focused on literacy, and as many innovative preschool approaches have been developed and evaluated. Studies from all countries were included, as long as the studies were available in English. In practice, all qualifying studies were from the U.S. Studies published in refereed journals, technical reports, dissertations, or unpublished papers, were all included. In addition to thorough electronic searches, manual searches of the major education journals were conducted, and references in reviews and primary research articles were followed up.

All potentially relevant papers were retrieved. Data were extracted and coded by one reviewer using a standard procedure and were checked by another reviewer. Disagreements were resolved by discussion and consensus and, if necessary, a third reviewer was consulted. The search yielded 32 experimental-control comparisons evaluating 22 different programs that met the inclusion criteria described in the following section (each experimental-control comparison is referred to hereafter as a "study.").

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Inclusion Criteria

The studies evaluated educational programs for groups of children between the ages of 3 and 5, or in the year before they begin kindergarten. The studies compared children taught in classes using a given program to those using an alternative program or business as usual, usually a teacher-designed program. All control groups used developmental models, either a specific program such as Creative Curriculum or High/Scope, or a teacher-designed approach. Studies that only compared preschool attendance to non-attendance were not included. Any early childhood setting that offered a regularly scheduled educational program to a group of preschoolers was included except for those that only provided narrow, time-limited supplements to developmental programs, such as shared reading interventions (Mason et al., 1990; Piasta et al., 2012) or vocabulary interventions (e.g., Neuman et al., 2011), as noted earlier. Only four studies of shared book reading and two of vocabulary interventions would have met the inclusion criteria. Other inclusion criteria were as follows.

1. Initial equivalence. Random assignment or matching with appropriate adjustments for any pretest differences (e.g., analyses of covariance) had to be used. Studies with differences of more than 50% of a standard deviation on a pretest were excluded because, even with analyses of covariance, large pretest differences cannot be adequately controlled for (Shadish, Cook, & Campbell, 2002).

Studies without control groups, such as pre-post comparisons, were excluded. Studies in which parents selected their children be placed into treatments (e.g., chose to attend a particular preschool program) were excluded.

2. Sample size. Studies needed to have least 2 teachers and 25 children in each condition in the analysis. The purpose of the two-teacher requirement was to reduce

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confounding of teachers and treatments. The sample size requirement was intended to reduce confounding with class effects, and to reduce the "small study size effect" in which very small studies have been found to greatly inflate reported program impacts (Slavin & Smith, 2009).

3. Outcome measures. The dependent measures included quantitative measures of literacy (e.g., alphabet knowledge, phonemic awareness, phonics, and concepts of print) and language (e.g., expressive and receptive language). Experimenter-made measures were accepted only if it could be determined that they assessed skills equally addressed in the control groups as well as the experimental groups.

Measures of objectives inherent to the intervention were excluded, for reasons discussed previously. Also excluded were measures in which the children's teachers rated cognitive skills or behaviors. Teachers in the treatment groups might have had their perceptions of the children's skills or behaviors influenced by their knowledge of being in a study and knowing the goals of the intervention. Also, as noted earlier, studies were excluded if child assessments were administered by the child's teacher or others involved with the program.

We included studies that followed children into kindergarten, or further into elementary school, and measured children's language or literacy outcomes.

4. Duration. A minimum study duration of 12 weeks was required, to focus the review on practical programs and practices intended for extended use. Very brief studies often create artificial conditions that could not be maintained over time.

Sometimes the impacts of an intervention become more apparent well after the immediate posttest. This is especially true for literacy outcomes, because reading is not generally assessed in preschool, although gains in vocabulary or other cognitive skills can have later effects on reading. For this reason, in the summary table, we report outcomes for the end of preschool, the

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end of kindergarten, and later in elementary school, and put particular emphasis on findings as of the end of kindergarten or later.

5. Replicability. Studies were excluded if they evaluated interventions that could not be broadly replicated as they were implemented. These include programs with extremely small class sizes, exceptional numbers of staff, locations in university lab schools with many researchers and students in daily participation, and so on. Students in which the researcher or graduate students delivered the treatment were excluded (e.g., Byrne & Fielding-Barnsley, 1993). Such studies may be of theoretical interest, but are not relevant to practice.

Computation of Effect Sizes

In general, effect sizes were computed as the difference between experimental and control individual child posttests after adjustment for pretests and other covariates, divided by the unadjusted posttest control group standard deviation (Lipsey & Wilson, 2001). If there were multiple studies of a given program, effect sizes were pooled across studies for the program, and effect sizes were also pooled across studies for various categories of programs. This pooling used means weighted by the final sample sizes to maximize the importance of large studies, as small studies tend to overstate effect sizes (see Rothstein et al., 2005; Slavin & Smith, 2009). Effect sizes were categorized as measures of language (including receptive and expressive vocabulary) and literacy (including phonological awareness, print knowledge, letter and word identification, and spelling).

Limitations

It is important to note several limitations of the present review. First, the review focuses on experimental studies using quantitative measures of child learning outcomes of early childhood interventions. To compare the effectiveness of programs, one needs quantitative

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evidence that can be evaluated on a common scale, primarily on individually-administered standardized tests. These are useful in assessing the practical outcomes of various programs and are fair to control as well as experimental groups. However, the review does not report on experimenter-made measures of content taught in the experimental group but not the control group, although results on such measures may also be of importance to researchers or educators (with due attention to the likelihood that such measures produce outcomes biased in favor of treatment groups).

Second, the review focuses on replicable programs used in realistic early childhood settings, excluding unrealistic implementations of programs that could not be replicated as they were implemented. This emphasis is consistent with the review's purpose in providing educators with useful information about the strength of evidence supporting various practical programs, but it does not attend to smaller or shorter, more theoretically-driven studies that may also provide useful information, especially to researchers.

The review focuses on the main approach used in preschool classes, with a particular interest in contrasts between main approaches that do or do not include explicit teaching of language and early literacy.

The review does not include important social-emotional outcomes. We intended to include the impacts of interventions on children's social and emotional development. However, few studies included these outcomes. When they did, the data usually came from teacher or parent ratings of children's behavior, rather than on unbiased observations of children's actual behavior. Teacher and parent ratings can be influenced by their knowledge of being in a study and of the goals of the particular intervention. For this reason, studies in this domain were not included.

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Finally, there were very few qualifying studies on mathematics impacts, so we have excluded math outcomes from the review.

Categories of Research Design

Three categories of research designs were included in this review. *Randomized experiments* were those in which children, classes, or schools were randomly assigned to treatments, and data analyses were at the level of random assignment. In a *cluster randomized* design, when classes, teachers, or schools were randomly assigned to experimental and control conditions, analysis should be at the class or school level, usually using hierarchical linear modeling (HLM; Raudenbush & Bryk, 2002). When schools, teachers, or classes were randomly assigned but there were too few schools or classes to justify analysis at the level of random assignment, the study was categorized as a *randomized quasi-experiment* (Slavin, 2008). *Quasi-experimental or matched control group* studies were ones in which experimental and control groups were matched on key variables at pretest, before posttests were known. Studies using fully randomized designs are preferable to randomized quasi-experiments, but all randomized experiments are less subject to bias than matched studies.

Results

Key study characteristics, child outcomes, and study quality are summarized in the following sections. Table 1 and Table 2 present the effect sizes for all measures in qualifying studies, as well as averages across language and literacy measures in preschool, kindergarten, and beyond. Tables 1 and 2 also include information on study demographics, sample sizes, nature of control groups, and other details. Where appropriate data were available from two or more studies of similar interventions, program means weighted by sample sizes were computed.

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Program Categories

To facilitate understanding and discussion, the 22 programs that had at least one qualifying study were organized in categories according to their main intentions, focus, and characteristics. The programs fell into two main categories: *balanced* and *developmental*. These are described below.

Decisions about where to place each program were made by two researchers independently with a third brought in if there were disagreements. The decisions were based on information on websites and in the studies that were summarized in this review. This discrimination was relatively easy to make, and there were few disagreements.

Balanced programs. Balanced programs are intended to use the best aspects of both developmental and skills-focused approaches. Like developmental approaches, they are likely to emphasize child-initiated activities, activity stations, art, and music. Activities are likely to be organized in themes, and are likely to provide many opportunities for make-believe, experimentation, and group play. However, some of the day is devoted to whole-class or small-group activities specifically focused on building language and early reading skills. Further, balanced programs are likely to regularly assess children's progress and to carefully plan both teacher-directed and child-initiated activities that contribute to progress toward specific language and literacy goals. Examples of balanced programs include *Curiosity Corner* (Chambers et al., 2001) and ELLM (Cosgrove et al., 2006).

Developmental programs. Programs falling into the developmental category base their theories of action on the work of Piaget and Vygotsky. These programs have also been referred to as "child-centered" in other reviews. Programs in this category have a strong emphasis on child-initiated activity, play, make-believe, art, music, and movement. Children typically work

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at self-chosen activity stations or tables, which offer them materials to stimulate language and cognitive development, with open-ended activities such as fingerpainting, sand and water tables, a dress-up corner, a puppet theatre, blocks, cars and trucks, and so on. Teachers' roles are primarily supportive rather than directive, with teachers setting out and introducing activities, engaging individuals or groups in conversations about what they are doing or plan to do. Teachers introduce themes, often based on the children's interests. They discuss key concepts such as numbers, shapes, colors, and vocabulary, read books to the class, and seek ways to encourage and expand appropriate uses of language. Direct teaching of phonemic awareness and phonics are rarely emphasized, and if it does take place it is in the context of thematic activities, rarely in a whole-class setting. There is usually a strong emphasis on social-emotional development, social skills (such as taking turns), and parent involvement. *The Creative Curriculum* and *High/Scope* models are widely known and longstanding examples of this approach.

Preschool Curriculum Evaluation Research (PCER). The evaluation of outcomes of alternative approaches to early childhood education was greatly accelerated by a large federal initiative, the Preschool Curriculum Evaluation Research (PCER), funded by the U.S. Institute for Education Sciences between 2002 and 2005. PCER was of particular importance both because it applied consistent standards and assessments across all programs and because it followed up outcomes to the end of kindergarten. PCER commissioned third-party evaluations of 14 different preschool curricula with two independent external evaluators and 12 PCER grantees to compare one or two different curricula to a control condition in cluster randomized experiments. In each study, preschool classes or whole schools were randomly assigned to experimental or control conditions for two years. The external evaluators (Mathematica and RTI)

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administered a battery of nine measures designed to assess children's cognitive, language, beginning reading, math, and writing skills. The child assessments included: Social Awareness Tasks; Peabody Picture Vocabulary Test—3; Test of Early Language Development—Phonemic Awareness Subtest and Grammatical Understanding Subtest; Test of Early Reading Ability—3rd Edition; and the Letter-Word Identification and Spelling Subtests of the Woodcock-Johnson III. The measures were administered in the fall of preschool, in the spring of preschool, and again in the spring of kindergarten. Posttest data, controlling for pretests, were analysed at the cluster level using hierarchical linear modelling (HLM; Raudebush & Bryk, 2002). In some cases, experimenters built on the PCER studies by following up PCER samples past kindergarten or by supplementing the PCER samples with additional students and schools recruited in the same way.

Program Summaries

The programs are clustered into the Balanced and Developmental categories described above and presented in alphabetical order within each category. The programs and outcomes are described in the text, but information on the research design is discussed only if there are features that are not obvious from the tables.

Balanced programs. Balanced programs explicitly emphasize all aspects of children's development, teaching specific skills, language and school behaviors in a deliberate and planful way, but still find time for plenty of play, discovery, music, art, gross motor activity, and parent involvement. Eighteen programs fell into this category. Table 1 summarizes the findings of these studies.

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TABLES 1 AND 2 HERE

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Breakthrough to Literacy. *Breakthrough to Literacy* is a systematic and integrated literacy and language program published by the Wright Group that seeks to promote language development and literacy skills among preschool children. The program uses systematic, direct instruction built around a series of weekly books in the classroom. Interactive computer programs are used to engage pupils in individualized activities, also organized around the weekly book, to support literacy skills and print knowledge.

Abt Associates (2007) carried out an 18-month study in Miami-Dade County, Florida, to examine the impacts of three intervention programs on teacher behaviors, classroom environments, and child outcomes—*Ready, Set, Leap!, Building Early Language and Literacy* (BELL), and *Breakthrough to Literacy* (BTL). One hundred sixty-two centers serving low-SES children in Miami-Dade County were randomly assigned to one of the treatment groups or a control condition that used ordinary preschool approaches.

Children were pretested in fall, 2003 and posttested in kindergarten (spring, 2005). Hierarchical linear models were used to analyze the data, with age, gender, language spoken at home, and classroom mean pretest scores as covariates. At the end of kindergarten, children who received *Breakthrough to Literacy* (*N*=354) outperformed the control group (*N*=509) on average literacy measures (ES = +0.52) and "definitional vocabulary" (ES = +0.44).

Bright Beginnings. *Bright Beginnings* is an integrated curriculum with a focus on language and early literacy. The curriculum goals are to provide a consistent, child-centered, literacy-focused program and to include instruction that addresses the needs of the whole child. The curriculum was especially designed to provide continuity in the preschool to second-grade curricula. *Bright Beginnings* includes nine curriculum units that focus on all domains of learning. The classroom environment is designed to encourage children's active exploration and

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interaction with adults, other children, and concrete materials. The curriculum also includes a parent involvement component.

As part of the PCER (2008) evaluation, researchers from Vanderbilt University evaluated *Bright Beginnings* and *Creative Curriculum*. This summary focuses on the description and findings for *Bright Beginnings.* Twenty-one full-day, public prekindergarten classrooms (309 children) in seven school districts in Tennessee mostly serving disadvantaged White students participated in the PCER study. In the control classrooms, teachers used teacher-developed curricula with a focus on basic school readiness. A non-significant mean effect size of +0.31 across literacy outcomes at the end of preschool had faded by the spring of kindergarten to +0.02. Limited effects were found for two language measures at preschool (ES =+0.11).

A linked study by Lipsey et al. (2009) followed a larger number of teachers and children over a five-year period. At the end of the preschool year, HLM analyses controlling for pretests found positive but non-significant effects on two literacy measures (mean ES = +0.18) but no differences on five language measures (mean ES = -0.03). Children in *Bright Beginnings* scored significantly higher than those in *Creative Curriculum* on Woodcock Johnson Letter-Word ID and Spelling scales, and on PPVT. Non-significant differences on individually-administered measures were also found on kindergarten and first grade assessments. However, on state tests in third grade, controlling for pretests, there were significant differences favoring former *Bright Beginnings* students in reading (ES = +0.27).

Building Early Language and Literacy (BELL). *Building Early Language and Literacy* (BELL) is a supplementary program aimed at promoting preschoolers' general language proficiency, phonological awareness, shared reading skills, and print knowledge. Children receive two 15-20 minutes lessons daily. Children's literature is used in the classroom to build

vocabulary and promote awareness of story sequencing and characters. The program also includes shared reading time and phonological awareness time to support reading skills and phonetic reading techniques.

Abt Associates (2007) carried out an 18-month study in Miami-Dade County to examine the impacts of three intervention programs on teacher behaviors, classroom environments, and child outcomes—*Ready, Set, Leap!*, BELL, and *Breakthrough to Literacy*. No statistically significant differences were found between the BELL group and the control group . Effect sizes averaged +0.06 for literacy measures and +0.07 for definitional vocabulary.

Classroom Links to Early Literacy. Powell, Diamond, Burchinal, & Koehler (2010), at Purdue University, created and evaluated a professional development approach for preschool teachers designed to help them implement balanced, literacy-focused methods. The professional development was provided either in person or using distance technology, but a sub-study comparing these two PD methods found them to be equally effective. In both cases, teachers made and returned to project coaches videos of themselves using program elements.

The PD approach, called *Classroom Links to Early Literacy*, was evaluated in 88 classrooms located in 24 Head Start centers in a Midwestern state. Teachers were randomly assigned to receive the PD or to continue current practices (most implemented *Creative Curriculum).* Seven percent of teachers and 19% of children dropped out before the end of the study, leaving 73 teachers (42E, 31C) and 642 children (360E, 280C). By the end of preschool, children in the experimental group scored significantly better than control children on measures of letter knowledge, concepts about print, writing, and blending, with an average effect size across five literacy measures of +0.19. However, there were no differences on PPVT (ES=-0.03).

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Curiosity Corner. *Curiosity Corner* is a comprehensive cognitive-developmental program developed by the Success for All Foundation. It aims to develop the attitudes, skills, and knowledge necessary for later school success with an emphasis on children's language and literacy skills. *Curiosity Corner* comprises two sets of 38 weekly thematic units. Teachers present children with learning experiences through sequential daily activities. The program provides training, support, and teaching materials for teaching staff and administrators. Parents are encouraged to participate in children's learning through activities both inside and outside the classroom.

Curiosity Corner was one of 14 curricula evaluated in randomized field trials in the PCER (2008) project. Adjusting for pretests, there were no significant differences at the end of preschool, but there were significant differences favoring the *Curiosity Corner* preschool attendees on literacy measures at the end of kindergarten.

Chambers, Chamberlain, Hurley, and Slavin (2001), in an earlier matched study, evaluated *Curiosity Corner* in high-poverty communities in New Jersey. Two age groups participated in the study. Children in the three-year-old Curiosity Corner classes scored significantly higher on expressive language than their counterparts in the control group, but there were no differences for four-year-olds (overall ES=+0.15).

Dialogic Reading plus Sound Foundations. Whitehurst et al. (1999) evaluated a program that combined *Dialogic Reading*, an interactive story reading approach (Whitehurst et al., 1994), with the *Sound Foundations* program (Byrne & Fielding-Barnsley, 1993), which focuses on phonics and phonemic awareness. *Dialogic Reading* was used all year, but *Sound Foundations* was used from February to June to teach key letter sounds and sound blending

skills. The study involved two successive cohorts of children in Head Start centers in Suffolk County, New York, serving a high-poverty, diverse community.

Children were pretested on PPVT and four scales from the Developing Skills Checklist (DSC). They were then posttested at the end of prekindergarten and kindergarten on the same four DSC measures and the Expressive One-Word Picture Vocabulary Test (EOWPVT).

Data were analyzed at the student level, and a composite test of all measures showed statistically significant positive effects at the end of pre-k and kindergarten. However, effect sizes were modest. The average effect size (controlling for pretests) for two literacy measures was +0.12 at pre-k and +0.08 at kindergarten. On three language measures, average effect sizes were +0.12 at pre-k and +0.13 at kindergarten. Follow-up assessments in first grade found that control students scored non-significantly higher than former experimental students on Stanford Word Reading (ES = -0.16) and WRMT Word Attack (ES = -0.10). At the end of second grade, effect sizes were ES = -0.29 for Word Reading and ES = -0.26 for Word Attack.

Direct Instruction. *Direct Instruction* (DI) is a program first developed by Bereiter and Englemann (1966) as an instructional method for at-risk children. DI is a teacher-directed program in which specific cognitive and literacy skills are broken down into small units and taught explicitly. Teachers follow highly scripted lesson plans and techniques in their lessons. The main focus of the program is on basic academic concepts, such as arithmetic and reading. DI was evaluated as a comprehensive program by Engelmann (1968), but this study had too few students in the treatment group and was conducted before the start date of this review. More recently, Salaway (2008) examined the additive effects of a supplemental DI addition to a developmentally appropriate preschool (DAP) curriculum. A total of sixty-one preschoolers were randomly assigned to either the *Language for Learning* (DI-Add-On) curriculum or the DAP-

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only curriculum group. Children in the treatment group were instructed by the trained teachers 3 days a week in the morning during small group activity. All participating children were tested on two measures prior to the intervention: Kaufman Survey of Early Academic and Language Skills (K-SEALS) and DIBELS. After the 6-month intervention, all children received posttest assessments. Outcomes at the end of preschool showed children in the experimental group outperformed controls on literacy (mean ES=+0.52) and language (mean ES= +0.46).

DLM Early Childhood Express* supplemented with *Open Court Reading Pre-K. A Florida State University research team implemented the *DLM Early Childhood Express* comprehensive curriculum in conjunction with the *Open Court Reading Pre-K* literacy-focused curriculum as part of the PCER (2008) project. We describe this combination of the two curricula as a separate program, compared to a control group, as the effects were only reported for the combined programs. In the control condition, teachers were provided with the *High/Scope* curriculum.

The *DLM Early Childhood Express Program* is a comprehensive curriculum, designed to promote children's social, emotional, intellectual, aesthetic, and physical development through the use of hands-on learning experiences. The curriculum has 36 weekly themes that address all learning domains.

The *Open Court Reading Pre-K* curriculum content is presented in eight thematic units that address children's identity, families, friends, social interactions, transportation, the physical senses, nature, and transitions. Phonological, phonemic, and print-awareness activities are incorporated into each lesson. The curriculum includes a home component that provides parents with suggested activities.

By integrating the literacy-focused instruction from *Open Court Reading Pre-K* with the comprehensive instructional framework of *DLM Early Childhood Express*, children received instruction that was intended to provide them with a strong foundation in oral language and print awareness as well as instruction in phonics and early decoding and comprehension skills.

In the PCER (2008) evaluation, the Florida State University research team recruited full-day public prekindergarten programs for participation in the study. Two teachers from each of the 16 participating schools were recruited to participate. The final study sample included 30 teachers and classrooms across three conditions (9 control, 10 *Literacy Express*, and 11 *DLM Early Childhood Express supplemented with Open Court Reading Pre-K*). There were 297 children.

The evaluators conducted repeated-measures linear spline analyses of the three reading assessments to control for a statistically significant pretest difference on the WJ Letter Word Identification test (ES = +0.41). Controlling for the pretest difference, outcomes at the end of preschool showed children in the experimental group outperformed controls on literacy (ES = +0.49) and language (ES = +0.40). Effects for the experimental group were sustained through spring of kindergarten, for an average effect size of +0.47 for literacy outcomes and +0.47 for language outcomes.

Doors to Discovery. *Doors to Discovery* focuses on oral language, phonological awareness, concepts of print, alphabet knowledge, writing, and comprehension. It uses learning centers and shared literacy activities presented in eight thematic units that cover topics such as friendship, communities, and nature. The curriculum components also include family learning activities, initial and ongoing training, professional development support for teachers; and assessment strategies that are integrated into the curriculum units.

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Doors to Discovery was one of the curricula evaluated in the PCER (2008) project by the University of Texas Health Science Center at Houston along with *Let's Begin with the Letter People.* These programs were separately compared to a control group. All were implemented in ethnically diverse full-day Head Start and public prekindergartens in Texas. Forty-four teachers/classrooms, and 297 children were selected for inclusion in the study sample. Effect sizes at the end of preschool were +0.10 for literacy and +0.16 for language. Experimental-control differences were non-significant on all measures at the end of kindergarten, with an effect size of -0.11 for literacy and +0.12 for language.

Early Literacy and Learning Model (ELLM). The *Early Literacy and Learning Model* (ELLM) is a literacy-focused curriculum and support system designed for young children from low-income families. The *ELLM* program includes curriculum and literacy building blocks, assessment for instructional improvement, professional development for literacy coaches and teachers, family involvement, and collaborative partnerships. The *ELLM* curriculum and support system is designed to enhance existing classroom curricula by focusing on children's early language and literacy skills and knowledge. They include a set of literacy performance standards; monthly literacy packets; targeted instructional strategies; resource guides for teachers; a book lending library, and literacy calendars. Parents receive tips on activities to do with their children. *ELLM* requires a two-hour block of daily literacy and language instruction. Trained literacy coaches provide instructional support to preschool teachers who use the curriculum. Teachers target instruction in phonological awareness and letter recognition specifically for individual children based on baseline assessments.

As part of the PCER project, *ELLM* was evaluated in 28 preschool classrooms in Florida. Effects on four literacy measures averaged +0.10, and effects on PPVT and TOLD outcomes

averaged +0.16. On follow-up into kindergarten, effect sizes averaged +0.11 for literacy and +0.39 for language.

In an extension to the PCER (2008) study, Cosgrove et al. (2006) also evaluated *ELLM*. The study sample was comprised of 466 4-year-old preschoolers in 48 classrooms in multiple settings. As in the PCER evaluation, *ELLM* was implemented in combination with the existing curricula, while controls used only the existing curricula (generally Creative Curriculum or High/Scope). The treatment group scored significantly higher than the control groups on five literacy outcomes (mean ES = +0.25).

Exemplary Model of Early Reading Growth and Excellence (EMERGE). *EMERGE* is a literacy-based program designed to help children from low-income families acquire early literacy skills. The program supports children's development of early literacy skills, using research-based teaching practices, progress monitoring to identify the need for more intensive intervention, provision of a literacy-rich learning environment, and continuous professional development. The curriculum includes interactive shared book reading and theme-based activities. The program also includes family involvement and home-based activity components.

Gettinger & Stoiber (2007) evaluated the model in a matched one-year study, implemented in 15 classrooms housed in five early childhood centers. The participating classrooms provided full-day, year-round programming for mostly African American, low SES children across two consecutive years prior to kindergarten. A total of 342 students were enrolled. Ten Head Start classrooms were selected to serve as a matched control group. *EMERGE* children outperformed those in the control classrooms, with a mean effect size in literacy of +0.34, and in language of +0.13, at the end of preschool.

Ladders to Literacy. *Ladders to Literacy* is a supplementary early literacy and language development curriculum for preschool and kindergarten children. It includes skill-building activities that are organized by print awareness; metalinguistic awareness; and oral language. Teachers are encouraged to select the activities that they want to implement and incorporate those activities into their daily classroom schedule. Teachers are provided with guidance on how to scaffold learning to individualize children's learning of language and literacy skills.

In the PCER (2008) study, a University of New Hampshire research team selected a common subset of 27 activities that all *Ladders to Literacy* treatment group teachers used throughout the school year. For this evaluation, *Ladders to Literacy* was implemented as a supplementary curriculum to the *Creative Curriculum*. Classrooms in the control condition implemented *Creative Curriculum* without the supplement.

The researchers recruited 14 full-day and half-day Head Start classrooms and 123 children in New Hampshire to participate in the study. Effects were negative at the end of preschool (ES= -0.08 for literacy and -0.30 for language) and also at the end of kindergarten (ES= -0.25 for literacy and -0.18 for language).

Let's Begin with the Letter People. *Let's Begin with the Letter People* (*LBLP*) emphasizes early language and literacy development through play. In addition to classroom teaching, the program has a strong home/parent component. The curriculum is arranged in the following five themes: 1) All About Me, 2) Animals, Animals, and Animals; 3) Everyone Has Needs, 4) Getting Along with Others; and 5) Nature All Around Us.

Fischel et al. (2007) carried out a one-year study to evaluate the effectiveness of *LBLP* and the *Waterford Early Reading Program* (see the *Waterford* section for effects for that program). Thirty-five Head Start preschool classrooms in six centers were randomly assigned to

one of these programs or a control condition, which used High/Scope. A total of 507 *Head Start* children participated in the study, during one of 3 school years.

Children in *LBLP* scored significantly higher than the control group across 7 literacy measures, averaging an effect size of +0.20. However, there were no differences on PPVT (ES = + 0.06).

LBLP was one of the curricula evaluated in the PCER (2008) project by the University of Texas Health Science Center at Houston. *LBLP* was compared to a control group that implemented teacher-developed, non-specific curricula in full-day Head Start and public prekindergarten programs in Texas. Forty-four teachers/classrooms and 297 parents and children were selected for inclusion in the study sample. No impacts on the preschool or kindergarten pupil-level outcomes were found. In preschool, effect sizes were +0.04 across four literacy measures and +0.03 for PPVT and TOLD measures. On kindergarten follow-up measures, effect sizes were -0.13 for literacy and -0.06 for language.

Literacy Express. *Literacy Express* is a preschool curriculum that is designed to promote children's emergent literacy skills. The curriculum is structured around thematic units that are sequenced in order of complexity. Each unit includes selected children's books that address theme-relevant vocabulary for small- and large-group reading activities. In addition, each thematic unit includes small-group activities, conducted three to four times a week, which provide homogeneous small groups of children with practice in the skills needed to develop oral language, phonological sensitivity, and print awareness. The large-group and extension activities provide opportunities for children to apply newly acquired skills in varied contexts.

As part of the PCER (2008) project, a Florida State University (FSU) research team evaluated two curricula: *Literacy Express* and *DLM Early Childhood Express supplemented with*

Open Court Reading Pre-K. In this section, we report on *Literacy Express* as compared to a control group, which implemented the *High/Scope* curriculum.

The FSU research team recruited two teachers from each of 16 full-day public prekindergarten programs to participate in the study. The final study sample included 30 teachers and classrooms across three conditions. Data were collected on a total of 282 children (59% African-American, 30% white) at the time of the fall baseline data collection.

At the end of preschool there was an effect size of +0.17 across four literacy measures, and +0.07 on PPVT and TOLD. By the end of kindergarten, the literacy effects had faded to +0.03, and language outcomes averaged +0.13.

As an extension of the PCER study, Lonigan et al. (2011) evaluated *Literacy Express* in a study involving random assignment of 48 preschool centers to experimental or control groups. At the end of preschool, there were differences on expressive language of +0.27.

Ready, Set, Leap! *Ready, Set, Leap!* is a comprehensive preschool curriculum, published by LeapFrog SchoolHouse, which combines literacy-focused instructional approaches with multisensory technology. The curriculum is structured around 9 thematic units, each with detailed lesson plans for large- and small-group instruction, and ongoing assessment tools. The program stresses the importance of experiential learning, social and emotional development, teacher-child relationships, and home-school connections. The curriculum covers all domains with a focus on language and literacy. The technology is designed to provide thematic center-based activities that provide individualized feedback to pupils. There is also a component to encourage parent-child interaction.

For the PCER (2008) project, University of California, Berkeley researchers, in collaboration with RMC Research, implemented *Ready, Set, Leap!* The research team recruited

21 full-day prekindergarten programs in New Jersey, mostly serving African American and Hispanic children. Centers were matched and then randomly assigned to treatments. In the control condition, teachers used High/Scope. No significant differences were found on the prekindergarten or kindergarten child outcomes, and all kindergarten effect sizes were essentially zero.

A cluster randomized study of Ready, Set, Leap! (RSL) that overlapped the PCER study was carried out in 17 high-poverty mostly African American or Hispanic, inner-city Newark public elementary schools by RMC Research Corporation (Davidson, Fields, & Yang, 2009). Schools were randomly assigned to either RSL or a control group. A two-level hierarchical linear analysis with pretests as covariates found small to moderate but non-significant effects on five of the posttest measures, with a mean effect size of +0.18 for literacy measures and +0.10 for language measures.

Abt Associates (2007) examined the impacts of three intervention programs on teacher behaviors, classroom environments, and child outcomes—*Ready, Set, Leap! Building Early Language and Literacy* (BELL), and *Breakthrough to Literacy* (BTL) - in an 18-month study in Miami-Dade County, Florida. Children in the *Ready, Set, Leap!* group scored significantly higher than control students on all four subscales of the Test of Preschool Emergent Literacy (TOPEL), with a mean effect size of +0.45.

Research-based Developmentally Informed (REDI) program . REDI (*Research-based, Developmentally Informed*) is an enrichment program that is integrated into regular Head Start centers that use *High/Scope* or *Creative Curriculum*. This program is designed to promote academic and social-emotional school readiness by training teachers using program-based strategies and techniques in their classrooms that combine Preschool PATHS (a social-emotional

approach), *Dialogic Reading*, a set of "Sound Games," and print center activities for emergent literacy skills. Teachers receive a three-day intensive training prior to the intervention and one-day follow-up training four months into the intervention. In addition, teachers receive weekly mentoring support provided by REDI trainers. Parents are also provided with materials for home activities with their children.

Bierman et al. (2008) recruited two cohorts of four-year-olds over two years to participate in an evaluation of REDI. Participants were 356 preschoolers from 44 Head Start classrooms in three counties in Pennsylvania. A cluster random sampling design stratifying on length of program, location, and demographics was used, and data were analyzed using hierarchical linear models. Significant treatment effects in pre-k were reported for two measures of literacy (mean ES = +0.31) and language (ES = +0.16).

A follow-up of the Bierman et al. (2008) sample into kindergarten was reported by Bierman et al. (2014). A significant difference was found only on the TOWRE phonemic decoding test (ES=+0.25, $p<.05$). Effect sizes were +0.03 for WJ Letter-Word Identification and -0.04 for TOWRE Sight Word Reading, for a kindergarten literacy mean of +0.08. On the EOWPVT vocabulary scale, the kindergarten effect sizes was +0.10 (n.s.).

Tools of the Mind. *Tools of the Mind* is a curriculum for three- to four-year-olds based on Vygotsky's theories. It focuses on children's ability to self-regulate, oral language, phonemic awareness, letter knowledge, and conventions of print. The activities emphasize children planning their activities, dramatic play, use of self-regulatory private speech, and use of external aids to facilitate memory and attention. Children learn in structured play, doing partner reading and writing activities, dance, and games.

Barnett et al (2008) carried out a randomized evaluation of *Tools of the Mind* in an urban New Jersey school district. More than 92% of children were Latino and 70% had Spanish as their primary home language. Children and teachers were randomly assigned to use *Tools of the Mind* or a control condition in which children experienced a district-created "balanced literacy" method. The focus of the two curricula was described as being equal with regard to literacy, but there was more emphasis in the control condition on teacher direction and less on the development of self-regulation skills. All classes provided full-day (6 hrs/day) programs.

Children were individually pre- and post-tested as individuals. Some measures were given in Spanish to Spanish-dominant children. Adjusting for pretests, effect sizes were -0.04 for literacy and +0.16 for language (PPVT and EOWPVT).

Farran & Wilson (2014) evaluated *Tools of the Mind* in 60 classes located in two southern states. The classes were in four rural and one urban district, and the population was very disadvantaged (88% free lunch) and ethnically diverse. Schools were randomly assigned to use *Tools of the Mind* or to keep using their existing programs. *Tools of the Mind* was used for one year, and then children were followed up through first grade.

Effects of *Tools of the Mind* were minimal in preschool and at follow-up. On two literacy measures effect sizes were -0.10 at the end of preschool, -0.21 in kindergarten, and -0.19 in first grade. A passage comprehension measure added in first grade showed an effect size of -0.04. On two language measures, mean effect sizes were-0.06 in preschool, -0.01 in kindergarten, and +0.03 in first grade.

Waterford Early Reading Program. The *Waterford Early Reading Program (Waterford)* is an integrated learning system that provides 15 minutes of daily computerized one-to-one learning activities for preschool children. It focuses on teaching children their letters, as well as

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developing phonological and phonemic awareness, story and print concepts, and language concepts. It gives teachers information on children's levels of skill, which they are expected to use to provide appropriate teaching outside of computer time. Developmentally appropriate books and videotapes are introduced in class and then sent home with children.

Fischel et al. (2007) carried out a randomized quasi-experimental evaluation of *Waterford* in six Head Start centers in south-eastern New York State, mostly serving African American or Hispanic children. Combining across three cohorts, a total of 12 classes (*n*=172) were randomly assigned to *Waterford* and 11 to control (*n*=150). An additional 12 classes (*n*=185) were randomly assigned to *Let's Begin with the Letter People*, described elsewhere in this article.

The centers had been using the *High/Scope* curriculum for 10 years, and all classes continued to do so, with the addition of the *Waterford* or *Let's Begin* activities in the experimental groups. Children were individually pre- and posttested on eight measures. Adjusting for pretests, posttest literacy effect sizes comparing *Waterford* to control averaged +0.08 across 7 literacy measures. This compares to an effect size (vs. control) of +0.20 for *Let's Begin*. On the PPVT language measure, the effect size for *Waterford* was +0.06.

Developmental programs. While developmental programs such as *Creative Curriculum* and *High/Scope* have long been the most popular programs in U.S. preschools, there were surprisingly few studies of these approaches. In fact, they were most likely to show up as the control condition for other innovations. Four programs were categorized as developmental. They were: *Creative Curriculum, Language-Focused Curriculum, Project Approach*, and *Project Construct.*

Creative Curriculum. *Creative Curriculum* is a comprehensive approach to education for 3- to 5-year-old children. The curriculum addresses four areas of development: social/emotional,

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physical, cognitive, and language development. *Creative Curriculum* requires the physical space of the classroom to be structured into 10 interest areas: blocks, dramatic play, toys and games, art, library, discovery, sand and water, music and movement, cooking, and computers. Time is also allotted for outdoor activities. The 10 interest areas are designed to address curriculum content, such as literacy, mathematics, science, social studies, the arts, and technology, in a fairly unstructured setting designed to promote skills, such as observing, exploring, and problem solving.

In the PCER project, researchers from Vanderbilt University evaluated *Creative Curriculum* and *Bright Beginnings*, described earlier. Twenty-one full-day, public prekindergarten classrooms in seven rural school districts in Tennessee participated in the PCER study. They were randomly assigned to *Creative Curriculum*, *Bright Beginnings*, or control. In the control classrooms, teachers used teacher-developed curricula with a focus on basic school readiness. No significant differences between *Creative Curriculum* and control classes were found. Effect sizes across literacy measures were +0.12 at preschool and +0.20 at kindergarten, and +0.15 at preschool and +0.12 at kindergarten for two language measures.

A research team from the University of North Carolina at Charlotte also evaluated *Creative Curriculum* as part of the PCER project. They recruited full-day Head Start programs in North Carolina and Georgia. There were eight classrooms in North Carolina and 10 classrooms in Georgia, mostly serving African-American children. A sample of 18 classrooms and 194 children participated in the study. In the control condition, teachers used teacher-developed, nonspecific curricula.

Teachers within centers were randomly assigned to condition. No significant impacts on preschool or kindergarten child outcomes were found. Effect sizes averaged -0.08 for four

literacy measures at preschool and -0.03 on two language measures. At kindergarten follow-up, effect sizes were -0.01 for literacy and -0.01 for language.

In the study cited previously by Lipsey et al. (2009), which overlapped the PCER evaluation, preschools in rural Tennessee were randomly assigned to *Creative Curriculum, Bright Beginnings*, or control. On HLM analyses at the end of the pre-k year, children in *Creative Curriculum* classes scored non-significantly lower than controls on 2 literacy measures (mean ES = -0.11) and 5 language measures (mean ES = -0.01), and they scored significantly lower than children in *Bright Beginnings* on Woodcock Johnson Letter-Word ID and Spelling, and on PPVT. However, followed up to third grade, former *Creative Curriculum* children scored non-significantly higher than controls on state reading tests (ES = +0.16).

Averaging across these three evaluations, a weighted mean effect size of -0.02 was found for literacy at pre-k and a mean of +0.06 was found at kindergarten. For language measures, mean effect sizes were +0.02 at pre-k and +0.04 at kindergarten.

Language-Focused Curriculum. *The Language-Focused Curriculum* (LFC) was developed at the University of Kansas (Bunce, 1995) for use with 3- to 5-year-old children with language limitations, including children with language impairment; children from disadvantaged backgrounds; and English-language learners. The curriculum has a thematic organization and focuses on the use of daily dramatic play to teach and use linguistic concepts. There are both teacher-led and child-led activities with explicit attention to oral language development that is enhanced by high-quality teacher-child conversations. Teachers use eight specific language stimulation techniques when interacting with children in the classroom, such as event casts (descriptions of an activity while it is taking place) and expansions (repeating the child's utterance with varied vocabulary) (Justice, Mashburn, Pence & Wiggins, 2008).

In the PCER (2008) study, researchers from the University of Virginia implemented the LFC in seven full-day Head Start and public prekindergarten classrooms in Virginia. There were also seven control classrooms. The control teachers reported using *High/Scope* curriculum materials. No significant impacts on preschool or kindergarten child outcomes were found. There was a modest effect on literacy (ES = +0.18) at the end of preschool which had diminished to ES = +0.05 by kindergarten. On two language measures effect sizes were +0.02 in preschool and -0.08 in kindergarten.

Project Approach. *The Project Approach* is a set of teaching strategies that enables teachers to guide children through in-depth investigations of real world topics. The curriculum is designed to use children's interests as the starting point for organizing and developing classroom learning activities. Three curriculum components address children's learning needs: spontaneous play, systematic instruction, and project work. A *project* is defined as an in-depth study of a real world topic that is worthy of children's attention and effort. Projects can be incorporated into an existing classroom instructional program and can extend over several days or weeks. The structural features of the *Project Approach* include discussion, fieldwork, representation, investigation, and display. During the preliminary planning stage, the teacher selects the topic of study (based primarily on classroom learning goals, children's interests, and the availability of local resources). The class brainstorms experience, knowledge, and ideas and the teacher represents them in a topic web. In *Project Approach* classrooms, the daily schedule is structured so that children and teachers spend at least 45 to 60 minutes engaged in investigation and discovery.

In the PCER (2008) project, researchers at Purdue University and the University of Wisconsin-Milwaukee implemented the *Project Approach* curriculum. The Purdue/Wisconsin

research team recruited ethnically diverse public prekindergarten classrooms for participation in the study. The research team recruited and randomly assigned 13 teachers from 12 different schools in Wisconsin. A sample of 204 children and parents were recruited for participation. In the control classrooms, teachers implemented their own teacher-developed, nonspecific curricula.

At the end of prekindergarten, there were non-significant effects on literacy (ES=+0.22) and language (ES= +0.16). At the end of kindergarten the effects on literacy dropped to +0.07, but the effects on language (ES = +0.21) maintained.

Project Construct. *Project Construct* was developed under the direction of the Missouri Department of Elementary and Secondary Education in 1986. The *Project Construct* approach is organized around 29 goals for students that are set within a context of four development domains: cognitive, representational, sociomoral, and physical. The Project Construct National Center supports professional development through institutes, workshops, conferences, and on-site consultations as well as through extensive print and video materials.

For the PCER (2008) project, a University of Missouri research team evaluated the *Project Construct* 2002 curriculum. The researchers recruited 21 full-day child-care centers, and the external evaluators grouped schools into blocks of two based on characteristics such as teachers' experience, school location, and score on a state report card system, and randomly assigned half the schools in each block to the treatment group and half to the control group. The treatment classrooms received training, supplies, and materials to support the implementation of *Project Construct*. In the control schools, teacher-developed generic curricula were implemented.

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Data were collected on a total sample of 188 children (65% Caucasian, 29% African American) at the fall baseline. No significant impacts on preschool or kindergarten child outcomes were found. At preschool, effect sizes averaged -0.03 for literacy and -0.01 for language, and in kindergarten effect sizes were 0.00 for literacy and -0.06 for language.

Programs and Outcomes by Category

Table 3 summarizes overall literacy and language outcomes at preschool and kindergarten for all 32 studies of 22 programs, sorted into "balanced" and "developmental" categories. Mean effect sizes are weighted by the smaller of the sample sizes involved (experimental or control). Comparing means at the end of preschool, it is clear that effect sizes for balanced programs were larger than those in developmental programs in literacy (mean ES=+0.15 for balanced, +0.04 for developmental) and to a lesser degree, in language (mean ES=+0.08 for balanced, +0.03 for developmental). Effect sizes at kindergarten follow-up also favored balanced programs, both for literacy (mean ES=+0.14 for balanced, +0.06 for developmental) and for language (mean ES=+0.15 for balanced, +0.06 for developmental). It is important to note that within-study comparisons also favor balanced approaches. All studies of balanced models used primarily developmental models as their control groups, and most of these are named programs such as High/Scope and Creative Curriculum.

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TABLE 3 HERE

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There is a great deal of variation among both balanced and developmental programs, and there are only six studies of developmental programs, but there is little evidence to support the outcomes of the developmental programs, and certainly no evidence that initial gains in balanced programs would fade by kindergarten or in the early elementary grades.

Discussion

The results of this systematic review of research on early childhood education programs support several clear conclusions. First, taken together, the 22 programs with at least one qualifying study have significantly greater impacts on children's learning than do their respective control groups, which generally represent current widespread practice (primarily developmental approaches). At the end of preschool, weighted effect sizes across all 32 qualifying studies were +0.12 for literacy measures and +0.07 for language. At kindergarten follow-up, effects averaged +0.08 for literacy measures and +0.12 for language. Largely because of the federal Preschool Curriculum Evaluation Research (PCER) and related studies, the 32 studies are of exceptional methodological quality. Twenty-seven of the 32 studies used cluster randomized designs, where schools, classes, or teachers were randomly assigned to treatments and analyses were done at the cluster level, and two more did random assignment at the student level. One small study randomly assigned at the cluster level but analyzed data at the student level. Only two studies used matched designs. The use of these rigorous designs, all but two with an element of random assignment, virtually rules out selection bias as an alternative explanation for study findings. Such rigorous designs make it difficult for programs to show strong positive effects, so the modest effect sizes for most programs must be seen in this light.

The most important substantive outcome of the review is a clear difference between outcomes of balanced and developmental programs. The findings support the idea that young

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children learn best in programs that balance skills-focused and developmental activities. Programs that focus on developmental, child-initiated activities but do not incorporate teaching of phonemic awareness and phonics skills had lower effect sizes than did those that had a focus on early literacy skills as well as developmental activities. Not surprisingly, the advantage of balanced over developmental programs was greatest on literacy at the end of preschool (ES: +0.15 for balanced programs, ES=+0.08 for developmental). This makes sense, because literacy activities are primarily what balanced programs add. However, balanced programs also produced somewhat higher effect sizes on language measures at the end of preschool (ES=+0.08 vs. +0.03). On kindergarten follow-up, balanced programs showed better outcomes than developmental programs on outcomes for both literacy (ES=+0.14 vs. +0.06) and language (ES=+0.15 vs. +0.06). Preschool literacy outcomes may merely indicate that teaching preschool children skills ordinarily emphasized in kindergarten or later produce immediate effects on those skills. However, given that mean effect sizes on language as well as literacy measures were higher for balanced programs than for developmental programs in kindergarten certainly does not support any concern that preschool literacy outcomes of balanced programs might just be temporary, due to an early focus on literacy.

All of the programs with strong evidence of effectiveness were from the balanced category. They had a combination of teacher-directed and child-initiated activities. They also had clear goals and measures of how children are achieving them with some focus on academic outcomes. It is easier for teachers to monitor the progress of children if they have a clear idea of what they are working toward. They can provide carefully planned experiences designed to move children toward success on literacy and language outcomes, and this gives the children a significant advantage as they enter the elementary grades.

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Beyond the curricular emphasis, another factor that differentiates programs is the degree of support that the teachers are provided in implementing the curriculum. In most of the studies reported here, teachers received more support for implementation of the program than teachers typically receive when implementing a new program. In practice, preschool teachers often receive very little support, perhaps just a teacher's manual with suggested activities. In some of the studies summarized here, teachers received extensive initial training and frequent follow-up coaching by the developer or researchers. It is important to understand this, because it usually takes ongoing support for teachers to learn to implement the innovative forms of instruction that new programs require. Educational administrators need to plan and budget for this when adopting new programs.

In large scale investigations of different curricula, it is important for researchers to observe and describe what actually happens in both the treatment and comparison conditions. Assessments of fidelity of implementation might help explain the impacts, or lack thereof, in some studies. Many of the studies that were reviewed for this article lacked sufficient description of both conditions, particularly the comparison condition.

Most of the programs included in this review were evaluated in implementations in high poverty communities. For this reason, the results may be more generalizable to those populations. And of course the issue of the applicability of the findings of this review to contexts outside the U.S. must be addressed. All of the studies reviewed here were conducted in the U.S., many in large urban areas, which may or may not generalize to other cultures or systems of education.

As programs for young children expand in availability, they must also grow in quality. Further development and evaluation of preschool approaches may discover new ways to help

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young children further prepare themselves for elementary school. However, the findings of this review of research since 1990 add to a growing body of evidence that early childhood programs can have an important impact on increasing the school readiness of young children. There is a tremendous need for systematic, large-scale, longitudinal, randomized evaluations of the effectiveness of preschool interventions in bringing children from high-risk environments to normative levels of academic achievement. This review identifies several promising approaches that could be used today to help children begin elementary school ready to succeed, but more programs and more research are needed to better understand how to provide young children with optimal experiences in preschool.

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Table 1
Designs, Settings, and Outcomes for Balanced Programs

Study	Design/ Control	Duration	N	Sample Characteristics	Posttest	Preschool ES	Preschool Mean ES	Kinder ES	Kinder Mean ES	Post Kinder ES
Breakthrough to Literacy										
Abt Associates (2007)	Cluster Randomized Ordinary preschool	18 months	863 students (354E, 509C)	162 child care centers in Miami-Dade County that served children from low-income families. 57% Hispanic, 24% White, and 19% African American	Literacy					
					TOPEL Print Knowledge			+0.60		
					TOPEL Phonological Awareness			+0.44	+0.52	
					Language					
					TOPEL Definitional Vocabulary			+0.31	+0.31	
Bright Beginnings					Literacy					
PCER (2008)	Cluster Randomized Ordinary preschool	2 years	14 classes 208 students (103E, 105C)	Seven school districts in six counties in TN; 80% White, 18% African American, 11% Hispanic	TERA	+0.39	+0.21	-0.07	+0.02	
					WJ Letter Word ID	+0.35		+0.09		
					WJ Spelling	+0.18		+0.06		
					Pre-CTOPP/CTOPP	-0.07		+0.01		
					Language					
					PPVT	+0.13	+0.11	+0.07	+0.12	
					TOLD	+0.09		+0.16		
Lipsey et al. (2009)	Cluster Randomized Ordinary preschool	5 years	36 pre-K classes (116E, 148C)	Seven school districts in six rural middle TN counties. Overlaps	Literacy					
					WJ Letter-Word ID	+0.20	+0.18			
					WJ Spelling	+0.15				

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				PCER sample.	Language				
					WJ Picture Vocabulary	-0.02	-0.03		
					WJ Story Recall	+0.06			
					WJ Directions	+0.06			
					WJ Comprehension	-0.17			
					PPVT	+0.05			
					Follow-Up				
					TCAP Reading				Gr. 3: +0.27
Building Early Language and Literacy (BELL)									
					Literacy				
Abt Associates (2007)	Cluster Randomized Ordinary preschool	18 months	849 students (340E, 509C)	162 child care centers in Miami-Dade County Florida that served children from low-income families. 57% Hispanic, 24% White, and 19% African American	TOPEL Print Knowledge			+0.07	+0.06	
					TOPEL Phonological Awareness			+0.04		
					Language					
					TOPEL Definitional Vocabulary			+0.07	+0.07	
Classroom Links to Early Literacy									
Powell, Diamond, Burchnal, & Koehler (2010)	Cluster Randomized Mostly Creative Curriculum	1 Semester	73 teachers (42E, 31C) 568 students (310E, 258C)	Head Start centers in a midwest state. 44% African American, 30% White, 23% Hispanic	Literacy	-	-	-		
					WJ Letter-Word ID	+0.10	+0.19	-		
					FACES Alphabet	+0.29				
					Concepts of	+0.22				

					Print				
					Writing	+0.17			
					TOPEL Blending	+0.18			
					Language				
					PPVT	-0.03	-0.03		
Curiosity Corner	-	-	-	-	-	-	-	-	
PCER (2008)	Cluster Randomized Mostly Creative Curriculum	2 years	18 pre-K programs 225 students (105E, 110C)	Preschool programs in FL, KS, and NJ; 28% White, 51% African American, 14% Hispanic, and 8% others	Literacy				
					TERA	+0.10	+0.10	+0.43	+0.33
					WJ Letter Word ID	+0.09		+0.43	
					WJ Spelling	+0.04		+0.20	
					Pre-CTOPP/CTOPP	+0.18		+0.25	
					Language				
					PPVT	-0.01	-0.05	+0.14	+0.15
					TOLD	-0.08		+0.15	
Chambers et al. (2001)	Matched control Ordinary preschool	1 yr	316 students (206E, 110C)	3 and 4-year-old children enrolled in child care centers and preschools in 4 high poverty urban school districts in New Jersey	Language				
					MSEL Expressive Language	+0.24	+0.15		
					MSEL Receptive Language	+0.06			
Dialogic Reading plus Sound Foundations									
Whitehurst et al. (1999)	Randomized Quasi-Experiment Ordinary preschool	4 years	37 classes 280 students	Head Start centers in Suffolk County, New	Literacy				
					DSC Print Concepts	+0.12	+0.12	+0.03	+0.08
					DSC Writing	+0.11		+0.13	

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				York. 43% African American, 33% White, 18% Hispanic, & 6% others	Language					
					EOWPVT Language	+0.08		+0.14		
					DSC Memory	+0.19	+0.12	+0.12	+0.13	
					DSC Auditory	+0.09		+0.13		
					Follow-Up					
					Stanford Word Reading					Gr 1: -0.16; Gr. 2: -0.29
					WRMT Word Attack					Gr 1: -0.10; Gr. 2: -0.26
Direct Instruction										
					Literacy					
Salaway (2008)	Randomized Develop-mentally appropriate preschool	6 months	61 students (35E, 26C)	A preschool center in an urban, at risk community. 20% White, 69% African American, 2% Hispanic, and 10% others	DIBELS Initial Sounds Fluency	+0.75				
					DIBELS Letter Naming Fluency	+0.50	+0.52			
					Letter and Word Skills	+0.32				
					Language					
					K-SEALS Expressive Language	+0.40				
					K-SEALS Receptive Language	+0.51	+0.46			
DLM Express plus Open Court										
					Literacy					
PCER (2008)	Cluster Randomized High/Scope	2 years	11 preschool programs 198 students (101E, 97C)	Public preschool programs in FL; 30%	TERA	+0.68		+0.76		
					WJ Letter Word ID	+0.51	+0.49	+0.50	+0.47	

				White, 59% African American, 6% Hispanic, 5% others	WJ Spelling	+0.46		+0.22	
					Pre-CTOPP/CTOPP	+0.32		+0.38	
					Language				
					PPVT	+0.40	+0.40	+0.48	+0.47
					TOLD	+0.40		+0.46	
Doors to Discovery									
					Literacy				
PCER (2008)	Cluster Randomized Ordinary preschool	2 years	29 classes 297 students (101E, 96C)	Head Start and public preschool programs in TX; 30% White, 13% African American, 43% Hispanic, 13% others	TERA	+0.06	+0.10	-0.05	-0.09
					WJ Letter Word ID	+0.10		-0.09	
					WJ Spelling	+0.06		-0.12	
					Pre-CTOPP/CTOPP	+0.18		-0.09	
					Language				
					PPVT	+0.15	+0.16	+0.18	+0.12
					TOLD	+0.17		+0.06	
Early Literacy & Learning Model (ELLM)				-	-	-	-	-	
				Head Start, subsidized, faith-based and preschool classrooms from 3 locations in FL; 14% White, 71% African American, 8% Hispanic, 6% others. Overlaps PCER sample.	Literacy				
Cosgrove et al. (2006)	Cluster Randomized Creative Curriculum or High/Scope	1 year	466 students (222E, 244C)		TERA Reading Quotient	+0.28	+0.25		
					TERA Alphabet	+0.28			
					TERA Print	+0.17			
					TERA Meaning	+0.29			
					Alphabet Letter Recognition Inventory	+0.25			

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PCER (2008)	Cluster RandomizedCreative Curriculum, High/Scope, others	1 yr	28 classes244 students(137E, 107C)	Head Start, subsidized, faith-based and preschool classrooms from 3 locations in FL;14% White, 71% African American, 8% Hispanic, 6% others	Literacy				
					TERA	+0.15	+0.10	+0.30	+0.11
					WJ Letter Word ID	-0.05		0.00	
					WJ Spelling	+0.11		+0.04	
					Pre-CTOPP/CTOPP	+0.18		+0.08	
					Language				
					PPVT	+0.17	+0.16	+0.34	+0.39
					TOLD	+0.15		+0.44	
EMERGE									
Gettinger & Stoiber (2007)	Matched control Ordinary preschool	1 year	342 students (188E, 154C)	Low SES Head Start and preschool centers in Milwaukee, Wisconsin, 90% African American	Literacy				
					PALS Pre-K Alphabet Knowledge	+0.47	+0.33		
					PALS Pre-K Print Awareness	+0.50			
					PALS Pre-K Name Writing	+0.01			
					Language				
					PPVT	+0.13	+0.13		
Ladders to Literacy									
PCER (2008)	Cluster Randomized Creative Curriculum	2 years	14 classes 123 students (62E, 61C)	Head Start centers in NH 38% White, 11% African American, 30 Hispanic, and 20% others	Literacy				
					TERA	-0.30	-0.08	-0.54	-0.25
					WJ Letter Word ID	-0.16		-0.27	
					WJ Spelling	+0.30		-0.08	
					Pre-CTOPP/CTOPP	-0.16		-0.10	

					Language				
					PPVT	-0.38	-0.30	-0.30	-0.18
					TOLD	-0.22		-0.06	
Let's Begin With The Letter People									
PCER (2008)	Cluster Randomized High/Scope	2 years	30 classes 196 students (100E, 96C) Shared same control group with Doors to Discovery	Head Start and public preschool programs in TX 30% White, 13% African American, 43% Hispanic, 13% others	Literacy				
					TERA	+0.02	+0.04	-0.13	-0.13
					WJ Letter Word ID	+0.10		-0.18	
					WJ Spelling	+0.17		-0.06	
					Pre-CTOPP/CTOPP	-0.13		-0.13	
					Language				
					PPVT	-0.03	+0.03	0.00	-0.06
					TOLD	+0.08		-0.12	
Fischel et al. (2007)	Randomized Quasi-ExperimentHigh/Scope	1 year	35 classes 335 students (185E, 150C)	Six Head Start centers in SE New York State 42% African American, 41% Hispanic, 7% White, 8% multiracial; 14% Spanish	Literacy				
					Get Ready to Read! Screen	+0.32	+0.20		
					Letters Known	+0.31			
					WJ-R Letter Word ID	+0.29			
					WJ-R Dictation	+0.38			
					WJ-R Book Knowledge	+0.12			
					WJ-R Print Conventions	+0.23			
					WJ-R Comprehension	-0.12			
					Language				
					PPVT	+0.06	+0.06		
Literacy Express									

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Lonigan et al (2011)	Cluster Randomized High/Scope	1 year	48 centers 739 students (497E, 242C)	Low SES Head Start and Title I school district preschools in Tallahassee, FL and LA, CA	PLS Expressive language	+0.27		-	
PCER (2008)	Cluster Randomized High/Scope	2 years	12 preschool programs 195 students (99E, 97C)	Public preschool programs in FL; 30% White, 59% African American, 6% Hispanic, 5% others	Literacy				
					TERA	+0.17	+0.17	-0.11	+0.03
					WJ Letter Word ID	+0.30		+0.08	
					WJ Spelling	+0.05		+0.06	
					Pre-CTOPP/CTOPP	+0.14		+0.08	
					Language			-	
					PPVT	+0.17	+0.07	+0.16	+0.13
					TOLD	-0.04		+0.10	
Ready, Set, Leap!									
PCER (2008)	Cluster Randomized High/Scope	2 years	39 classes 286 students (149E, 137C)	Preschools from an urban area in New Jersey 78% African American, 20% Hispanic	Literacy				
					TERA	+0.08	+0.05	+0.01	-0.02
					WJ Letter Word ID	+0.01		-0.12	
					WJ Spelling	+0.20		+0.04	
					Pre-CTOPP/CTOPP	-0.09		-0.02	
					Language				
					PPVT	+0.15	+0.02	-0.02	-0.03
					TOLD	-0.11		-0.03	
Davidson. Fields, &	Cluster Randomized	1 year	27 classes 254 students	High poverty inner-city	Literacy			-	
					CTOPP	+0.35	+0.16	-	

Yang (2009)	High/Scope		(129E, 125C)	Newark public elementary schools. Overlaps PCER sample.	Blending				
					DIBELS Letter Naming	-0.10			
					DIBELS Initial Sound Fluency	+0.21			
					WJ Rhyming	+0.19			
					WJ Passage Comprehension	+0.09			
					WJ Letter ID	+0.19			
					Language			-	
					PPVT	+0.01	+0.01	-	
Abt Associates (2007)	Cluster RandomizedOrdinary preschool	18 months	829 students (320E, 509C)	162 child care centers in Miami-Dade County Florida that served children from low-income families. 57% Hispanic, 24% White, and 19% African American	Literacy				-
					TOPEL Print knowledge			+0.65	
					TOPEL Phonological Awareness			+0.35	+.50 -
					Language				-
					TOPEL Definitional Vocabulary			+0.28	
Research-Based, Developmentally Informed (REDI)				-	-	-	-	-	
Bierman et al. (2008); Bierman et al. (2014)	Cluster Randomized High/Scope or Creative Curriculum	2 years	356 students	44 Head Start classrooms in three counties in PA. 25% African American,	Literacy				
					TOPEL Print Awareness	+0.18	+0.31		
					TOPEL Blending and Elision	+0.43			

				42% White, 17% Hispanic	TOWRE Phonemic Decoding			+0.25		
					TOWRE Sight Word			-0.04	+0.08	
					WJ LWID			+0.03		
					Language					
					EOWPVT Picture Vocabulary	+0.16	+0.16	+0.10	+0.10	
Tools of the Mind										
					Literacy					
Barnett et al. (2008)	Cluster Randomized District program	1 year	18 classes 218 students (85E, 120C)	High poverty urban school district in NJ; 80% free lunch, 92% Hispanic	Get Ready to Read	+0.03	-0.04			
					WJ Letter-Word	-0.11				
					Language					
					PPVT	+0.22	+0.16			
					EOWPVT	+0.11				
					Literacy					
					WJ Letter-Word ID	-0.15	-0.10	-0.17	-0.21	Gr 1: -0.12
					WJ Spelling	-0.04		-0.24		Gr 1: -0.25
					Language					
Farran & Wilson (2014)	Cluster Randomized Ordinary preschool	3 years	60 classes (32E, 28C) 877 children (498E, 379C)	Schools in 4 rural and 1 urban district in 2 southern states. 41%White, 25% Hispanic, 23% African-American, 6% Asian, 88% free lunch	WJ Oral Comprehension	-0.07	-0.06	-0.02	-0.01	Gr 1: 0.00
					WJ Picture Vocabulary	-0.04		+0.01		Gr 1: +0.05
					Follow-Up					
					WJ Passage Comprehension (Gr. 1)					Gr 1: -0.04
Waterford				-	-	-	-	-		

Fischel et al. (2007)	Randomized Quasi-Experiment High/Scope	1 year	35 classes 335 students (185E, 150C)	Six Head Start centers in SE New York State 42% African American, 41% Hispanic, 7% White, 8% multiracial; 14% Spanish language dominant	Literacy		
					Get Ready to Read! Screen	+0.32	
					Letters Known	+0.12	
					WJ-R Letter Word ID	+0.11	
					WJ-R Dictation	+0.02	+0.08
					WJ Book Knowledge	+0.00	
					WJ Print Conventions	+0.21	
					Comprehension	-0.21	
					Language		
					PPVT	+0.06	+0.06

Abbreviations:
Measures
CTOPP: Comprehensive Test of Phonological Processing
DIBELS: Dynamic Indicators of Basic Early Literacy Skills
DSC: Developing Skills Checklist
FACES: Family and Child Experiences Survey from Head Start
K-SEALS: Kaufman Survey of Early Academic and Language Skills
PALS-Pre-K: Phonological Awareness and Literacy Screening-PreKindergarten
PLS: Preschool Language Scale
PPVT: Peabody Picture Vocabulary Test
PRE-CTOPP: PreSchool Comprehensive Test of Phonological and Print Processing
TCAP: Tennessee Comprehensive Assessment Program
TELD: Test of English Language Development
TERA: Test of Early Reading Ability
TOPEL: Test of Preschool Early Literacy
TOLD: Test of Language Development
WJ: Woodcock-Johnson
WJ: COMP: Woodcock-Johnson Passage Comprehension
WJ: DIRECTIONS: Woodcock-Johnson Understanding Directions
WJ: LWID: Woodcock-Johnson Letter-Word Identification
WRMT: Woodcock Reading Mastery Tests

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Table 2
Designs, Settings, and Outcomes for Developmental Programs

Study	Design/ Control	Duration	N	Sample Characteristics	Posttest	Preschool ES	Preschool Mean ES	Kinder ES	Kinder Mean ES	Post Kinder ES
Creative Curriculum					-	-	-	-		
Lipsey et al. (2009)	Cluster Randomized Ordinary preschool	5 years	36 pre-K classes (109E, 148C)	Seven school districts in six rural middle TN counties. Overlaps PCER sample.	Literacy	-	-	-		
					WJ Letter-Word ID	-0.14	-0.11			
					WJ Spelling	-0.08				
					Language					
					WJ Picture Vocabulary	-0.02	-0.07			
					WJ Story Recall	+0.04				
					WJ Understanding Directions	-0.09				
					WJ Oral Comprehension	-0.16				
					PPVT	-0.14				
					Follow-Up					
					TCAP Reading 3rd Grade					Gr. 3: +0.16
PCER (2008) (Tennessee)	Cluster Randomized Ordinary preschool	2 years	14 classes 206 students (101E, 105C)	Seven school districts in six rural counties in TN; 80% White, 18% African American,	Literacy					
					TERA	+0.02	+0.12	+0.10	+0.20	
					WJ Letter Word ID	+0.16		+0.38		
					WJ Spelling	+0.19		+0.25		
					Pre-CTOPP/CTOPP	+0.10		+0.06		

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				11% Hispanic	Language				
					PPVT	+0.23	+0.15	+0.12	+0.12
					TOLD	+0.07		+0.11	
PCER (2008) (North Carolina and Georgia)	Cluster Randomized Ordinary preschool	2 years	18 classes 194 students (97E, 97C)	Head Start centers in NC and GA; 3% White, 85% African American, 8% Hispanic	Literacy				
					TERA	-0.08	-0.08	-0.04	-0.01
					WJ Letter Word ID	-0.08		0.00	
					WJ Spelling	-0.18		-0.05	
					Pre-CTOPP/CTOPP	+0.02		+0.06	
					Language				
					PPVT	+0.08	-0.03	+0.15	-0.01
					TOLD	-0.16		-0.17	
Language-Focused Curriculum									
PCER (2008)	Cluster Randomized High/Scope	2 years	14 classes 195 students (97E, 98C)	Head Start and public preschool classrooms in VA; 71% White, 21% African American, 4% Hispanic, 3% others	Literacy				
					TERA	+0.16	+0.18	+0.05	+0.05
					WJ Letter Word ID	+0.11		+0.02	
					WJ Spelling	+0.25		+0.11	
					Pre-CTOPP/CTOPP	+0.20		+0.03	
					Language				
					PPVT	+0.02	+0.02	-0.09	-0.08
					TOLD	+0.01		-0.07	
Project Approach									
PCER (2008)	Cluster Randomized	2 years	13 classes	Public preschool	Literacy				
					TERA	+0.14	+0.22	+0.29	+0.07

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	Ordinary preschool		204 students (114E, 90C)	programs in WI; 28% White, 40% African American, 17% Hispanic, 13% others	WJ Letter Word ID	+0.42		+0.03	
					WJ Spelling	+0.27		+0.14	
					Pre-CTOPP/CTOPP	+0.05		-0.17	
					Language				-
					PPVT	+0.16	+0.16	+0.10	+0.21
					TOLD	+0.15		+0.32	
Project Construct									
					Literacy				
PCER (2008)	Cluster Randomized Ordinary preschool	2 years	21 preschool programs 231 students (123E, 108C)	Preschool centers from urban and rural MO; 65% White, 29% African American, 3% Hispanic, 6% others	TERA	0.00	-0.03	-0.03	0.00
					WJ Letter Word ID	-0.05		+0.16	
					WJ Spelling	-0.15		0.00	
					Pre-CTOPP/CTOPP	+0.10		-0.12	
					Language				
					PPVT	+0.03	-0.01	+0.10	+0.06
					TOLD	-0.05		+0.01	

Table 3 *Summary of Programs and Outcomes by Category*				
Balanced				
	Pre-K		Kindergarten	
	Literacy	Language	Literacy	Language
Breakthrough to Literacy			+0.52	+0.31
BELL			+0.06	+0.07
Bright Beginnings				
PCER	+0.21	+0.11	+0.02	+0.12
Lipsey	+0.18	-0.03		
Classroom Links to Early Literacy	+0.19	-0.03		
Curiosity Corner				
PCER	+0.10	-0.05	+0.33	+0.15
Chambers		+0.15		
Dialogic Reading + Sound Foundations	+0.12	+0.12	+0.08	+0.13
Direct Instruction (Supplement)	+0.52	+0.46		
DLM Express + Open Court	+0.49	+0.40	+0.47	+0.47
Doors to Discovery	+0.10	+0.16	-0.09	+0.12
ELLM				
Cosgrove	+0.25			
PCER	+0.10	+0.16	+0.11	+0.39
EMERGE	+0.33	+0.13		
Ladders to Literacy	-0.08	-0.30	-0.25	-0.18
Let's Begin				
PCER	+0.04	+0.03	-0.13	-0.06
Fischel	+0.20	+0.06		
Literacy Express				
Lonigan		+0.27		
PCER	+0.17	+0.07	+0.03	+0.13
Ready, Set, Leap				
PCER	+0.05	+0.02	-0.02	-0.03
Davidson	+0.16	+0.01		
Abt			+0.50	+0.28
REDI	+0.31	+0.16	+0.08	+0.10

Tools of the Mind				
Barnett	-0.04	+0.16		
Farran	-0.10	-0.06	-0.21	-0.01
Waterford	+0.08	+0.06		
Balanced Mean	+0.15	+0.08	+0.14	+0.15
Developmental				
	Pre-K		Kindergarten	
	Literacy	Language	Literacy	Language
Creative Curriculum				
Lipsey	-0.11	-0.07		
PCER-Tenn	+0.12	+0.15	+0.20	+0.12
PCER-NC/GA	-0.08	-0.03	-0.01	-0.01
Language-Focused Curriculum	+0.18	+0.02	+0.05	-0.08
Project Approach	+0.22	+0.16	+0.07	+0.21
Project Construct	-0.03	-0.01	0.00	+0.06
Developmental Mean	+0.04	+0.03	+0.06	+0.06

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