



RESEARCH PAPER

Effective early childhood education programmes: a best-evidence synthesis

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Professor Chambers' current work focuses on developing and evaluating replicable programmes that use co-operative learning and technology-embedded instruction, particularly in early childhood education and early literacy. She is working on the pilot of an early years programme called Curiosity Corner Interactive which uses embedded multimedia segments presented on the interactive whiteboard. Other projects include an evaluation of Success for All, one of Reading Roots Interactive, a technology-based beginning literacy programme, and a randomised experiment of a Year 4 and 5 mathematics programme.

Professor Chambers has been the recipient of the Bothwell-Smith award for outstanding contribution to the field of early childhood education and the Palmer O. Johnson award for the best article in an American Educational Research Association (AERA) journal in 2007.

Professor Robert E Slavin

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Abstract

“...long-term effects on social adjustment outcomes such as reductions in delinquency, welfare dependency, and teenage pregnancy, and increases in educational and employment levels.”

This report systematically reviews research on the outcomes of programmes that teach young children in a group setting before they begin reception. Study inclusion criteria included the use of randomised or matched control groups, and study duration of at least 12 weeks. Studies included valid measures of language, literacy, phonological awareness, mathematical, and/or cognitive outcomes that were independent of the experimental treatments. A total of 40 studies, evaluating 29 different programmes met these criteria for outcomes assessed at the end of preschool and/or reception/kindergarten.

The review concludes that on academic outcomes at the end of preschool and/or reception, six early childhood programmes showed strong evidence of effectiveness and five had moderate evidence of effectiveness. Of the 29 programmes reviewed, eight are available for implementation in the UK.

A few longitudinal studies have followed their subjects into secondary school, and even adulthood. These studies show that comprehensive programmes, from a cognitive developmental perspective rather than a solely academic focus, had better long-term effects on social adjustment outcomes such as reductions in delinquency, welfare dependency, and teenage pregnancy, and increases in educational and employment levels.

Introduction

“*Depending on the study, researchers have found that for each dollar spent on preschool, somewhere between four and eight dollars is saved in later social service costs to society.*”

The education of young children who are at risk of school failure is widely recognised as an important factor in determining future school success. Previous reviews of programmes for children between the ages of three and five, or before they begin reception or kindergarten, demonstrate that early childhood education is a worthwhile investment (Barnett, Frede, Mosbasher & Mohr, 1987; Reynolds, Temple, Robertson & Mann, 2001).

Depending on the study, researchers have found that for each dollar spent on preschool somewhere between four and eight dollars is saved in later social service costs to society (Barnett, 2007; Karoly & Bigelow, 2005). In addition to short-term effects on academic achievement, long-term effects of several programmes include fewer arrests, fewer teenage pregnancies, and higher employment (Gilliam & Zigler, 2000).

Recent research on brain and cognitive development is reinforcing this evidence that early education is crucial in getting children off to a good start in life (Bowman, Donovan & Burns, 2001; Magnuson, Meyers, Ruhm, Waldfogel, 2003). Based in part on this research, local and national policy makers are establishing new early childhood programmes, and trying to improve the quality of the ones that exist.

Recent evaluations of Sure Start have demonstrated mixed findings. While there have been positive impacts on social development and health outcomes, there has been no significant impact on oral language development, an important precursor to success in school (Belsky & Melhuish, 2007). Today, the important question before researchers and policy makers is what **kind** of preschool or nursery is most effective for young children? Which particular programmes have positive outcomes and what elements of these programmes contribute to their effectiveness?

The present report reviews the evidence for the effectiveness of various preschool/nursery programmes for young children who are at risk of school failure due to poverty. It reviews the research on the outcomes of early childhood programmes provided in a group setting for all children, applying consistent methodological standards to the research. The aim of this review is both to assist educators and policy makers in deciding the types of programmes to implement and to inform researchers about the current evidence on nursery programmes as well as guiding further research. The scope of the review includes all types of programmes that Children's Centre directors, headteachers or childcare directors might consider adopting to prepare their children for success in primary school and beyond.

“Poor children do worse academically and make less progress in learning throughout the early years.”

Previous reviews

Most previous reviews of preschool interventions have focused on the question of whether or not preschool attendance influences future school success (e.g. Currie, 2000; Gilliam & Zigler, 2000; Gorey, 2001; Karweit, 1993). A few have conducted cost-benefit analyses of early education (Barnett, 1993; Penn *et al.* 2006). And a few have made comparisons of different types of interventions (Barnett, 1995; Chambers, Cheung & Slavin, 2006; White, Taylor & Moss, 1992).

White's (1992) meta-analytic review concluded that early intervention benefited most children, but could not identify which types of interventions were most effective. Barnett (1995) reviewed 36 studies of preschool attendance, Head Start, child care, and home visiting programmes. He concluded that early childhood interventions (compared to no preschool) generally have large short-term effects on intelligence measures and sizeable effects on school achievement, grade retention, special education placement and social adjustment. However, he was not able to compare alternative preschool programmes.

The Chambers *et al.* (2006) review compared traditional, academic, and cognitive-developmental early childhood programmes and found that academic programmes generally produced better immediate and mid-term cognitive outcomes. However, cognitive-developmental programmes produced better long-term educational and social adjustment outcomes. In addition to curriculum, another factor that differentiated programmes was the degree of support that the teachers are provided in implementing the curriculum.

Based on these early reviews and long-term effects of preschool programmes, new programmes have been developed in recent years. Most of these new programmes take a cognitive developmental perspective and combine elements of direct instruction for the whole class and small groups along with times when children individually choose what activities to engage in. There is usually a focus on developing children's language and emergent literacy. Many recent studies have evaluated these new programmes and often the experimental programmes from past studies (e.g. High/Scope, Creative Curriculum) are now the control condition.

Camilli and his colleagues (Camilli, Vargas, Ryan, & Barnett, 2009) conducted a meta-analysis of the effects of early education interventions on cognitive and social development. Using data from 123 studies, they included both studies that compared early childhood interventions to a no intervention group or to an alternative intervention. Their conclusions echoed that of previous reviews in that they reported significant effects from attending a preschool programme on social and school progress, and particularly cognitive outcomes.

In a more focused meta-analysis of the effects of early childhood curricula on children's receptive and expressive vocabulary, Darrow (2009) evaluated the 17 different early childhood curricula. Drawing on data from 29 separate studies, Darrow concluded that overall early childhood curriculum interventions do not have an effect on the vocabulary development of preschool children by the end of preschool, nor at the end of kindergarten. However, she could not determine the impacts of particular programmes.

The Centre for Excellence and Outcomes (C4EO) (Coghlan *et al.* 2009) recently presented findings from a rapid review of research and national data to improve outcomes for children in the early years, particularly for children living in poverty, children from ethnic minorities, and children with English as an additional language (EAL). The review identified literature on practices with children from birth to seven years of age, published since 2000.

They found that poverty affects more than 2.9 million children and young people in the UK, especially Pakistani, Bangladeshi, and black non-Caribbean children. Poor children do worse academically and make less progress in learning throughout the early years. Most of the associations between ethnicity and child outcomes are related to poverty and having EAL.

“The purpose of the review is to place all types of early childhood programmes intended to enhance school readiness on a common scale.”

The review found strong evidence that implementing focused and sustained system-level strategies for remediating child and family poverty can significantly improve the range of outcomes for young children. With regards to education for young children in preschool settings, the review recommends helping them through the transition into preschool and then into primary school and providing effective English language support to help children with EAL to catch up on language skills quickly, and improve their social skills.

It suggests making greater use of targeted interventions and trained bilingual staff, and educating mainstream early years professionals in working with children who have EAL. It recommends providing high-quality preschool learning environments and ensuring that children from the most disadvantaged and poor families take up places at those preschools.

The review suggests providing sufficient free play to enable children to explore their own interests and take responsibility for their own learning, and training teachers to provide sufficient opportunities for ‘sustained shared thinking’ by interacting with children and asking open-ended questions.

The report recommends that these goals could be achieved by having strong leadership in curriculum and planning, high staff qualifications, low turnover, opportunities for professional development, and support for effective home learning environments.

None of the recent reviews have evaluated the strength of the research base for particular programmes. Several key evaluations of early childhood programmes have recently been conducted, notably the Preschool Curriculum Research Evaluation, a US Department of Education cross-site evaluation of 14 different early childhood programmes (Preschool Curriculum Evaluation Research Consortium, 2007). The present review includes those studies.

Focus of the review

The purpose of the review is to place all types of early childhood programmes 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 programmes most likely to improve their children’s school readiness. The review emphasises practical programmes that are or could be used at scale. To make the review most useful to educators and policy makers, it emphasises large studies done over significant time periods that used standard measures. It also identifies common characteristics of programmes likely to make a difference in achievement. This synthesis was intended to include all kinds of approaches to early childhood education.

Methodological issues unique to early childhood education

While a review of research on early childhood programmes shares methodological issues common to all systematic reviews, there are also some key issues unique to early childhood education. One of these relates to measurement. We intended to include the impacts of interventions on children’s social and emotional development. However, the vast majority of the data on these outcomes comes from teacher or parent ratings of children behaviour, rather than on unbiased observations of children’s actual behaviour. Because teacher and parent ratings can be influenced by their knowledge of being in a study and of the goals of the particular intervention, we could only include objective measures of children’s behaviour and there was not enough of this type of data to report in this review. Therefore the data summarised here focuses on academic and cognitive outcomes.

Because of the uncertainty of enduring effects of preschool interventions, multi-year evaluations that follow children at least through the end of reception and into primary school are of particular value. There is a small set of studies that have followed children into adulthood. The review presents separately a small set of longitudinal studies that report long-term outcomes.

“ This search yielded 1,698 articles, which was narrowed down to 40 studies of 29 different programmes. ”

Review methods

The review uses a form of best evidence synthesis (Slavin, 1986), adapted for use in reviewing ‘what works’ literatures in which there are generally few studies evaluating each of many programmes (see Slavin, 2008). Best-evidence syntheses apply consistent, well-justified standards to identify unbiased, meaningful information from experimental studies, discussing each study in some detail, and pooling effect sizes across studies in substantively justified categories. The method is very similar to meta-analysis (Cooper, 1998; Lipsey & Wilson, 2001), adding an emphasis on narrative description of each study’s contribution. See Slavin (2008) for an extended discussion and rationale for the procedures used in all of these reviews.

Search procedures

The Centre for Reviews and Dissemination (CRD) at the University of York conducted an exhaustive search to locate all studies that have compared alternative approaches to early childhood education from 1960 to the present. Studies from all countries were included, as long as the studies were available in English.

Databases searched included: JSTOR, ERIC, EBSCO, Psych INFO, and Dissertation Abstracts. Search terms used were different combinations of key words (‘preschool’, ‘nursery’, ‘pre-kindergarten’, ‘compensatory education’, ‘school readiness’, ‘childcare’) and programme names (e.g. High/Scope, Creative Curriculum, Abecedarian, Perry Preschool, Montessori, Reggio Emilia, Project Approach, Project Construct). Studies published in refereed journals, technical reports, or dissertations, or unpublished evaluations, were included.

Manual searches of the following journals were conducted: American Educational Research Association Journal, Harvard Educational Review, Journal of Experimental Education, British Journal of Educational Psychology, Educational Evaluation and Policy Analysis, Educational Research Quarterly, Child Study Journal, Reading and Writing, Early Education and Development, Literacy Research and Instruction, Journal of Education for Students Placed at Risk. Using branching, citations from other reviews were found (e.g. Chambers, Cheung, & Slavin, 2006; Currie, 2000; Gilliam & Zigler, 2000; Gorey, 2001; Karweit, 1993; Barnett, 1995; White, Taylor & Moss, 1992).

Titles and abstracts were downloaded onto an Endnote X1 database and studies were de-duplicated. All potentially relevant papers were retrieved. Data were extracted and coded by one reviewer using a standard procedure and at least 25% were checked by another reviewer. Disagreements were resolved by discussion and consensus and, if necessary, a third reviewer was consulted. This search yielded 1,698 articles, which was narrowed down to 40 studies of 29 different programmes.

Inclusion criteria

The studies were of programmes and practices for the education of groups of young children. Studies of parenting programmes, nutrition interventions, and programmes for individual children, such as home visitation programmes, were not reviewed. The studies involved children between the ages of three and five or in the year or two before they begin reception or kindergarten.

The studies compared children taught in classes using a given programme or specified replicable practice to those using an alternative programme or standard practices. Studies that only compared preschool attendance to non-attendance, without a clear articulation of the preschool programme, were not included. The group setting could be pre-kindergarten or nursery classes in primary schools, child care centres, Head Start centres, or Sure Start centres. Any early childhood setting that offered a regularly scheduled educational programme to a group of preschoolers was included.

Studies designed specifically to meet the needs of non-English-speaking or children with special needs were not included in this review. If programmes began in infancy and continued through preschool, such as the Carolina Abecedarian Study (Campbell & Ramey, 1995), they were excluded if it was impossible to determine the effects of the preschool intervention alone.

Initial equivalence

Random assignment or matching with appropriate adjustments for any pre-test differences (e.g. analyses of covariance) had to be used. If children were randomly assigned to condition and they were well matched on demographics then we did not require a pre-test; however, if they were not randomly assigned there needed to be a pre-test, unless studies used random assignment of at least 25 units (individuals, classes, or schools) and there were no indications of initial inequality. Studies with pre-test differences of more than 50% of a standard deviation were excluded because, even with analyses of covariance, large pre-test differences cannot be adequately controlled for as underlying distributions may be fundamentally different.

Studies without control groups, such as pre-post comparisons and comparisons to 'expected' scores, were excluded. Studies in which parents selected their children to be placed into treatments (e.g. chose to attend a particular school programme) or were specially selected into treatments (e.g. gifted or behavioural programmes) were excluded unless experimental and control groups were designated after selections were made.

Sample size

Studies need to have at least two teachers and 25 individuals per condition (or 20 classes or schools per condition) in the analysis with no indications of initial inequality.

Immediate outcomes

The dependent measures included quantitative measures of phonological awareness, oral language, emergent literacy (e.g. alphabet knowledge, concepts of print), emergent mathematics, or cognitive measures. Experimenter-made measures were accepted only if it could be determined that they would be fair to the control groups as well.

Measures of objectives inherent to the intervention, but unlikely to be emphasised in control groups, were excluded. This included measures where the children's teachers rated their social or cognitive skills or behaviours. Teachers in the treatment groups might have had their perceptions of the children's behaviour influenced by their knowledge of being in a study and knowing the goals of the intervention.

Intermediate outcomes

Most studies that followed children into reception or further into primary school measured children's language, literacy, or mathematics outcomes. Others determined children's educational outcomes, such as grade retention, school attendance, and/or special education referrals.

Long-term outcomes

A few key studies have followed subjects into secondary school and even adulthood. The outcomes that were included to assess the long-term effects of the intervention were education and social adjustment factors such as delinquency/crime, employment, welfare dependence, teenage pregnancy, graduation from higher education.

“There is much to be learned from qualitative and correlational research that can add depth and insight to understanding the effects of these programmes. However, to compare the effectiveness of programmes, one needs quantitative evidence that can be evaluated on a common scale.”

Duration

A minimum study duration of 12 weeks was required. This requirement was intended to focus the review on practical programmes and practices intended for extended use, rather than brief investigations. Brief studies may not allow programmes to show their full effect. On the other hand, brief studies often advantage experimental groups that focus on a particular set of objectives during a limited time period while control groups spread instruction over a longer period. Studies with brief treatment durations that measured outcomes over periods of more than 12 weeks were included however, as long as the time between pre-test and post-test was at least 12 weeks, on the basis that if a brief treatment has lasting effects, it should be of interest to educators.

Sometimes the impacts of an intervention become more apparent well after the immediate post-test. This is especially true for literacy outcomes, because the intensive oral language development that is the focus of some preschool programmes provides a larger vocabulary, which helps children when they learn to read. For this reason, in the summary table and rating scale, we report outcomes for the end of preschool and the end of reception.

A few notable studies of preschool interventions have been reported numerous times. Sometimes this is due to the longitudinal nature of the studies as with the Consortium for Longitudinal Studies, which followed the subjects from early interventions to determine the long-term impacts (Lazar & Darlington, 1982). For these redundant reports we were careful to code each outcome only once and use the most recent report available.

Effect sizes

In general, effect sizes were computed as the difference between experimental and control individual pupil post-tests after adjustment for pre-tests and other covariates, divided by the unadjusted post-test control group standard deviation. If the control group SD was not available, a pooled SD was used. Procedures described by Lipsey & Wilson (2001) and Sedlmeier & Gigerenzor (1989) were used to estimate effect sizes when unadjusted standard deviations were not available, as when the only standard deviation presented was already adjusted for covariates or when only gain score SDs were available. If pre-test and post-test means and SDs were presented but adjusted means were not, effect sizes for pre-tests were subtracted from effect sizes for post-tests.

Effect sizes were pooled across studies for each programme and for various categories of programmes. This pooling used means weighted by the final sample sizes. The reason for using weighted means is to maximise the importance of large studies, as the previous reviews and many others have found that small studies tend to overstate effect sizes (see Rothstein *et al.*, 2005; Slavin, 2008; Slavin & Smith, 2008).

Effect sizes were broken down for measures of language, literacy, phonological awareness, mathematics, cognition, and educational outcomes.

Limitations

It is important to note several limitations of the current review. First, the review focuses on experimental studies using quantitative measures of early childhood interventions. There is much to be learned from qualitative and correlational research that can add depth and insight to understanding the effects of these programmes. However, to compare the effectiveness of programmes, one needs quantitative evidence that can be evaluated on a common scale.

Second, the review focuses on replicable programmes used in realistic early childhood settings expected to have an impact over periods of at least 12 weeks. This emphasis is consistent

with the review's purpose in providing educators with useful information about the strength of evidence supporting various practical programmes, but it does not attend to shorter, more theoretically-driven studies that may also provide useful information, especially to researchers.

Finally, the review focuses on traditional measures of academic and cognitive outcomes, primarily individually-administered standardised tests. These are useful in assessing the practical outcomes of various programmes 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 of such measures may also be of importance to researchers or educators.

To avoid the bias inherent in teacher or parent ratings of children's social-emotional skills, these were not included in the review. We would have included independent observations of children's social behaviours; however, there were not enough studies with this kind of independent data to include social-emotional outcomes as a factor in the review.

Categories of research design

Four categories of research design were included in this review. *Randomised experiments* were those in which pupils, classes, or schools were randomly assigned to treatments, and data analyses were at the level of random assignment. When schools 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 categorised as a *randomised quasi-experiment* (Slavin, 2008). *Matched* studies were ones in which experimental and control groups were matched on key variables at pre-test, before post-tests were known, while *matched post-hoc* studies were ones in which groups were matched retrospectively, after post-tests were known. Studies using fully randomised designs are preferable to randomised quasi-experiments, but all randomised experiments are less subject to bias than matched studies. Among matched studies, prospective designs were preferred to post-hoc or matched designs.

Presentation of findings

Key study characteristics, pupil outcomes and study quality are summarised in a narrative and tables. Where appropriate data were available from two or more studies of a similar intervention a quantitative synthesis was undertaken. A narrative synthesis was conducted where a quantitative synthesis was considered inappropriate statistically or from an educational perspective.

To make the findings for each programme more easily understandable and usable for educators searching for programmes with evidence of effectiveness, the programmes are presented on a rating scale. This is a modified version of a rating system that Slavin (2008) developed for the Best Evidence Encyclopaedia to balance methodological quality, weighted mean effect sizes, sample sizes, and other factors. The categories of effectiveness are as follows.

Strong evidence of effectiveness

Programmes in this category have at least two studies, one of which is a large randomised or randomised quasi-experimental study, or multiple smaller studies, with a sample size-weighted effect size of at least +0.20, and a collective sample size across all studies of 250 pupils or 20 classes. The effects can be on any of the academic or cognitive outcomes, at the end of preschool and/or reception.

Moderate evidence of effectiveness

Programmes in this category have at least one randomised or two matched studies of any qualifying design, with a collective sample size of 125 pupils or 10 classes, and a weighted mean effect size of at least +0.20.

Limited evidence of effectiveness: strong evidence of modest effects

Programmes in this category have studies that meet the criteria for 'moderate evidence of effectiveness' except that the weighted mean effect size is +0.10 to +0.19.

Limited evidence of effectiveness: weak evidence with notable effects

Programmes in this category have studies that have a weighted mean effect size of at least +0.20, but do not qualify for 'moderate evidence of effectiveness' due to insufficient numbers of studies or small sample sizes.

Insufficient evidence of effectiveness

Qualifying studies do not meet the criteria for 'limited evidence of effectiveness'.

No qualifying studies

Programmes in this category do not have any qualifying studies.

We begin with Table 1, which presents effect sizes for each study, listed in alphabetical order by programme. Table 2 presents the overall effects by programme.

Summaries of programmes and studies

This section of the review contains brief descriptions of the programmes that were included in the review and of the studies that evaluated their impacts. Table 1 presents the effect sizes for each outcome in each included study for each programme. Table 2 (page 31) presents the mean averages for each programme, weighted by sample size, for each outcome for the immediate effects, and for the end of reception (kindergarten) where a follow-up was conducted.

Table 1 – Outcomes for Included Studies										
Study	Design	Duration	N	Sample Characteristics	Evidence of Initial Equality	Post-test	Preschool ES	Preschool Mean ES	Reception/ Kinder ES	Reception/ Kinder Mean ES
Breakthrough to Literacy										
Abt Associates (2007)	Randomised	18 months	863 pupils (354E, 509C)	162 child care centres in Miami-Dade County that served children from low-income families. 57% Hispanic, 24% White, and 19% African American	Well matched on pre-test scores	Literacy				
						Early Literacy Index			+0.54	+0.48
						Print knowledge			+0.60	
						Definitional Vocabulary			31	
						Phonological Awareness				
Phonological Awareness			+0.44	+0.44						
Bright Beginnings										
PCER (2008)	Randomised	2 years	14 classes 208 pupils (103E, 105C)	Seven school districts in six different counties in TN; 80% White, 18% African American, 11% Hispanic	Matched on pre-test and demographics	Literacy				
						TERA	+0.39	+0.31	-0.07	+0.03
						WJ Letter Word ID	+0.35		+0.09	
						WJ Spelling	+0.18		+0.06	
						Language				
						PPVT	+0.13	+0.11	+0.07	+0.12
						TOLD	+0.09		+0.16	
						Phonological Awareness				
						Pre-CTOPP/CTOPP	-0.07	-0.07	+0.01	+0.01
						Mathematics				
						WJ Applied problems	+0.16	+0.06	+0.13	+0.12
						CMA-A Math composition	+0.14		+0.07	
Shape composition	-0.03	+0.15								

Study	Design	Duration	N	Sample Characteristics	Evidence of Initial Equality	Post-test	Preschool ES	Preschool Mean ES	Reception/ Kinder ES	Reception/ Kinder Mean ES						
Building Blocks																
Clements & Sarama (2008)	Randomised	26 weeks	24 classes 253 pupils	9 Head Start, 15 State funded, and 12 mixed income preschool centres in New York. 45% African American, 12% Hispanic, and 42% White	Fairly well matched on pre-test	Early Math Assessment	+1.06	+1.06								
Building Blocks plus DLM Early Childhood Express Math Software (moved to combined)																
PCER (2008)	Randomised	2 year	40 classes 316 pupils (159E, 157C)	Head Start and public preschool programmes in CA and NY; 18% White, 45% African American, 23% Hispanic, 13% others	Matched on pre-test, child characteristics, and demographics	TERA	+0.13	+0.11	+0.31	+0.19						
						WJ Letter Word ID	-0.01		+0.22							
						WJ Spelling	+0.20		0.03							
						Language										
						PPVT	+0.17	+0.17	+0.11	+0.10						
						TOLD	+0.17		+0.08							
						Phonological Awareness										
						Pre-CTOPP/CTOPP	+0.04	+0.04	-0.11	-0.11						
						Mathematics										
						WJ Applied problems	+0.22	+0.33	+0.13	+0.13						
CMA-A Math composition	+0.44	+0.13														
Building Early Language and Literacy (B.E.L.L.)																
Abt Associates (2007)	Randomised	18 months	849 pupils (340E, 509C)	162 child care centres in Miami-Dade County that served children from low-income families. 57% Hispanic, 24% White, and 19% African American	Well matched on pre-test scores	Literacy										
						Early Literacy Index			+0.06	+0.07						
						Print knowledge			+0.07							
						Definitional Vocabulary			+0.07							
						Phonological Awareness										
Phonological Awareness			+0.04	+0.04												

Study	Design	Duration	N	Sample Characteristics	Evidence of Initial Equality	Post-test	Preschool ES	Preschool Mean ES	Reception/ Kinder ES	Reception/ Kinder Mean ES
Creative Curriculum										
PCER (2008) (Tennessee)	Randomised	2 years	14 classes 206 pupils (101E, 105C)	Seven school districts in six different counties in TN; 80% White, 18% African American, 11% Hispanic	Matched on pre-test, child characteristics, and demographics	Literacy				
						TERA	+0.02	+0.12	+0.10	+0.24
						WJ Letter Word ID	+0.16		+0.38	
						WJ Spelling	+0.19		+0.25	
						Language				
						PPVT	+0.23	+0.15	+0.12	+0.12
						TOLD	+0.07		+0.11	
						Phonological Awareness				
						Pre-CTOPP/CTOPP	+0.10	0.10	+0.06	+0.06
						Mathematics				
						WJ Applied problems	+0.17	0.13	+0.17	+0.07
						CMA-A Math composition	+0.10		+0.05	
						Shape composition			0.00	
PCER (2008) (North Carolina and Georgia)	Randomised	2 years	18 classes 194 pupils (97E, 97C)	Head Start centres in NC and GA; 3% White, 85% African American, 8% Hispanic	Matched on pre-test, child characteristics, and demographics	Literacy				
						TERA	-0.08	-0.11	-0.04	-0.03
						WJ Letter Word ID	-0.08		0.00	
						WJ Spelling	-0.18		-0.05	
						Language				
						PPVT	+0.08	-0.03	+0.15	-0.01
						TOLD	-0.16		-0.17	
						Phonological Awareness				
						Pre-CTOPP/CTOPP	+0.02	+0.02	+0.06	+0.06
						Mathematics				
						WJ Applied problems	+0.20	+0.10	+0.09	+0.07
						CMA-A Math composition	-0.10		+0.14	
						Shape composition	+0.19		-0.01	

Study	Design	Duration	N	Sample Characteristics	Evidence of Initial Equality	Post-test	Preschool ES	Preschool Mean ES	Reception/ Kinder ES	Reception/ Kinder Mean ES
Curiosity Corner										
PCER (2008)	Randomised	2 years	18 pre-K programmes 225 pupils (105E, 110C)	preschool programmes in FL, KS, and NJ; 28% White, 51% African American, 14% Hispanic, and 8% others	Matched on pre-test, child characteristics, and demographics	Literacy				
						TERA	+0.10	+0.08	+0.43	+0.39
						WJ Letter Word ID	+0.09		+0.43	
						WJ Spelling	+0.04		+0.20	
						Language				
						PPVT	-0.01	-0.05	+0.14	+0.15
						TOLD	-0.08		+0.15	
						Phonological Awareness				
						Pre-CTOPP/CTOPP	+0.18	+0.18	+0.25	+0.25
						Mathematics				
						WJ Applied problems	+0.10	+0.09	+0.26	+0.18
						CMA-A Math composition	+0.01		-0.05	
						Shape composition	+0.16		+0.32	
Chambers <i>et al.</i> (2001)	Matched control	1 year	316 pupils (206E, 110C)	3 and 4-year-old children enrolled in child care centres and preschools in 4 high poverty urban school districts in New Jersey	Matched on demographics, pre-test scores used as covariates to adjust for initial differences	Language				
						Expressive Language	+0.24	+0.08		
						Receptive Language	+0.06			
						Visual Reception	-0.06			

Study	Design	Duration	N	Sample Characteristics	Evidence of Initial Equality	Post-test	Preschool ES	Preschool Mean ES	Reception/ Kinder ES	Reception/ Kinder Mean ES
The Demonstration and Research Center for Early Education (DARCEE)										
Miller & Dyer (1975)	Randomised	1 year	96 pupils (64E, 32C)	African American pupils with lowest SES in Louisville, KY	Random assignment	Cognitive (IQ)				
						End of preschool	-0.11	-0.11		
						Kindergarten			-0.11	-0.11
Dialogic Reading										
Whitehurst <i>et al.</i> (1994)	Randomised	6 week intervention with follow-up at 6 months	73 pupils (46E, 24C)	Five day care centres in Suffolk County, New York. 22% White, 55% African American, and 23% Hispanic	Well matched on pre-test scores	Language				
						One Word	+0.13	-0.03		
						PPVT	-0.17			
ITPA	-0.01									
Dialogic Reading plus Sound Foundations										
Whitehurst <i>et al.</i> (1999)	Randomised Quasi-Experiment	4 years	280 pupils	Head Start centres in Suffolk County, New York. 43% African American, 33% White, 18% Hispanic, and 6% others	Well matched on pre-test scores	Language				
						Language	+0.10	+0.15	+0.15	+0.12
						Literacy				
						Memory	+0.21	+0.15	+0.14	+0.12
						Auditory	+0.10		+0.15	
Print Concepts	+0.14	+0.05								
Writing	+0.13	+0.15								
Direct Instruction										
Miller & Dyer (1975)	Randomised	1 year	98 pupils (64E, 34C)	African American pupils with lowest SES in Louisville, KY	Random assignment	Cognitive (IQ)				
						End of preschool	+0.11	+0.11		
						Kindergarten			-0.02	-0.02
Salaway (2008)	Randomised	6 months	61 pupils (35E, 26C)	A preschool centre in an urban, at risk community. 20% White, 69% African American, 2% Hispanic, and 10% others	Well matched on pre-test scores	Literacy				
						Initial Sounds Fluency	+0.75	+0.52		
						Letter Naming Fluency	+0.50			
						Letter and Word Skills	+0.32			
						Language				
						Expressive language	+0.40	+0.46		
						Receptive language	+0.51			
Cognitive										
Number Skills	+0.37	+0.37								

Study	Design	Duration	N	Sample Characteristics	Evidence of Initial Equality	Post-test	Preschool ES	Preschool Mean ES	Reception/ Kinder ES	Reception/ Kinder Mean ES
Direct Instruction (Contd.)										
Englemann (1968)	Matched control	2 years	43 pupils (15E, 28C)	Four-year old culturally disadvantaged children who were eligible for Head Start	Well-matched on initial IQ test scores, SES, and ethnicity	Cognitive (IQ)				
						End of preschool	+0.66	+0.66		
						End of K			+1.34	+1.34
DLM Express plus Open Court										
PCER (2008)	Randomised	2 years	11 pre-school programmes 198 pupils (101E, 97C)	Public preschool programmes in FL; 30% White, 59% African American, 6% Hispanic, 5% others	Matched on pre-test, child characteristics, and demographics	Literacy				
						TERA	+0.68		+0.76	
						WJ Letter Word ID	+0.51	+0.55	+0.50	+0.49
						WJ Spelling	+0.46		+0.22	
						Language				
						PPVT	+0.40	+0.40	+0.48	+0.47
						TOLD	+0.40		+0.46	
						Phonological Awareness				
						Pre-CTOPP/CTOPP	+0.32	+0.32	+0.38	+0.38
						Mathematics				
						WJ Applied problems	+0.36		+0.48	
						CMA-A Math composition	+0.17	+0.26	+0.13	+0.23
						Shape composition	+0.24		+0.09	

Study	Design	Duration	N	Sample Characteristics	Evidence of Initial Equality	Post-test	Preschool ES	Preschool Mean ES	Reception/ Kinder ES	Reception/ Kinder Mean ES
Doors to Discovery										
PCER (2008)	Randomised	2 years	29 classes 297 pupils (101E, 96C)	Head Start and public preschool programmes in TX; 30% White, 13% African American, 43% Hispanic, 13% others	Matched on pre-test, child characteristics, and demographics	Literacy				
						TERA	+0.06	+0.07	-0.05	-0.09
						WJ Letter Word ID	+0.10		-0.09	
						WJ Spelling	+0.06		-0.12	
						Language				
						PPVT	+0.15	+0.16	+0.18	+0.12
						TOLD	+0.17		+0.06	
						Phonological Awareness				
						Pre-CTOPP/CTOPP	+0.18	+0.18	-0.09	-0.09
						Mathematics				
						WJ Applied problems	+0.01	+0.00	-0.02	-0.10
						CMA-A Math composition	+0.13		-0.16	
						Shape composition	-0.13		-0.12	
Assel <i>et al.</i> (2006)	Randomised (L)	1 year	22 schools 409 pupils (206E, 203C)	A fairly large economically diverse school district in greater Houston, Texas	Matched on pre-test and demographics	Language				
						PLS-IV	-0.20	-0.20		
						Expressive Vocabulary test	-0.20			
						Phonological Awareness				
DSC auditory	+0.12	+0.12								

Study	Design	Duration	N	Sample Characteristics	Evidence of Initial Equality	Post-test	Preschool ES	Preschool Mean ES	Reception/ Kinder ES	Reception/ Kinder Mean ES
Early Literacy & Learning Model										
Cosgrove <i>et al.</i> (2006)	Randomised	1 year	466 pupils (222E, 244C)	Head Start, subsidised, faith based and preschool classrooms from 3 locations in FL; 14% White, 71% African American, 8% Hispanic, 6% others	Matched on pre-test, child characteristics, and demographics	Literacy				
						Reading Quotient	+0.28	+0.25		
						Alphabet	+0.28			
						Prints	+0.17			
						Meaning	+0.29			
						Alphabet Letter Recognition	+0.25			
PCER (2008)	Randomised	1 year	28 classes 244 pupils (137E, 107C)	Head Start, subsidised, faith based and preschool classrooms from 3 locations in FL; 14% White, 71% African American, 8% Hispanic, 6% others	Matched on pre-test, child characteristics, and demographics	Literacy				
						TERA	+0.15	+0.07	+0.30	+0.11
						WJ Letter Word ID	-0.05		0.00	
						WJ Spelling	+0.11		+0.04	
						Language				
						PPVT	+0.17	+0.16	+0.34	+0.39
						TOLD	+0.15		+0.44	
						Phonological Awareness				
						Pre-CTOPP/CTOPP	+0.18	+0.18	+0.08	+0.08
						Mathematics				
						WJ Applied problems	+0.10	-0.01	+0.26	+0.08
						CMA-A Math composition	+0.01		-0.05	
						Shape composition	-0.14		+0.03	

Study	Design	Duration	N	Sample Characteristics	Evidence of Initial Equality	Post-test	Preschool ES	Preschool Mean ES	Reception/ Kinder ES	Reception/ Kinder Mean ES
Emerge										
Gettinger & Stoiber (2007)	Matched control	1 year	342 pupils (188E, 154C)	Low SES Head Start and preschool centres in Milwaukee, Wisconsin, 90% African American	Matched on pre-test and demographics	Literacy				
						Alphabet Knowledge	+0.32	+0.37		
						Story Telling	+0.40			
						Picture Naming	+0.63			
						Print Awareness	+0.49			
						Name Writing	-0.01			
						Language				
						PPVT	+0.13	+0.13		
						Phonological Awareness				
						Alliteration	+0.33	+0.28		
Rhyming	+0.23									
Interactive Book Reading										
Wasik & Bond (2001)	Randomised Quasi-Experiment	15 weeks	121 pupils	Title 1 early learning centre in Baltimore, Maryland. 94% African American, 95% Free Lunch	Matched on pre-test and demographics	Language				
						PPVTIII	+0.63	+1.33		
						Receptive	+1.45			
Expressive	+1.92									
Wasik, Bond & Hindman (2006)	Randomised Quasi-Experiment	1 year	16 classes 200 pupils (139E, 68C)	2 Head Start centres in 2 Title I high-poverty neighbourhood schools; 99% AA	Matched on pre-test and demographics	Literacy				
						Alphabet Knowledge	-0.33	-0.33		
						Language				
Receptive Language	+0.73	+0.59								
Expressive Language	+0.44									

Study	Design	Duration	N	Sample Characteristics	Evidence of Initial Equality	Post-test	Preschool ES	Preschool Mean ES	Reception/ Kinder ES	Reception/ Kinder Mean ES
Ladders to Literacy										
PCER (2008)	Randomised	2 years	14 classes 123 pupils (62E, 61C)	Head Start centres in NH 38% White, 11% African American, 30 Hispanic, and 20% others	Matched on pre-test, child characteristics, and demographics	Literacy				
						TERA	-0.30	-0.05	-0.54	-0.30
						WJ Letter Word ID	-0.16		-0.27	
						WJ Spelling	+0.30		-0.08	
						Language				
						PPVT	-0.38	-0.30	-0.30	-0.18
						TOLD	-0.22		-0.06	
						Phonological Awareness				
						Pre-CTOPP/CTOPP	-0.16	-0.16	-0.10	-0.10
						Mathematics				
						WJ Applied problems	-0.14	+0.02	-0.33	-0.21
						CMA-A Math composition	+0.18		-0.19	
						Shape composition	+0.02		-0.10	
Language-Focused Curriculum										
PCER (2008)	Randomised	years	14 classes 195 pupils (97E, 98C)	Head Start and public preschool classrooms in VA; 71% White, 21% African American, 4% Hispanic, 3% others	Matched on pre-test, child characteristics, and demographics	Literacy				
						TERA	+0.16	+0.17	+0.05	+0.06
						WJ Letter Word ID	+0.11		+0.02	
						WJ Spelling	+0.25		+0.11	
						Language				
						PPVT	+0.02	+0.02	-0.09	-0.08
						TOLD	+0.01		-0.07	
						Phonological Awareness				
						Pre-CTOPP/CTOPP	+0.20	+0.20	+0.03	+0.03
						Mathematics				
						WJ Applied problems	+0.20	+0.12	+0.11	+0.06
						CMA-A Math composition	+0.08		0.00	
						Shape composition	+0.08		+0.06	

Study	Design	Duration	N	Sample Characteristics	Evidence of Initial Equality	Post-test	Preschool ES	Preschool Mean ES	Reception/ Kinder ES	Reception/ Kinder Mean ES
Let's Begin with the Letter People										
Assel <i>et al.</i> (2006)	Randomised (L)	1 year	22 schools 401 pupils (198E, 203C)	A fairly large economically diverse school district in greater Houston Texas	Matched on pre-test and demographics	Language				
						PLS-IV	+0.03	-0.03		
						Expressive Vocabulary test	-0.09			
						Phonological Awareness				
						DSC auditory	+0.42	+0.42		
PCER (2008)	Randomised	2 years	30 classes 196 pupils (100E, 96C) Shared same control group with Doors to Discovery	Head Start and public preschool programmes in TX. 30% White, 13% African American, 43% Hispanic, 13% others	Matched on pre-test, child characteristics, and demographics	Literacy				
						TERA	+0.02	+0.10	-0.13	
						WJ Letter Word ID	+0.10		-0.18	-0.12
						WJ Spelling	+0.17		-0.06	
						Language				
						PPVT	-0.03	+0.03	0.00	-0.06
						TOLD	+0.08		-0.12	
						Phonological Awareness				
						Pre-CTOPP/CTOPP	-0.13	-0.13	-0.13	-0.13
						Mathematics				
						WJ Applied problems	-0.10	+0.09	-0.13	-0.09
						CMA-A Math composition	+0.15		-0.07	
						Shape composition	+0.21		-0.06	
Fischel <i>et al.</i> (2007)	Randomised Quasi-Experiment	3 – 1 year	35 classes 335 pupils (185E, 150C)	Six Head Start centres in SE New York State. 42% African American, 41% Hispanic, 7% White, 8% multiracial; 14% Spanish language dominant	Matched on pre-test, teacher credentials, and pupil's primary language	Literacy				
						Get Ready to Read	+0.32	+0.20		
						Letters Known	+0.31			
						WJ-R Letter Word ID	+0.29			
						WJ-R Dictation	+0.38			
						Book Knowledge	+0.12			
						Print Conventions	+0.23			
						Comprehension	-0.12			
						Language				
						PPVT	+0.06	+0.06		

Study	Design	Duration	N	Sample Characteristics	Evidence of Initial Equality	Post-test	Preschool ES	Preschool Mean ES	Reception/ Kinder ES	Reception/ Kinder Mean ES
Literacy Express										
PCER (2008)	Randomised	2 years	12 pre-school programmes 195 pupils (99E, 97C)	Public preschool programmes in FL; 30% White, 59% African American, 6% Hispanic, 5% others	Matched on pre-test, child characteristics, and demographics	Literacy				
						TERA	+0.17	+0.17	-0.11	-0.01
						WJ Letter Word ID	+0.30		+0.08	
						WJ Spelling	+0.05		+0.06	
						Language				
						PPVT	+0.17	+0.07	+0.16	+0.13
						TOLD	-0.04		+0.10	
						Phonological Awareness				
						Pre-CTOPP/CTOPP	+0.14	+0.14	+0.08	+0.08
						Mathematics				
						WJ Applied problems	+0.05	-0.01	-0.02	-0.12
						CMA-A Math composition	-0.02		-0.21	
						Shape composition	-0.01		-0.14	
Montessori										
Miller & Dyer (1975)	Randomised	1 year	64 pupils (22E, 34C)	African American pupils w lowest SES in Louisville, KY	Random assignment	Cognitive				
						IQ	-0.09	-0.09	-0.11	-0.11
Paths										
Domitrovich <i>et al.</i> (2007)	Randomised	1 year	20 classes 201 pupils	Two regional Head Start programmes in moderate sized cities in central PA. 47% African American, 38% White, and 10% Hispanic	Well matched on pre-test scores and other demographics	Cognitive				
						Leiter Attention sustained measure	+0.16	+0.16		

Study	Design	Duration	N	Sample Characteristics	Evidence of Initial Equality	Post-test	Preschool ES	Preschool Mean ES	Reception/ Kinder ES	Reception/ Kinder Mean ES						
Project Approach																
PCER (2008)	Randomised	2 years	13 classes 204 pupils (114E, 90C)	Public preschool programmes in WI; 28% White, 40% African American, 17% Hispanic, 13% others	Matched on pre-test, child characteristics, and demographics	Literacy										
						TERA	+0.14	+0.28	+0.29	+0.15						
						WJ Letter Word ID	+0.42		+0.03							
						WJ Spelling	+0.27		+0.14							
						Language										
						PPVT	+0.16	+0.16	+0.10	+0.21						
						TOLD	+0.15		+0.32							
						Phonological Awareness										
						Pre-CTOPP/CTOPP	+0.05	+0.05	-0.17	-0.17						
						Mathematics										
						WJ Applied problems	+0.07	+0.17	+0.27	+0.24						
						CMA-A Math composition	+0.18		+0.22							
						Shape composition	+0.27		+0.24							
						Project Construct										
						PCER (2008)	Randomised	2 years	21 pre-school programmes 231 pupils (123E, 108C)	Preschool centres from urban and rural in MO; 65% White, 25% African American, 3% Hispanic, 6% others	Matched on pre-test, child characteristics, and demographics	Literacy				
TERA	0.00	-0.07	-0.03	+0.04												
WJ Letter Word ID	-0.05		+0.16													
WJ Spelling	-0.15		0.00													
Language																
PPVT	+0.03	-0.01	+0.10	+0.06												
TOLD	-0.05		+0.01													
Phonological Awareness																
Pre-CTOPP/CTOPP	+0.10	+0.10	-0.12	-0.12												
Mathematics																
WJ Applied problems	+0.06	-0.12	+0.08	+0.05												
CMA-A Math composition	-0.11		-0.06													
Shape composition	-0.42		+0.12													

Study	Design	Duration	N	Sample Characteristics	Evidence of Initial Equality	Post-test	Preschool ES	Preschool Mean ES	Reception/ Kinder ES	Reception/ Kinder Mean ES
Ready, Set, Leap!										
PCER (2008)	Randomised	2 years	39 classes 286 pupils (149E, 137C)	Preschools from an urban area in New Jersey: 78% African American, 20% Hispanic	Matched on pre-test, child characteristics, and demographics	Literacy				
						TERA	+0.08	+0.10	+0.01	-0.02
						WJ Letter Word ID	+0.01		-0.12	
						WJ Spelling	+0.20		+0.04	
						Language				
						PPVT	+0.15	+0.02	-0.02	-0.03
						TOLD	-0.11		-0.03	
						Phonological Awareness				
						Pre-CTOPP/CTOPP	-0.09	-0.09	-0.02	-0.02
						Mathematics				
						WJ Applied problems	+0.04	-0.04	0.00	-0.02
						CMA-A Math composition	-0.24		-0.10	
						Shape composition	+0.08		+0.03	
RMC (2003)	Randomised	1 year	254 pupils (1E29, 125C)	17 high poverty inner-city Newark public primary schools. 44% African American, 37% Hispanic, 15% White	Well matched on pre-test scores	Literacy				
						Blending	+0.35	+0.18		
						Initial sound fluency	+0.21			
						Letter Word ID	+0.19			
						Rhyming	+0.18			
						Letter naming	-0.01			
						Language				
						Passage comprehension	+0.09	+0.10		
						PPVT	+0.01			
						LTRID composite	-0.05			
PA composite	+0.33									

Study	Design	Duration	N	Sample Characteristics	Evidence of Initial Equality	Post-test	Preschool ES	Preschool Mean ES	Reception/ Kinder ES	Reception/ Kinder Mean ES
Ready, Set, Leap! (Contd.)										
Abt Associates (2007)	Randomised	18 months	829 pupils (320E, 509C)	162 child care centres in Miami-Dade County that served children from low-income families. 57% Hispanic, 24% White, and 19% African American	Well matched on pre-test scores	Literacy				
						Definitional Vocabulary			+0.28	+0.48
						Print knowledge			+0.65	
						Early Literacy Index			+0.51	
						Phonological Awareness				
Phonological Awareness			+0.35	+0.35						
Research-Based, Developmentally Informed (REDI)										
Bierman <i>et al.</i> (2008)	Randomised	1 year	356 pupils	44 Head Start classrooms in three counties in PA. 25% African American, 42% White, 17% Hispanic	Matched on pre-test, length of programmes, location, and demographics	Literacy				
						Print Awareness	+0.18	+0.18		
						Language				
						Picture Vocabulary	+0.16	+0.16		
Phonological Awareness										
Blending and Elision	+0.43	+0.43								
Sound Foundations										
Byrne and Fielding-Barnsley (1991)	Randomised	12 weeks	128 pupils (64E, 62C)	No information	Matched on pre-test and age	Literacy				
						Trained phonemes	+0.42	+0.43		
						Untrained Phonemes	+0.18			
		Word Choice	+0.69							
		Literacy								
		Phoneme awareness					+0.30	+0.21		
		Alphabet knowledge					+0.00			
Word identification			+0.09							
Pseudoword ID			+0.53							
Spelling			+0.15							

Study	Design	Duration	N	Sample Characteristics	Evidence of Initial Equality	Post-test	Preschool ES	Preschool Mean ES	Reception/ Kinder ES	Reception/ Kinder Mean ES
Tools of the Mind										
Barnett <i>et al.</i> (2008)	Randomised	1 year	18 classes 218 pupils (85E, 120C)	High poverty urban school district in NJ; 80% free lunch, 92% Hispanic	Matched on pre-test and demographics	Literacy				
						Get Ready to Read	+0.03	-0.04		
						WJ-R Letter-Word	-0.11			
						Language				
						PPVT-III	+0.22	+0.16		
						EOWPVT-R	+0.11			
						Cognitive				
						WJ-R Applied Problems	+0.14	+0.10		
						WIPPSI	+0.05			
Waterford										
Fischel <i>et al.</i> (2007)	Randomised Quasi-Experiment	3 _ 1 year	35 classes 335 pupils (185E, 150C)	Six Head Start centres in SE New York State. 42% African American, 41% Hispanic, 7% White, 8% multiracial; 14% Spanish language dominant	Matched on pre-test, teacher credentials, and pupil's primary language	Literacy				
						Get Ready to Read	+0.32	+0.08		
						Letters Known	+0.12			
						WJ-R Letter Word ID	+0.11			
						WJ-R Dictation	+0.02			
						Book Knowledge	+0.00			
						Print Conventions	+0.21			
						Comprehension	-0.21			
						Language				
						PPVT	+0.06	+0.06		

Programme	End of Preschool						End of Kindergarten/Reception					
	Studies (N)	Literacy	Language	Phonological Awareness	Maths	Cognitive	Studies (N)	Literacy	Language	Phonological Awareness	Maths	Cognitive
Breakthrough to Literacy	1	-	-	-	-	-	1	0.48	-	0.44	-	-
Bright Beginnings	1	0.31	0.11	-0.07	0.06	-	1	0.03	0.12	0.01	0.12	-
Building Blocks	1	-	-	-	1.06	-	0	-	-	-	-	-
Building Blocks plus DLM	1	0.11	0.17	0.04	0.54	-	1	0.19	0.10	-0.11	0.22	-
BELL	1	-	-	-	-	-	0	0.07	-	0.04	-	-
Creative Curriculum	2	0.01	0.06	0.06	0.12	-	2	0.11	0.06	0.06	0.07	-
Curiosity Corner	2	0.08	0.08	0.18	0.09	-	1	0.39	0.15	0.25	0.18	-
DARCEE	1	-	-	-	-	-0.11	1	-	-	-	-	-0.11
Dialogic Reading	1	-	-0.03	-	-	-	1	-	-	-	-	-
Dialogic Reading plus Sound Foundations	1	+0.15	0.10	-	-	-	1	0.12	0.15	-	-	-
Direct Instruction	3	0.52	0.46	-	0.37	0.31	2	-	-	-	-	0.39
DLM with Open Court	1	0.55	0.4	0.32	0.26	-	1	0.49	0.47	0.38	0.23	-
Doors to Discovery	2	0.07	-0.05	0.15	0	-	1	-0.09	0.12	-0.09	-0.1	-
ELLM	2	0.19	0.16	0.18	-0.01	-	1	0.11	0.39	0.08	0.08	-
EMERGE	1	0.37	0.13	0.28	-	-	1	-	-	-	-	-
Interactive Book Reading	2	-0.33	0.86	-	-	-	2	-	-	-	-	-
Ladders to Literacy	1	-0.05	-0.3	-0.16	0.02	-	1	-0.3	-0.18	-0.1	-0.21	-
Language Focus Curriculum	1	0.17	0.02	0.2	0.12	-	1	0.06	-0.08	0.03	0.06	-
Let's Begin with the Letter People	3	0.15	-0.01	0.24	0.09	-	1	-0.12	-0.06	-0.13	-0.09	-
Literacy Express	1	0.17	0.07	0.14	-0.01	-	1	-0.01	0.13	0.08	-0.12	-
Montessori	1	-	-	-	-	-0.09	1	-	-	-	-	-0.11
PATHS	1	-	-	-	-	0.16	0	-	-	-	-	-
Project Approach	1	0.28	0.16	0.05	0.17	-	1	0.15	0.21	-0.17	0.24	-
Project Construct	1	-0.07	-0.01	0.1	-0.12	-	1	0.04	0.06	-0.12	0.05	-
Ready, Set, Leap!	2	0.14	0.06	-0.09	-0.04	-	1	0.24	-0.03	0.18	-0.02	-
REDI	1	0.18	0.16	0.43	-	-	0	-	-	-	-	-
Sound Foundations	1	0.43	-	-	-	-	1	0.21	-	-	-	-
Tools of the Mind	1	-0.04	0.16	-	-	0.1	0	-	-	-	-	-
Waterford	1	0.08	0.06	-	-	-	0	-	-	-	-	-

In some cases, a number of programmes were evaluated in one study. In these cases, the overall design of the study is presented just before the first programme is introduced and then referred back to when subsequent programmes from that study are presented.

One set of evaluations was conducted under a unique structure. Fourteen programmes were evaluated by independent evaluators in comparisons conducted in the Preschool Curriculum Evaluation Research sponsored by the Institute of Education Sciences of the US Department of Education. This programme of research is described below.

Preschool Curriculum Evaluation Research

Between 2002 and 2005, the Preschool Curriculum Evaluation Research (PCER) Program implemented evaluations of 14 different preschool curricula with two independent external evaluators and 12 PCER grantees who received awards in June 2002 or 2003 to compare one or two different curricula to a control condition. In randomised experiments conducted in the preschool year, the children were followed until the end of kindergarten. The external evaluators (Mathematical and RTI) administered a battery of nine measures designed to assess children's cognitive, language, beginning reading, mathematics, and writing skills. It was designed to take no more than one hour to complete. The components of the child assessment 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; Child Math Assessment Abbreviated; Shape Composition Task; Color Naming and Counting Task; and the Letter-Word Identification, Applied Problems, and Spelling Subtests of the Woodcock-Johnson III.

The measures were administered in the autumn of preschool, in the spring of preschool, and again in the spring of kindergarten (reception). Below, under each of the different curricula studied, the PCER findings are summarised but the methods are not repeated for each PCER evaluation presented. Teacher and parent interviews and ratings of children's behaviour were also collected but they are not included in this review as the parents and teachers were aware of the condition that the children were in and may have been biased in their perceptions by that fact.

Breakthrough to Literacy

Breakthrough to Literacy is a systematic and integrated literacy and language programme published by the Wright Group, which aims at promoting language development and literacy skills to preschool children. The programme uses systematic, direct instruction built around a series of weekly books in the classroom. Interactive computer programs are also used to engage pupils in individualised activities, also organised around the weekly book, to support their literacy skills and print knowledge.

Abt Associates (2007). Abt Associates Inc. (2007) carried out an 18-month study in Miami-Dade County to examine the impacts of three intervention programmes on teacher behaviours, classroom environments, and pupil outcomes – *Ready, Set, Leap!*, *Building Early Language and Literacy* (B.E.L.L.), and *Breakthrough to Literacy* (BTL). (See sections for the other curricula for their impacts.) A total of 162 centres in Miami-Dade County were randomly assigned to one of the treatment groups or a 'business as usual' control condition. To be eligible for the study, a centre had to primarily serve low-income children and at least one class of four-year-old children with at least five children. In centres where there were more than one class of four-year-olds, the class with most low SES children was chosen. Children were pre-tested in autumn, 2003 and post-tested in kindergarten (spring, 2005). Teachers in the treatment conditions received initial training prior to the study. In addition, follow-up trainings and ongoing mentoring support were provided over the course of the study. Hierarchical linear models were used to analyse the data with age, gender, and language spoken at home and classroom mean pre-test scores as covariates. At the end of kindergarten, pupils who received *Breakthrough to Literacy* (N=354) outperformed the control group (N=509) on four

“*Bright Beginnings is an integrated curriculum with a focus on language and early literacy.*”

measures: Definitional Vocabulary (ES = +0.31, $p < 0.009$), Phonological Awareness (ES = +0.44, $p < 0.000$), Print Knowledge (ES = +0.60, $p < 0.000$), and Early Literacy Index (ES = +0.54, $p < 0.000$).

Bright Beginnings

Bright Beginnings is an integrated curriculum with a focus on language and early literacy. The curriculum goals are to provide a child-centred, literacy-focused programme that is consistent, and to include instruction that addresses 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 language and literacy, mathematics, social and personal development, healthful living, scientific thinking, social studies, creative arts, physical development, and technology. The classroom environment is designed to encourage children's active exploration and interaction with adults, other children, and concrete materials. The curriculum also includes a parent involvement component that requires parents to be actively engaged in the child's education.

PCER (2008). Researchers from Vanderbilt University evaluated *Bright Beginnings* and *Creative Curriculum* as part of the PCER study. This summary focuses on the description and findings for *Bright Beginnings*. For the PCER findings for *Creative Curriculum*, see the summary for that curriculum. A total 21 full-day, public pre-kindergarten classrooms in seven school districts in Tennessee participated in the PCER study. The children were 80% White, 18% African American, and 11% Hispanic and were 4.5 years old at the time of baseline data collection. Of the 309 children who participated in the study, 103 were in the *Bright Beginnings* treatment group, 101 in the *Creative Curriculum* treatment group, and 105 in the control group. 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 for literacy outcomes at the end of preschool had faded by the spring of kindergarten to +0.03. Limited effects were found for language both at preschool +0.11 and at kindergarten +0.12 and for mathematics at the end of kindergarten +0.12.

Building Blocks Mathematics

The Building Blocks curriculum provided pupils with small-group mathematics sessions of 10–15 minutes once a week, along with whole-class activities four times a week for 5–15 minutes. Parents were continuously updated on these activities and encouraged to do home-based supplemental activities through letters sent home each week.

Clements, D.H. & Sarama, J. (2008). The Building Blocks preschool mathematics curriculum was compared to both another innovative comparison mathematics curriculum and a control condition in this randomised control trial. Based in New York State, the study involved 276 pupils and 35 teachers within a variety of preschool settings. The control classes used the standard mathematics instruction used prior to the study. The other innovative comparison group was excluded due to huge pre-test differences between them and the control group. Children were individually pre-tested at the beginning of the study and post-tested after the intervention ended. After 26 weeks of instruction, children in the treatment group scored significantly higher than the controls in their overall mean scores Early Math Assessment after adjusting for pre-test difference with an effect size of +1.06.

Building Blocks supplemented with the DLM Early Childhood Express Math software

For their part of the PCER project, researchers from the University of California at Berkeley, and the University of New York at Buffalo implemented the *Pre-K (Building Blocks) Mathematics* curriculum supplemented with the *DLM Early Childhood Express Math software (Pre-K Math with DLM)* in preschool classrooms in California and New York. The *Pre-K Math with DLM* curriculum consisted of 29 small-group mathematics activities with concrete manipulatives for use by teachers and children in preschool classrooms as well as 19 home mathematics activities and materials, sent home every one to two weeks. The teacher's manual provided a curriculum plan that linked small-group classroom activities to home activities. Teachers conducted small-group

mathematics activities twice per week with all pre-kindergarten children. Small-group activities were conducted with groups of four to six children for approximately 20 minutes per group. In addition to these structured activities, similar mathematics materials and activities were available to children in classroom mathematics centres for use during free play.

The *DLM Early Childhood Express Math* software included 26 numerical, quantitative, geometric, and spatial activities. The *DLM Early Childhood Express Math* software is a component of *Building Blocks*, a research-based mathematics curriculum that addresses (a) geometric and spatial ideas and skills and (b) numeric and quantitative ideas and skills. Working with the *DLM Early Childhood Express Math* software, children use pattern blocks and tangrams to complete puzzles. The software programme provided individualised pre-kindergarten mathematics instructional activities for children to use approximately twice a week. Activities were scheduled such that children engaged in conceptually related small-group, home, and computer mathematics activities during the same week.

A research team from the University of California at Berkeley and the University of New York at Buffalo recruited five Head Start and public pre-kindergarten programmes in California and two Head Start and public pre-kindergarten programmes in New York. A total of 40 teachers/classrooms (20 in each state) were recruited from these Head Start and public pre-kindergarten programmes to participate in the study. Twenty-six (12 in California and 14 in New York) of the 40 classrooms were full-day pre-kindergarten programmes. The children were 4.3 years of age at baseline and included African American (45%), Hispanic (23%) and White (18%) preschoolers. The racial/ethnic composition of the sample of children varied based on the geographic location of the sample. The California sample was primarily African American (48%) or Hispanic (35%). A larger percentage of White children (36%) were represented in the New York sample.

Several curricula were implemented in the control condition including *Creative Curriculum*, *High/Scope*, *Montessori*, specialised literacy curricula, and local school district and teacher-developed curricula. Sites were randomly assigned in the autumn of the pilot study year by the research team, using block randomisation to either the treatment condition (*Pre-K Math with DLM*) or the control condition. Blocks were formed at the programme level (five programmes in California and two in New York), with teachers from Head Start and state-funded programmes balanced by curriculum assignment in each site.

One of the post-tests was the Shape Composition task, which is based on activities that were similar to those in the *DLM Early Childhood Express Math* software and thus inherent to the treatment, so it was not counted in the average of the mathematics measures. There was an unusual pattern of effects for the *Pre-K Math with DLM* programme. The effect sizes on mathematics and language in preschool (+0.33 and +0.17, respectively) dropped to +0.13 and +0.10 in kindergarten, while the modest effect for literacy (+0.11) increased to +0.19.

Building Early Language and Literacy (B.E.L.L.)

Building Early Language and Literacy (B.E.L.L.) is a preschool supplementary programme 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 programme also includes shared reading time and phonological awareness time to support reading skills and phonetic reading techniques.

Abt Associates (2007). Abt Associates Inc. (2007) carried out an 18-month study in Miami-Dade County to examine the impacts of three intervention programmes on teacher behaviours, classroom environments, and child outcomes – *Ready, Set, Leap!*, *Building Early Language and Literacy* (B.E.L.L.), and BTL. (See the *Breakthrough to Literacy* section for details of the method.) No statistically significant differences were found between the B.E.L.L. group (N=340) and the control

“*Creative Curriculum is a comprehensive approach to education for 3–5 year old children. The curriculum addresses four areas of development – social/emotional, physical, cognitive, and language development.*”

group (N=509). Definitional Vocabulary (ES = +0.07, p<0.58), Phonological Awareness (ES = -0.04, p<0.77), Print Knowledge (ES = +0.07, p<0.57), and Early Literacy Index (ES = +0.06, p<0.64).

Creative Curriculum

Creative Curriculum is a comprehensive approach to education for 3–5 year old children. The curriculum addresses four areas of development – social/emotional, 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 children’s process skills, such as observing, exploring, and problem solving. *Creative Curriculum* includes a Developmental Checklist which teachers are asked to use in ongoing assessments of child progress.

PCER (2008). For their part of the PCER project, researchers from Vanderbilt University evaluated *Bright Beginnings* and *Creative Curriculum*. This summary focuses on the description and findings for *Creative Curriculum*. For the PCER findings for *Bright Beginnings* see the summary for that programme. Twenty-one full-day, public pre-kindergarten classrooms in seven school districts in Tennessee participated in the PCER study. The children were 4.5 years old at the time of baseline data collection and were 80% White, 18% African American, and 11% Hispanic. Of the 309 children who participated in the study, 103 were in the *Bright Beginnings* treatment group, 101 in the *Creative Curriculum* treatment group, and 105 in the control group. In the control classrooms, teachers used teacher-developed curricula with a focus on basic school readiness. No significant impacts on the pre-kindergarten or kindergarten child outcomes were evident with the highest mean effect size (+0.24) being for literacy at the end of kindergarten.

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 programmes in North Carolina and Georgia. There were eight classrooms in North Carolina and 10 classrooms in Georgia. A sample of 18 classrooms and 194 children (97 treatment, 97 control) participated in the study. The children were 85% African American and 4.5 years old at the time of baseline data collection. In the control condition, teachers used teacher-developed, non-specific curricula.

Teachers within centres were randomly assigned to condition. At the end of the pilot year, the North Carolina site retained eight (four treatment and four control) of the 10 classrooms. Two classrooms were dropped because they were funded by the State’s More at Four programme, had teachers with at least university degrees, and had problems with high rates of teacher attrition. The Georgia site retained 10 out of 10 classrooms. No significant impacts on the preschool or kindergarten child outcomes were found.

Averaging across these two evaluations, a limited weighted mean effect size of +0.11 is found for literacy outcomes.

Curiosity Corner

Curiosity Corner is a comprehensive cognitive-developmental programme 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, one for three-year-olds and one for four-year-olds. Each day teachers present children with learning experiences through sequential daily activities. The programme 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.

“Children in the three-year-old Curiosity Corner classes scored significantly higher on expressive language than their counterparts in the control group.”

Chambers, Chamberlain, Hurley, and Slavin (2001). Chambers and her colleagues evaluated this programme in high-poverty communities in New Jersey. Two age groups participated in the study. The first group was 169 three-year-old children enrolled in privately run early childhood centres and the second group was 147 four-year-old children attending publicly run preschool classrooms. Each group was compared to a comparison group matched on demographic characteristics. The majority of the children were African American. PPVT pre-tests were administered to establish a baseline. At the end of the school year, the children were tested on three language subtests of Mullen Scales of Early Learning (MSEL). Children in the three-year-old Curiosity Corner classes scored significantly higher on expressive language than their counterparts in the control group. The combined three- and four-year-old effect size was +0.24. No significant differences were found on children’s receptive language or visual reception, and no differences were found among the four-year-olds.

PCER (2008). Curiosity Corner was also one of 14 curricula evaluated in randomised field trials in the Preschool Curriculum Evaluation Research (PCER) project of the Department of Education in the US. Eighteen high-poverty preschool sites in three states with 215 children in total were randomly assigned to implement Curiosity Corner or continue with their regular instruction. Children were tested on a battery of measures in the autumn and spring of preschool and followed up in the spring of their kindergarten (reception) year. Adjusting for pre-test scores, there were no significant differences at the end of preschool but there were significant differences favouring the Curiosity Corner preschool attendees on literacy at the end kindergarten (ES= +0.39) and non-significant effect sizes of +0.25 for phonological awareness and +0.18 for mathematics.

Averaging across the two studies of Curiosity Corner, there were weighted mean effect sizes of +0.39 for literacy, +0.25 for phonological awareness, +0.18 for mathematics, and +0.15 for language.

Demonstration and Research Center for Early Education (DARCEE)

The DARCEE programme was a direct instruction model, didactic in nature like Direct Instruction, but it focused more on association, classification and sequencing, along with the development of such aptitudes as achievement motivation, task persistence, and delay of gratification.

The Louisville Experiment. Miller and Dyer (1975) compared four different programmes: two academic programmes (Direct Instruction and DARCEE), one cognitive-developmental (Montessori), and one maturational (Traditional). In 1968, 214 four-year-old children were randomly assigned to the four programmes in Head Start classes in Louisville. There was a no-preschool control group that was excluded from our analyses because it had a non-equivalent, more advantaged group of children. Children attended classes daily from September 1968 to June 1969. About one quarter of the children attended a token economy Follow Through kindergarten programme. There were small negative effects for DARCEE on cognition at the end of preschool and kindergarten (ES= -0.11). The follow-up study is reported in the section on longitudinal evaluations.

Dialogic Reading

Dialogic Reading is an emergent literacy intervention programme developed by Whitehurst and his colleagues (1994). The programme is an interactive story-reading programme aimed at improving the oral language and listening comprehension abilities of young children. Children in the *Dialogic Reading* programme are encouraged to switch roles with their teacher to become the storyteller during the small-group shared reading practice. The teacher assumes the role of active listener and questioner, helping children to improve their oral and language skills in the reading process. In a typical Dialogic Reading programme, parents are also involved in the process by reading to their child daily using the same books that their child uses during dialogic reading in class.

“Direct Instruction is a teacher-directed programme in which specific cognitive and literacy skills are broken down into small units and taught explicitly.”

Whitehurst et al. (1994). Whitehurst and his colleagues (1994) evaluated the *Dialogic Reading* programme in five day-care centres in Suffolk County, New York. A total of 73 three-year-olds were pre-tested on several standardised tests of language ability and were randomly assigned within classrooms to one of the three following conditions in a 6-week intervention: (1) a school plus home reading condition in which children were read to by both teachers and their parents; (2) a school reading condition in which children were read to only by teachers; and (3) a control condition in which children participated in play activities under the supervision of their teachers. The composition of the demographics was 55% African American and 23% Hispanics. For the school reading condition, children were engaged in *Dialogic Reading* with a teacher in a small group setting, usually no more than five children. In addition, pupils also participated in a daily shared reading session for approximately 10 minutes with their reading group. For the school plus home reading condition, pupils were engaged in the same dialogic reading session as the school reading condition. In addition, their parent or their primary carer was encouraged to read to their children at home after being trained to use dialogic reading. Children were post-tested after the six-week intervention and again at a six-month follow-up. Although the intervention was only six weeks, the study was included because a follow-up was conducted at six months, making the time between the pre-test and post-test sufficiently long to determine ongoing effects. No significant differences were found on language scores at the follow-up (ES= -0.03).

Direct Instruction

Direct Instruction (DI) is a programme first developed by Bereiter and Englemann (1966) as an instructional method to teach at-risk children. DI is a teacher-directed programme in which specific cognitive and literacy skills are broken down into small units and taught explicitly. Teachers followed highly scripted lesson plans and techniques in their lessons. The main focus of the programme is basic academic concepts, such as arithmetic and reading.

Engelmann (1968). A small matched study involving both disadvantaged and middle-class pupils was conducted by Engelmann (1968) to examine the effectiveness of direct instruction on IQ and achievement in reading and arithmetic. Pupils were well matched on initial IQ, gender, ethnicity, and SES. The fifteen disadvantaged children in the experimental group attended three 20-minute sessions daily – a language concept class, an arithmetic class, and a reading class, for two years beginning at age four. In contrast, 28 disadvantaged children in the control group attended a regular preschool programme, which emphasised play and traditional nursery school activities. In addition to the disadvantaged children, a comparison group of 18 middle-class children attending a Montessori school were added to the study to demonstrate the differential effects of the experimental programme, which we excluded because there were no pre-tests to determine equivalency.

Children were administered a Stanford Binet IQ test after the first and second year of instruction. At the end of preschool, the experimental group outperformed the control group on the IQ test with an effect size of +0.66. At the end of second year, the experimental group again outscored the control group with an effect size of +1.34. Note that this is after two years of Direct Instruction intervention, not an assessment of the longitudinal effects of a preschool-only intervention, as the end-of-kindergarten results for most of the other programmes are.

The Louisville Experiment. Miller and Dyer (1975) compared four different programmes: Direct Instruction, DARCEE, Montessori, and Traditional Instruction. See details of the study in the description of DARCEE. There were immediate small positive effects for Direct Instruction on cognitive skills at the end of preschool (ES=+0.11) that had faded by kindergarten (-0.02). A follow-up study is reported in the section on longitudinal evaluations.

Salaway (2008). In her study, Salaway (2008) examined the additive effects of DI on top of a Developmentally Appropriate Preschool (DAP) curriculum. A total of 61 preschoolers were randomly assigned to either the *Language for Learning* (DI) curriculum or the DAP-only

curriculum group. Approximately 70% of the participants were African American, 20% White, and 10% others. Children in the treatment group were instructed by the trained teachers three days a week, in the morning during small group activity. All participating children were tested in two measures prior to the intervention: K-SEALS and DIBELS. After the 6-month intervention, all children received post-test assessments. Children in the experimental group outperformed their counterparts in the control group on: Expressive Language (ES = +0.40), Receptive Language (ES = +0.51), Initial Sounds Fluency (ES = +0.75), Letter Naming Fluency (ES = +0.50), Number Skills (ES = +0.37), Letter and Word Skills (ES = +0.32) and Number Skills (+0.37).

The weighted mean effect sizes across these studies show strong effects at the end of preschool for literacy (ES=+0.52), language (ES=+0.46) mathematics (ES=+0.37), and cognition (ES=+0.31) with effects on cognition continuing through kindergarten (ES=+0.39). There is no kindergarten data on the other outcomes.

DLM Early Childhood Express, supplemented with Open Court Reading Pre-K

The PCER 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 project. We describe this combination of the two curricula as a separate programme, compared to a control group, as the effects represent the two programmes combined, not the independent effects of either programme separately. 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 the following content areas: literacy, mathematics, science, social studies, fine arts, health/safety, personal/social development, physical movement, and technology. Each thematic unit includes more than 200 age-appropriate, hands-on learning activities that are designed to promote children's social, emotional, intellectual, aesthetic and physical development.

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. Each day, teachers read literature selections that focus on a thematic topic. The curriculum includes a home component that provides parents with suggestions for activities that they can engage in at home with their children.

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

PCER (2008). The Florida State University research team recruited public pre-kindergarten programmes for participation in the study. Two teachers from each of the 16 participating schools were recruited to participate in the study. All of the programmes were full-day programmes. 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*). A total of 297 children (99 in the *Literacy Express* treatment group; 101 in the *DLM Early Childhood Express supplemented with Open Court Reading Pre-K* treatment group; and 97 in the control group). Data were collected on a total of 282 children and 270 parents at the time of the autumn baseline data collection. The children were 4.6 years of age at baseline, with the majority of the sample of preschoolers being African American (59%) or White (30%).

“*The Doors to Discovery curriculum is a preschool programme that is based on the areas identified as important for literacy success...*”

The evaluators conducted repeated measures linear spline analyses of the three reading assessments to control for a statistically significant pre-test difference on the WJ Letter Word Identification test (ES = +0.41). For the spring kindergarten assessment, statistically reliable differences were obtained on two of the three reading measures (TERA, ES = .76, $p < .01$; WJ Letter Word Identification, ES = +0.50), indicating that the difference in the spring of pre-kindergarten was sustained through to the spring of the following year.

Analyses of the kindergarten phonological awareness outcome also indicated a statistically significant difference between groups on the CTOPP phonemic awareness assessment in the spring of kindergarten favouring the *DLM Early Childhood Express with Open Court Reading Pre-K* classrooms (ES = +0.38).

Analyses controlling for those pre-test differences indicated that effects for the experimental group were sustained through to the spring of kindergarten for an average effect size of +0.47 for language outcomes.

This combined programme had the largest impact on more child outcomes of any programme in the PCER project. This is an important finding, less so for educators trying to decide what programme to adopt because this is in essence two programmes; but it indicates that the greater the instructional focus on language and literacy skills, the greater an impact you can have.

Doors to Discovery

The *Doors to Discovery* curriculum is a preschool programme that is based on the areas identified as important for literacy success: oral language, phonological awareness, concepts of print, alphabet knowledge, writing, and comprehension. The programme focuses on the use of learning centres and shared literacy activities in the preschool classroom. The curriculum is presented in eight thematic units that cover topics such as friendship, communities, nature, society, and health. Classroom practices include large and small group teacher-directed activities and children's application of skills and independent practice on activities that are related to the themes. The curriculum components also include family learning activities that are designed to foster partnerships between the school and the family; initial training for teachers and ongoing professional development support; and assessment strategies that are integrated into the curriculum units.

Assel et al. (2006). Assel and colleagues conducted a one-year study of the *Doors to Discovery* programme in 22 schools including Head Start centres and a large public school district in greater Houston, Texas (both Title 1 and non-Title 1 classrooms). The sample represented an economically and ethnically diverse population that matched on pre-tests. A total of 206 pupils were assigned to the experimental condition, while 203 were in the control condition. Sites differed in the approach to teaching English language learners. In the school district, monolingual Spanish-speaking children were in classrooms where English was the language of instruction. In Head Start, Spanish-speaking children were instructed in English and Spanish, thus having language and literacy concepts presented in both languages. Finally, half of the *Doors* classroom teachers received mentoring by senior level trainers, while the other half did not. There were a total of 25 classrooms implementing *Doors to Discovery* and 27 control classrooms. The results showed a mean effect size of -0.20 on both the Preschool Language Scale (PLS-IV) and the Expressive Vocabulary Test (EVT). The Developing Skills Checklist (DSC), a test of phonological awareness, showed a positive effect size of +0.12 on the Auditory subscale.

PCER (2008). *Doors to Discovery* was one of the curricula evaluated in the PCER project by the University of Texas Health Science Center at Houston along with *Let's Begin with the Letter People*. Here we report each of these programmes as compared to a control group, implementing teacher-developed, non-specific curricula. *Doors to Discovery* and its control were implemented in full-day Head Start and public pre-kindergarten (Title I and non-Title I) programmes in Texas. Altogether 44 teachers/classrooms, and 297 parents and children (101 in the *Doors to Discovery* treatment

“The Early Literacy and Learning Model (ELLM) is a literacy-focused curriculum and support system designed for young children from low-income families.”

group, 100 in the *Let's Begin with the Letter People* treatment group, and 96 in the control group) were selected for inclusion in the study sample for the PCER project. The children were on average 4.6 years of age at the time of baseline data collection and more than half (55%) were male. The racial/ethnic composition of the sample of children was diverse: 43 per cent Hispanic, 30 per cent White, and 13 per cent African American.

The average effects on weighted mean language scores found small differences at the end of kindergarten (ES=+0.12).

Early Literacy and Learning Model

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* programme 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 specifically focusing on children's early literacy skills and knowledge. The *ELLM* curriculum materials include a set of literacy performance standards; monthly literacy packets; targeted instructional strategies; resource guides for teachers; a book lending library; and literacy calendars. *ELLM* requires a one-hour block of daily literacy instruction. Trained literacy coaches provide instructional support to preschool teachers who use the curriculum.

The *ELLM* programme contains a family involvement action plan. Parents receive monthly family tip sheets and calendars with suggestions for literacy activities they could engage in with their children. Parents also have the opportunity to engage in preschool site-based family activities during the school year. Teachers targeted instruction in phonological awareness and letter recognition specifically for individual children based on baseline assessments.

PCER (2008). As part of the PCER project, the University of North Florida (Florida-UNF) team implemented the *Early Literacy and Learning Model* (ELLM) in 28 preschool classrooms from three geographic locations in Florida. The sampled classrooms included Head Start, subsidised faith-based, and early intervention pre-kindergarten classrooms. All of the classrooms were full-day programmes. A total of 28 classrooms and teachers participated in the study. The *ELLM* curriculum was implemented in combination with the existing comprehensive curricula that were in use in the control group classrooms in Florida. Several curricula were used in the control classrooms including *Creative Curriculum*, *Beyond Centers and Circletime*, *High Reach*, and *High/Scope*.

No impacts regarding pre-kindergarten child outcomes were found. However, it appears that *ELLM* is one of the programmes that had a delayed effect, in this case, on language outcomes, that showed up in kindergarten (ES=+0.39).

Cosgrove et al. (2006). This randomised comparison of the effectiveness of *ELLM* versus traditional methods is a supplement to the larger Preschool Curriculum Evaluation Research (PCER) funded by the US Department of Education. The study sample was comprised of 466 four-year-old preschoolers in 48 classrooms in multiple settings. In the treatment sites, *ELLM* was implemented in combination with the existing curricula (*Creative Curriculum*, *High/Scope*, and *High Reach*). The controls used only the existing curricula. The treatment group (N=222) scored significantly higher than the controls (N=244) for five literacy scores: Alphabet (ES=+.28), Conventions of Print (ES=+.17), and Meaning (ES=+.29), the Reading Quotient of the Test of Early Reading Ability – Third Edition (TERA-3) (ES=+.28), and the Alphabet Letter Recognition Inventory (ALRI) (ES=+.25) for an average of effect size of (ES=+.25).

The weighted mean effect sizes for *ELLM* across the two studies at kindergarten were: +0.11 for literacy, +0.08 for phonological awareness and +0.08 for mathematics with a strong effect for language of +0.39.

“The Interactive Book Reading programme, developed by Wasik and Bond (1994), is designed to promote the language and literacy proficiency in young children.”

Exemplary Model of Early Reading Growth and Excellence (EMERGE)

EMERGE is a literacy-based programme designed to help children from low-income families acquire early literacy skills. The programme supports children's development of four early literacy skills. Its goals include the use of research-based teaching practices, progress monitoring to identify the need for more intensive intervention, provision of a literacy-rich learning environment, and continuing professional development. The curriculum increases the amount of time children are engaged in interactive shared book reading and includes theme-based activities. The programme also includes family involvement and home-based activity components.

Gettinger & Stoiber (2007). Gettinger and Stoiber (2007) of the University of Wisconsin designed and implemented the *EMERGE* programme, which incorporates a response-to-intervention (RTI) model. There was a matched control, one-year study, implemented in 15 classrooms housed in five centre-based early childhood centres. The participating classrooms provided full-day, year-round programming for children across two consecutive years prior to kindergarten. A total of 342 pupils were enrolled, 188 assigned to the experimental condition, and 154 to the control condition. Ten Head Start classrooms were randomly selected to serve as a control group. Both experimental and control groups were matched on pre-tests and demographics, which included low SES and 90% African-American participants. *EMERGE* children outperformed those in the control classrooms in three categories, with a mean effect size in literacy of +0.37, in language of +0.13, and in phonological awareness of +0.28, at the end of preschool.

Interactive Book Reading

The Interactive Book Reading programme, developed by Wasik and Bond (1994), is designed to promote language and literacy proficiency in young children. The programme is basically an adaptation of the *Dialogic Reading* programme. Where the *Dialogic Reading* programme is usually used in a one-to-one or small group setting, the Interactive Book Reading programme is for the use of a whole class setting. Like *Dialogic Reading*, teachers actively engage their children in shared reading time by asking open-ended questions, encouraging them to use newly acquired vocabulary from the book, and providing opportunities to elaborate on what children read and hear. Teachers are provided with a box of materials which consists of a set of trade books and concrete objects that represent the target vocabulary in these trade books. In addition, teachers receive specific instruction on interactive book reading strategies – defining target words, providing opportunities for children to use vocabulary from the books, asking open-ended questions, and offering children opportunities to talk and to be heard. Prior to reading time, teachers introduce their children to a set of target words with the aid of concrete objects. After reading the story, children are encouraged to use these target words in the extended activities.

Wasik & Bond (2001). Wasik and Bond conducted a 15-week study of the impact of the Interactive Book Reading programme on preschoolers. Participants were 121 children from a public early childhood centre in Baltimore, Maryland. Most of the children were African American and eligible for free or reduced-cost lunch. Four teachers were randomly assigned to either treatment or control condition. All children were pre-tested individually on PPVT and post-tested on three measures of vocabulary. At the end of the study, treatment children outperformed control children on PPVT III, receptive, and expressive measures with effect sizes of +0.63, +1.44, and +1.92 respectively for an average of +1.33.

Wasik, Bond & Hindman (2006). A similar study was conducted by Wasik, Bond and Hindman (2006). The three key components in the programme included: 1) asking questions, 2) building vocabulary, and 3) making connections. Two Head Start centres were randomly assigned to treatment and control condition with a total of 207 pupils from low socio-economic families, mostly African Americans. The children were pre-tested in autumn and post-tested in spring on three measures. At post-test, treatment children scored significantly higher than control children

“*The Language-Focused Curriculum was designed for use with three- to five-year-old children with language limitations, including children with language impairment; children from disadvantaged backgrounds; and English language learners.*”

on receptive language (ES=+0.73) and expressive language (ES=+0.44) for an average of +0.58. No significant difference was found on Alphabet Knowledge between the two groups.

Averaging across these two studies, the weighted mean effect size on children’s language outcomes was +0.86.

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 organised 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 individualise children’s learning of language and literacy skills.

PCER (2008). The 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 the *Creative Curriculum* without the supplement.

The researchers recruited 14 full-day and half-day Head Start classrooms in New Hampshire to participate in the study. A sample of 123 children (62 treatment, 61 control) participated in the study. The children were 4.6 years old at the time of baseline data collection and less than half (44%) were male. The racial/ethnic composition of the sample of children was diverse: 39 per cent White, 11 per cent African American, and 31 per cent identified as Hispanic. No impacts on the preschool or kindergarten student-level outcomes were found.

Language-Focused Curriculum

The *Language-Focused Curriculum (LFC)* was developed at the University of Kansas through a 1985 Model Demonstration Project funded by the US Department of Education (Bunce, 1995). The *LFC* was designed for use with three- to five-year-old children with language limitations, including children with language impairment; children from disadvantaged backgrounds; and English language learners. The curriculum has a thematic organisation 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 child’s utterance with varied vocabulary) (Justice, Mashburn, Pence & Wiggins, 2008).

PCER (2008). Researchers from the University of Virginia implemented the PCER study of the *LFC* in seven full-day Head Start and public pre-kindergarten classrooms in Virginia, with seven control classrooms, with a total of 195 children. The children were 4.6 years of age at the time of baseline data collection and slightly more than half (53%) were male. The majority of the sample was White (71%) or African American (21%). The control teachers reported using High/Scope curriculum materials but this was not assessed. No significant impacts on the preschool or kindergarten child outcomes were found by the spring of kindergarten. There was small effect on literacy (ES=+0.17) at the end of preschool which had faded by kindergarten.

Let’s Begin with the Letter People

Let’s Begin with the Letter People emphasises early language and literacy development through learning through play. In addition to classroom teaching, the programme has a strong home/parent component. The curriculum is arranged in the following five themes: (1) All About Me,

“*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.*”

(2) *Animals, Animals, and Animals*; (3) *Everyone Has Needs*, (4) *Getting Along with Others*; and (5) *Nature All Around Us*.

Fischel et al. (2007). Fischel and his colleagues carried out a one-year study to evaluate the effectiveness of *Let’s Begin with the Letter People* and the *Waterford Early Reading Program* (see *Waterford* section for effects for that programme). Thirty-five Head Start preschool classrooms in six centres were randomly assigned to one of these programmes or the control condition. A total of 507 children participated in the study, who attended Head Start during one of the following school year cohorts: 2001–2002, 2002–2003, and 2003–2004. Forty-two per cent were African American, 41% Hispanic, and 7% White.

ANCOVAs indicated that both treatment groups generally outperformed the control group in emergent writing, book and print knowledge and general reading-readiness skills. Specifically, pupils in *Let’s Begin with the Letter People* scored significantly higher than the control group in Get Ready to Read! Screen (ES=+0.32), Letters Known (ES=0.31), Dictation (ES=+0.38), Book Knowledge (ES=+0.12), and Print Convention (ES=+0.23). No significant differences were found on PPVT, Letter Word ID, and Comprehension for an average effect size of +0.20 on literacy outcomes.

PCER (2008). *Let’s Begin with the Letter People* was one of the curricula evaluated in the PCER project by the University of Texas Health Science Center at Houston, along with *Doors to Discovery*. Here we report each of these programmes as compared to a control group, implementing teacher-developed, non-specific curricula. *Let’s Begin* and its control were implemented in full-day Head Start and public pre-kindergarten (Title I and non-Title I) programmes in Texas. A total of 44 teachers/classrooms, and 297 parents and children (101 in *Doors to Discovery* treatment group, 100 in the *Let’s Begin* treatment group, and 96 in the control group) were selected for inclusion in the study sample for the PCER project. The children were on average 4.6 years of age at the time of baseline data collection and more than half (55%) were male. The racial/ethnic composition of the sample of children was diverse: 43 per cent Hispanic, 30 per cent White, and 13 per cent African American. No impacts on the preschool or kindergarten student-level outcomes were found.

Across all studies, the average weighted effects size for *Let’s Begin* on literacy outcomes at the end of preschool was +0.15 and on phonological awareness +0.24 but these had faded by the end of kindergarten.

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 thematic unit of the curriculum 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 small groups of children of homogeneous ability 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.

PCER (2008). As part of the PCER project, the Florida State University (Florida-FSU) research team chose to evaluate two curricula: *Literacy Express* and *DLM Early Childhood Express supplemented with Open Court Reading Pre-K*. In this section we report *Literacy Express* as compared to a control group, which implemented the *High/Scope* curriculum.

The Florida-FSU research team recruited public pre-kindergarten programmes for participation in the study. Two teachers from each of the 16 participating schools were recruited to participate in the study. All of the programmes were full-day programmes. The final study sample included 30 teachers and classrooms across three conditions (9 control, 10 *Literacy Express*, and 11 *DLM*

“The Project Approach is a set of teaching strategies that enables teachers to guide children through in-depth investigations of real world topics.”

Early Childhood Express supplemented with Open Court Reading Pre-K) involving a total of 297 children (99 in the *Literacy Express* treatment group; 101 in the *DLM Early Childhood Express supplemented with Open Court Reading Pre-K* treatment group; and 97 in the control group). Data were collected on a total of 282 children at the time of the autumn baseline data collection. The children were 4.6 years of age at baseline, with the majority of the sample of preschoolers African American (59%) or White (30%).

No impacts on the pre-kindergarten or kindergarten child outcomes were found with the spring of kindergarten.

Montessori

Maria Montessori developed a programme to educate the children in a housing development for poor families in Rome in the 19th century. She created many self-correcting materials designed to be used by individual children in prescribed ways to teach very specific concepts. She developed a programme that emphasised teaching children responsibility through practical life skills and independent activities in a carefully planned environment (Roopnarine & Johnson, 1999).

Karnes, Shwedel & Williams (1983). Karnes and her colleagues compared five different programmes: Direct Instruction (Bereiter & Engelmann, 1966); Montessori; a community integrated programme, with a few low-income children integrated into middle-class preschools; a traditional preschool; and the Ameliorative Approach, designed by Karnes. The Ameliorative Approach (later known as GOAL for Games-Oriented Activities for Learning) was a cognitive-developmental programme designed to promote language and general cognitive development and enhance school-related motivation as well as social, emotional, and motor development. It included structured and unstructured periods that encompassed language, mathematics, science, social studies, art, and music activities.

The Louisville Experiment (1975). Miller and Dyer (1975) compared four different programmes: two academic programmes (*Direct Instruction* and *DARCEE*), Montessori, and traditional instruction. In 1968, 214 four-year-old children were randomly assigned to the four programmes in Head Start classes in Louisville. There was a no-preschool control group that was excluded from our analyses because it was a non-equivalent, more advantaged group of children. Children attended classes daily from September 1968 to June 1969.

The short-term effects for Montessori were negative with an effect size on cognition at the end of preschool of -0.09 and at kindergarten -0.11. The long-term effects were more positive and are described in the section on longitudinal studies.

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 organising and developing classroom learning activities. There are three curriculum components that 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 programme 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 teacher then brainstorms his or her own experience, knowledge and ideas, and represents them in a topic web. This topic web is revised throughout the project and used for recording the progress of the project. In *Project Approach* classrooms, the daily schedule is to be structured so that children and teachers spend at least 45 to 60 minutes engaged in investigation and discovery, typically in small groups.

PCER (2008). As part of the PCER project, researchers at the Purdue University and University of Wisconsin-Milwaukee (Purdue/Wisconsin) research team implemented the *Project Approach* curriculum. The Purdue/Wisconsin research team recruited public pre-kindergarten classrooms for participation in the study. The research team recruited 13 teachers from 12 different schools. A sample of 204 children (114 treatment, 90 control) and parents were recruited for participation in the study. Data were collected on 204 children and 176 parents at the time of the autumn baseline data collection. The children were 4.6 years of age at the baseline data collection and the racial/ethnic composition of the sample was diverse: African American (40%), White (28%) and Hispanic (17%).

The Purdue/Wisconsin research team randomly assigned 13 teachers and their classes to the experimental conditions (seven treatment and six control classrooms). The *Project Approach* curriculum was implemented in public pre-kindergarten classrooms in Wisconsin. In the control classrooms, teachers reported implementing their own teacher-developed, non-specific curricula.

At the end of kindergarten the non-significant effects on language (ES = +0.21), and mathematics (ES = +0.24) were slightly higher in kindergarten than in pre-kindergarten but the literacy scores dropped from an effect size in pre-kindergarten of +0.28 to +0.15 and the phonological awareness scores in kindergarten produced a negative effect size (-0.17).

Project Construct

Project Construct was developed under the direction of the Missouri Department of Elementary and Secondary Education in 1986 to fulfil the need for a curriculum and assessment framework that supports children's learning. *Project Construct* is derived from constructivism – the theoretical view that learners construct knowledge through interactions with physical and social environments. The preschool curriculum, the *Early Childhood Framework*, was first published in 1992 by the *Project Construct* National Center. The *Project Construct* approach is organised around 29 goals for pupils that are set within a context of four developmental 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.

PCER (2008). For the PCER project, the University of Missouri (Missouri) research team evaluated the *Project Construct* curriculum. The Missouri researchers recruited 21 full-day child-care centres, and the external evaluators grouped schools into blocks of two based on characteristics such as teachers' experience, school location, or 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.

A total of 231 children were recruited. Data were collected on a total sample of 188 children at the time of the autumn baseline data collection. The children were 4.7 years old at the time of baseline data collection and the majority of the sample of preschoolers were White (65%) or African American (25%).

No significant impacts on the preschool or kindergarten child outcomes were found, with effect sizes in the spring of kindergarten ranging from -0.06 for CMA-A Mathematics Composite to +0.16 for WJ Letter Word Identification.

Promoting Alternative Thinking Strategies (PATHS) Curriculum

Spanning the social-emotional, behavioural and cognitive skill domains, the *Promoting Alternative Thinking Strategies (PATHS)* curriculum is a social-emotional curriculum, delivered in a developmentally-appropriate sequence. The curriculum emphasises affective awareness of self and others, targeting children's ability to self-regulate their behaviour.

“Ready, Set, Leap! is a comprehensive, preschool curriculum... which combines research-based instructional approaches with multisensory technology.”

Domitrovich et al. (2007). To test the effectiveness of PATHS for preschoolers, Domitrovich and colleagues carried out a randomised study. The first year of the three-year study was devoted to familiarising intervention teachers with the PATHS curricular processes and materials. The following year, 20 classrooms within two Pennsylvania Head Starts (246 children in total) were randomly assigned ten intervention and ten control classes. Demographically, the participant sample reflected the make-up of their Head Starts in terms of race, gender and SES indicators. On pre-test measures, intervention and control pupils performed similarly. Delivery of the treatment consisted of 30 lessons. At post-test, 201 pupils remained, due to 18% attrition over the school year. Several child outcomes were administered but only one cognitive measure, the Leiter sustained attention, met the criteria for inclusion in this review. After one year, PATHS scored higher, though not statistically significantly, than the controls with an effect size of +0.16.

Ready, Set, Leap!

Ready, Set, Leap! is a comprehensive, preschool curriculum, published by LeapFrog SchoolHouse, which combines research-based instructional approaches with multisensory technology. The curriculum is structured around nine thematic units, each with detailed lesson plans for large- and small group instruction, and ongoing assessment tools. This programme stresses the importance of experiential learning, social and emotional development, teacher-child relationships, and the home-school connection. The curriculum includes language and early literacy, mathematics, science, social studies, fine arts, health and safety, personal and social development, physical development, and technology applications. The language and literacy component emphasises phonological awareness, alphabetic knowledge, print awareness, oral language development, reading aloud and reading comprehension through story discussion. The technology is designed to provide thematic centre-based activities that provide individualised feedback to pupils. There is also a home component to encourage parent-child interactions to forge strong home-school connections.

PCER (2008). For the PCER project the University of California, Berkeley researchers, in collaboration with RMC Research, implemented *Ready, Set, Leap!* The California research team recruited 21 full-day pre-kindergarten programmes in New Jersey. The children were 4.5 years of age at the time of baseline data collection and the majority of the preschoolers were African American (78%) or Hispanic (20%). In the control condition, teachers used the *High/Scope* approach. The external evaluators grouped schools into blocks of two based on characteristics such as teachers' experience, school location, or 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. No impacts on the pre-kindergarten or kindergarten child outcomes were found.

RMC (2003). A randomised study of the *Ready, Set, Leap!* (RSL) programme was carried out in 17 high-poverty, inner-city Newark public elementary schools by RMC Research Corporation (RMC, 2003). Schools were randomly assigned to either an RSL or a control group. Treatment (N=129) and control groups (N=125) were comparable in terms of their initial pre-test scores and other characteristics. All children were pre-tested in autumn 2002 and post-tested in spring 2003. Demographically, on average 44% was African American, 37% Hispanic, and 15% Caucasian. A two-level hierarchical linear analysis with pre-tests as co-variables found a small-to-moderate but non-significant effect on five of the post-test measures, with a mean effect size of +0.18 for literacy measures and of +0.10 for language measures.

Abt Associates (2007). Abt Associates Inc. (2007) examined the impacts of three intervention programmes on teacher behaviours, classroom environments, and child outcomes – *Ready, Set, Leap!*, *Building Early Language and Literacy* (B.E.L.L.), and *Breakthrough to Literacy* (BTL) in an 18-month study in Miami-Dade County. See the BTL section for details of the method. Children in the *Ready, Set, Leap!* group scored significantly higher than the control group pupils on all four subscales of measures of the Test of Preschool Emergent Literacy (TOPEL): Definitional Vocabulary (ES=+0.28, $p<0.017$), Phonological Awareness (ES=+0.35, $p<0.003$), Print Knowledge (ES=+0.65, $p<0.000$), and Early Literacy Index (ES=+0.51, $p<0.000$).

“Tools of the Mind ...focuses on children’s ability to self-regulate, oral language, phonemic awareness, letter knowledge, conventions of print, and early mathematics skills.”

Across the three studies of *Ready, Set, Leap!* the weighted mean effect size was +0.24 for literacy outcomes and +0.18 for phonological awareness.

Research-based Developmentally Informed (REDI) Program

REDI (Research-based, Developmentally Informed) is an enrichment programme that was integrated into regular Head Start centres that use High/Scope or Creative Curriculum. This programme is designed to promote academic and social-emotional school readiness in preschoolers by training teachers using various specific research-based strategies and techniques in their classrooms. For social-emotional skills, the Preschool PATHS curriculum was used. For emergent literacy skills, three programme components were adopted, including an interactive reading programme (Whitehurst, Arnold *et al.*, 1994), a set of ‘Sound Games’ (Adams *et al.*, 1998), and print centre activities. Teachers received a three-day intensive training prior to the intervention and a one-day follow-up training four months after the intervention. In addition, teachers also received weekly mentoring support provided by REDI trainers. Parents were also provided with materials for home activities with their children.

Bierman *et al.* (2008). Two cohorts of four-year-olds were recruited over two years to participate in a study conducted by Bierman and colleagues. Participants were 356 preschoolers from 44 Head Start classrooms in three counties in Pennsylvania. A stratified random sampling using length of programme, location and demographics was used. To account for the nesting nature of the data, i.e. pupils nested with classrooms, hierarchical linear models were employed to estimate the true intervention effect. Significant and marginally significant treatment effects were detected in nine of the eleven child skills, with effect sizes ranging from +0.15 to +0.39.

Sound Foundations

Sound Foundations is a phonemic awareness programme developed in Australia by Byrne and Fielding-Barnsley (1991). The key feature of the programme is recognition of phoneme identity across words, with special attention paid to nine key phonemes. Large pictorial posters with words of the key phonemes are used in the class to help children learn these phonemes. Children are trained in small groups of 4–6 in a weekly 25–30 minutes lesson. In each lesson, the teacher introduces one phoneme and children are then asked to identify words associated with that phoneme on the poster. After children master these key phonemes, they are introduced to worksheets and game cards to facilitate further learning.

Byrne & Fielding-Barnsley (1991). Byrne and Fielding-Barnsley (1991) conducted an experimental study on 128 children from four preschools to examine the efficacy of a new phonological programme entitled *Sound Foundations*. Children were randomly assigned to treatment and control. The treatment group received phoneme training in a small group of 4–6 for twelve weeks; the controls were also trained in a small group of 4–6 in reading but without phoneme training. At post-test, the treatment children scored significantly higher than controls on word-choice test (ES = +1.53), trained phoneme identity scores (ES = +0.84), and untrained phoneme identity scores (ES = +0.19).

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, conventions of print, and early mathematics skills. The activities emphasise 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 and his colleagues (2008) carried out a randomised 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 (N=7 teachers, 88 children) or a control condition (N=12 teachers, 122 children) 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 used full-day (6hrs/day) programmes.

Children were pre- and post-tested as individuals. Some measures were given in Spanish to Spanish-dominant children. Adjusting for pre-tests, there were non-significant effects with an average effect size for language (ES = +0.17), cognition (ES = +0.06), maths (ES = +0.15), and literacy (ES = -0.03) outcomes.

Waterford Early Reading Program

The *Waterford Early Reading Program (Waterford)* is an integrated learning system that provides 15 minutes of daily one-to-one learning activities for preschool children. It focuses on teaching children their letters, as well as 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). Fischel and his colleagues carried out a randomised quasi-experimental evaluation of *Waterford* in six Head Start centres in southeastern New York. The children were four-year-olds, and were 42% African American, 41% Hispanic, 8% multiracial, and 7% White. 14% were Spanish-dominant. Combining across three cohorts (2001–2002, 2002–2003, and 2003–2004), 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 earlier in this report.

The centres had been using the *High/Scope* curriculum for ten years, and all classes continued to do so, with the addition of the *Waterford* or *Let's Begin* activities in the experimental groups. The control classes continued using *High/Scope* as before. Children were individually pre- and post-tested on eight measures. Adjusting for pre-tests, post-test effect sizes comparing *Waterford* to control were +0.32 for Get Ready to Read!, +0.06 for PPVT, +0.12 for FACES Letters Known, +0.11 for Woodcock Letter Word Identification, +0.02 for Woodcock Dictation, 0.00 for FACES Book Knowledge, +0.25 for FACES Print Conventions, and -0.21 for FACES Comprehension, for an overall mean of +0.08.

Overall patterns of outcomes

Across all categories, there were 40 qualifying studies of early childhood programmes which post-tested children at the end of preschool and/or reception/kindergarten. Some of these studies evaluated more than one programme, providing findings for 29 different programmes or combinations of programmes.

Summarising evidence of effectiveness for programmes

It is useful to have summaries of the strength of the evidence supporting effects of programmes that educators might select to improve pupils' outcomes. The following early childhood programmes were rated as follows.

Strong evidence of effectiveness

Six early childhood programmes produced strong evidence of effectiveness, with a sample size-weighted effect size of at least +0.20:

Curiosity Corner

Direct Instruction

ELLM

Interactive Book Reading

Let's Begin with the Letter People

Ready, Set, Leap!

The effects for these programmes were on language, literacy, phonological awareness, or cognition. For some of the studies the meaningful effects were seen at the end of preschool (Direct Instruction, Interactive Book Reading), for others at the end of reception/kindergarten (Curiosity Corner, ELLM, Ready, Set, Leap!).

Moderate evidence of effectiveness

Six programmes had at least one randomised or two matched studies and a weighted mean effect size of at least +0.20:

DLM Express plus Open Court

Breakthrough to Literacy

Bright Beginnings

Building Blocks

PreK Mathematics plus DLM Express

Project Approach

Three of these programmes had effects for mathematics (Building Blocks plus DLM software and DLM Express plus Open Court, Ladders to Literacy); however, two of these were actually two programmes combined together (Building Blocks plus DLM software and DLM Express plus Open Court).

Limited evidence of effectiveness: strong evidence of modest effects

Three studies met the criteria for 'moderate evidence of effectiveness' with weighted mean effect size between +0.10 and +0.19:

Doors to Discovery

Language Focus Curriculum

Literacy Express

Limited evidence of effectiveness: weak evidence with notable effects

Two studies had a weighted mean effect size of at least +0.20, but did not qualify for 'moderate evidence of effectiveness' due to insufficient numbers of studies:

EMERGE

PATHS

Sound Foundations

Insufficient evidence of effectiveness

Studies of the following programmes did not meet the criteria for 'limited evidence of effectiveness':

B.E.L.L.

Creative Curriculum

DARCEE

Dialogic Reading

Dialogic Reading plus Sound Foundations

Ladders to Literacy

Montessori

Project Construct

REDI

Tools of the Mind

Waterford

No qualifying studies

These programmes did not have any qualifying studies:

Abecedarian

DISTAR

Early Authors Program

High/Scope

Reading Street

Reggio Emilia

Scholastic Preschool Program

Programmes available in the UK

Some of the programmes included in this review are no longer distributed. Of those that are in distribution, the following are currently available in the UK:

Breakthrough to Literacy

Creative Curriculum

Curiosity Corner

High/Scope

Montessori

PATHS

Sound Foundations

Tools of the Mind

Studies of long-term effects

There are a few longitudinal studies that follow up on studies of programmes that were evaluated initially in the 1960s and 70s. This section summarises the effects that those studies report on long-term educational and social adjustment outcomes.

The curricular models that were initially studied 30 or 40 years ago have evolved and the current versions of those models may be quite different from the programmes that were implemented

“ Statistically significant short-term effects for intelligence, achievement and creativity favoured the Learning to Learn participants. ”

in the initial evaluations. Furthermore, standard practices, social conditions, and such factors as access to television and other media have also changed, meaning that control groups today may be different from control groups 30–40 years ago. In fact, in some of the more recent evaluations, the interventions evaluated in these early studies are the control conditions today. For these reasons, it cannot be assumed that these studies would have the same effects today. However, we report these longitudinal studies because they may indicate that the long-term impacts of programmes might be different from short-term findings.

The studies are described below and their findings are summarised in Table 3.

High/Scope Curriculum Comparison Project

In 1967, Weikart conducted a comparison of High/Scope, Direct Instruction, and a traditional nursery school. Altogether 68 high-poverty three- and four-year-olds participated in half-day classes conducted each weekday morning. Teachers made weekly home visits for an hour and a half. At the end of preschool, the Direct Instruction group significantly outperformed the nursery group on IQ (ES = +0.66). However, the IQ difference among the groups diminished over time. Upon follow-up at age 23, the High/Scope and nursery groups had a higher high school grade point average than the Direct Instruction group, fewer years in special education, and fewer failed grades (Schweinhart & Weikart, 1997). In addition, pupils who attended High/Scope and nursery programmes were more likely to have attended college or vocational training. High/Scope and nursery attendance had an effect on delinquency, and employment. A higher percentage of High/Scope and nursery participants were employed than the Direct Instruction group. This study was excluded from the quantitative synthesis because of the small sample size in each condition and differing duration of exposure to the different programmes.

Learning to Learn

Sprigle and Schaefer (1985) followed up on a randomised evaluation of Learning to Learn, a cognitive-developmental programme, which compared it to a standard Head Start programme (Van de Riet & Resnick, 1973). A total of 90 four- and five-year-old African American children participated in either three years of compensatory education from preschool to first grade, or two years from kindergarten to first grade.

Statistically significant short-term effects for intelligence, achievement and creativity favoured the Learning to Learn participants. In the follow-up study for grades 4–6, in fourth and fifth grade the Learning to Learn participants scored significantly higher in reading (ES = +0.61 and 0.83), and sixth grade differences were positive but not statistically significant (ES = +0.51). The most striking differences were for special education placement and grade retention (ES = +0.57 and ES = +0.62, respectively). However, these effects were not influenced by the number of years of participation in the programme. Children who started the programme in kindergarten achieved at the same level as those who began in preschool.

The Louisville Experiment. Miller and Dyer (1975) compared four different programmes: two academic programmes (Direct Instruction and DARCEE), one cognitive-developmental (Montessori), and one maturational (Traditional). In 1968, 214 four-year-old children were randomly assigned to the four programmes in Head Start classes in Louisville. There was a non-preschool control group that was excluded from our analyses because it had a non-equivalent, more advantaged group of children. The DARCEE programme was didactic in nature like Direct Instruction, but it focused more on association, classification, and sequencing, along with the development of such aptitudes as achievement motivation, task persistence, delay of gratification. Children attended classes daily from September 1968 to June 1969. About one quarter of the children attended a token economy Follow Through kindergarten programme.

Table 3 – Studies of Long-Term Effects								
Study	Design	Duration	N	Sample Characteristics	Evidence of Initial Equality	Post-test	Preschool ES	Preschool Mean ES
DARCEE								
Miller & Bizzel (1984)	Randomised	1 year	96 pupils (64E, 32C)	African American pupils w lowest SES in Louisville, KY	Random assignment	Cognitive (IQ)		
						10th grade	-0.14	
						Literacy (Reading)		
						8th grade	+0.17	
Montessori								
Miller & Bizzel (1984)	Randomised	1 year	64 pupils (22E, 34C)	African American pupils w lowest SES in Louisville, KY	Random assignment	Cognitive (IQ)		
						10th grade	-0.01	
						Literacy (Reading)		
						8th grade	+0.56	
Direct Instruction								
Miller & Bizzel (1984)	Randomised	1 year	98 pupils (64E, 34C)	African American pupils w lowest SES in Louisville, KY	Random assignment	Cognitive (IQ)		
						10th grade	-0.13	
						Literacy (Reading)		
						8th grade	+0.28	
Evans (1985)	Retro-spective	1–2 years	44 pupils (27E, 17C)	Subjects were low income, minority (mostly black) pupils in urban school districts	Similar preschool WPPSI mean scores between the two surviving groups (DI and High/Scope)	Literacy (MAT Reading)		
						8th grade	+0.43	
						Mathematics		
						8th grade	-0.03	
Learning to Learn								
Sprigle & Schaefer (1985)	Randomised	2–3 years	90 pupils	4 and 5 year old African American children from the same neighbourhood	Random assignment with similar IQ pre-tests	Literacy (Reading)		
						6th grade	+0.51	
						6th grade		
						School		
						Special Education	+0.57	+0.60
Grade Retention	+0.62							

The children were tested each spring through second grade on measures of IQ, achievement, curiosity, persistence, inventiveness and classroom behaviour. They were followed up in seventh to twelfth grade as part of the Consortium for Longitudinal Studies project. Generally, immediate small positive effects for Direct Instruction on cognitive skills faded, while the positive effects for Montessori increased over time, particularly for boys (Miller & Bizzell, 1984).

Karnes, Shwedel & Williams (1983). Karnes and her colleagues compared five different programmes: Direct Instruction (Bereiter & Engelmann, 1966); Montessori; a community integrated programme, with a few low-income children integrated into middle-class preschools; a traditional preschool; and the Ameliorative Approach, designed by Karnes. The Ameliorative Approach (later known as GOAL, for Games-Oriented Activities for Learning) was a cognitive-developmental programme designed to promote language and general cognitive development and enhance school-related motivation as well as social, emotional, and motor development.

The findings of this study were confounded by unequal duration of treatments. There were two cohorts. Only the 1965 cohort had a traditional condition and only the 1966 cohort had the community-integrated programme. The Direct Instruction programme continued through kindergarten and the Ameliorative Approach received an hour daily of additional training in kindergarten. We excluded this study from the quantitative synthesis because these duration differences make the comparisons difficult to interpret.

Overall the long-term results of these few longitudinal studies indicate that cognitive developmental programmes have better long-term outcomes than solely academic programmes.

Discussion

It appears from the findings of this systematic review that children learn what they are taught. The programmes focusing on mathematics instruction improved mathematics achievement; those focusing on phonological awareness increased those skills. The implication of this outcome for educators and policy makers is to decide what are the most important skills that young children need to learn before they transfer into primary school. Many of the effective programmes focus on oral language development, particularly for EAL children, to provide a strong vocabulary and oral language base for success in reading, which is the cornerstone of learning in school.

Of the 29 programmes evaluated, six showed strong evidence of effectiveness and five had moderate evidence of effectiveness. Interestingly, averaging across all included studies of the interventions there were small effects at the end of preschool for all outcomes – language (ES= +0.11), literacy (ES= +0.15), phonological awareness (ES= +0.15), mathematics (ES= +0.17) and cognition (ES= +0.13). While there is a long way to go to determining exactly what constitutes the most effective forms of early childhood programmes for improving the outcomes for children at risk due to poverty, the increased number and quality of the studies on early childhood programmes is heading the field in the right direction.

The findings from the end of preschool or reception/kindergarten for the recent studies reported should be interpreted with some caution based on the long-term effects of programmes from the 1960s and 70s which found that the short-term effects of more academic programmes wore off after a few years in primary school and that the longitudinal effects on educational and social adjustment outcomes, such as reduced delinquency, and teenage pregnancy and higher employment, were found for cognitive developmental programmes. Hopefully, longitudinal studies will be conducted to determine the long-term impacts of the current programmes, most of which combine elements of direct instruction with more child-initiated activities.

Aspects of both cognitive developmental and academic approaches have benefits that can inform the creation of comprehensive preschool programmes. Academic approaches generally have clearly defined specific objectives. It is easier for teachers to monitor the progress of children if they have a clear idea of what they are working towards. They then provide carefully planned experiences designed to move children toward success in academic performance and this gives a significant advantage as they enter primary school. At the same time, the cognitive-developmental approach emphasises the importance of giving children choice and fostering their autonomy and self-regulation, scaffolding children's development by providing the foundational knowledge in an interactive, constructivist way.

While the curriculum is one important factor that differentiates early childhood programmes, another factor that also differentiates programmes 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 programme than teachers typically receive when implementing a new programme. Teachers often receive very little support, perhaps just a teacher's manual with suggested activities; while in some of the research studies, they received extensive initial training and very frequent follow-up coaching by the developer or the researchers, which may or may not be typical when the programme is implemented at scale. There are two lessons in this. First, it usually takes ongoing support for teachers to learn to implement the innovative forms of instruction that new programmes require. Educational administrators need to plan and budget for this when adopting new programmes.

Second, researchers need to conduct research on educational programmes as they are implemented at scale, without the additional support often provided in studies. In larger-scale investigations of different curricula, it is important for researchers to observe and describe what

“The findings of this review add to a growing body of evidence that early childhood programmes can have an important impact on increasing the school readiness of young children.”

actually happens in both treatment and comparison conditions. This fidelity of implementation data might help explain the difference, 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.

Of course the issue of the applicability of the findings of this review to the UK context must be addressed. Most of the studies reviewed here were conducted in the US, many in large urban areas. However, the similarities of the challenges of large inner city communities in the US to those in the UK lead one to think that the findings would likely generalise to the UK. There is definitely a need for large-scale randomised evaluations of programmes in the UK on programmes already being implemented here and of those programmes that show evidence of effectiveness in other countries. Of the programmes in this review we only found evidence that eight of the programmes are available in the UK. More should be done to have promising programmes evaluated in the UK and if found to be effective, disseminated here.

The findings of this review add to a growing body of evidence that programmes can have an important impact on increasing the school readiness of young children. There is a tremendous need for systematic, large-scale, longitudinal, randomised evaluations of the effectiveness of preschool interventions in bringing children from high-risk environments to normative levels of academic achievement. However, this review identifies several promising approaches that could be used today to help children begin primary school ready to succeed.

References

1. Abt Associates, Inc. (2007, March). *Findings from Project Upgrade in Miami-Dade County*. Cambridge, MA.
2. Assel, M., Landry, S., Swank, P. & Gunnewig, S. (2007). An evaluation of curriculum, setting, and mentoring on the performance of children enrolled in prekindergarten. *Reading and Writing, 20*(5), 463–494.
3. Barnett, W.S. (2007). Benefits and costs of quality early childhood education. *Legal Rights Journal, 27*(1), 7–23.
4. Barnett, W.S., Frede, E.C., Mosbasher, H. & Mohr, P. (1987). The efficacy of public preschool programs and their relationship of program quality to efficacy. *Educational Evaluation and Policy Analysis, 10*(1), 37–49.
5. Barnett, W.S., Jung, K., Yarosz, D.J., Thomas, J., Hornbeck, A., Stechuk, R., Burns, S. (2008). *Educational effects of Tools of the Mind curriculum: A randomized trial*. *Early Childhood Research Quarterly, 23*(3), 299–313.
6. Belsky, J. & Melhuish, E. (2007). Impact of Sure Start Local Programmes on children and families. In J. Belsky, J. Barnes, & E. Melhuish (eds.) *The National Evaluation of Sure Start: Does Area-Based Early Intervention Work?* (pp. 133–154). Bristol, UK: The Policy Press.
7. Berrueta-Clement, J., Barnett, W., Schweinhart, L., Epstein, A. & Weikart, D. (1984). *Changed lives: The effects of the Perry Preschool Program on youths through age 19* (Monograph of the High/Scope Educational Research Foundation No. 8). Ypsilanti, MI: High/Scope Press.
8. Bierman, K.L. (2008). Promoting Academic and Social-Emotional School Readiness. In C.E. Domitrovich, R.L. Nix, S.D. Gest, J.A. Welsh, M.T. Greenberg, C. Blair, K.E. Nelson & S. Gill (eds.), *The Head Start REDI Program, 79*, 1802–1817.
9. Bowman, B.T., Donovan, M.S. & Burns, M. (eds.) (2001). *Eager to learn: Educating our preschoolers*. Washington, DC: National Research Council.
10. Bryant, D.M., & Ramey, C.T. (1987). An analysis of the effectiveness of early intervention programs for environmentally at-risk children. In M.J. Guralnick & F.C. Bennett (eds.), *The effectiveness of early intervention for at-risk and handicapped children* (pp 33–78). Chapel Hill, NC: Academic Press.
11. Byrne, B. & Fielding-Barnsley, R. (1993). Evaluation of a program to teach phonemic awareness to young children: A 1-year follow-up. *Journal of Educational Psychology, 85*(1), 104–111.
12. Camilli, G., Vargas, S., Ryan, S. & Barnett, S. (2010). Meta-analysis of the effects of early education interventions on cognitive and social development. *Teachers College Record, 112*(3) <http://www.tcrecord.org> ID Numbers: 15440.
13. Campbell, F.A. & Ramey, C.T. (1995). Cognitive and school outcomes for high-risk African American students at middle adolescence: Positive effects of early intervention. *American Education Research Journal, 32*, 743–772.
14. Chambers, B., Chamberlain, A., Hurley, E. & Slavin, R. (2001, April). *Curiosity Corner: Enhancing preschoolers' language through comprehensive reform*. Paper presented at the annual meeting of the American Educational Research Association, Seattle, WA.
15. Chambers, B., Cheung, A., Slavin, R.E. (2006). Effective preschool programs for children at risk of school failure: A best-evidence synthesis. In B. Spodek (ed.), *Handbook of research on the education of young children*. (pp. 347–360). New York: Lawrence Erlbaum.

16. Cheung, A. & Slavin, R.E. (2005). Effective reading programs for English language learners and other language minority students. *Bilingual Research Journal*, 29 (2), 241–267.
17. Clements, D.H. & Sarama, J. (2008). Experimental Evaluation of the Effects of a Research-Based Preschool Mathematics Curriculum. *American Educational Research Journal*, 45(2), 443–494.
18. Coghlan, M., Bergeron, C., White, K., Sharp, C., Morris, M., Rutt, S. (2009). *Narrowing the gap in outcomes for young children through effective practices in the early years*. London, UK: Centre for Excellence and Outcomes in Children and Young People's Services.
19. Cooper, H. (1998). *Synthesizing research* (3rd ed.). Thousand Oaks, CA: Sage.
20. Cosgrove, M., Fountain, C., Wehry, S. *et al.* (2006). Randomized Field Trial of an Early Literacy Curriculum and Instructional Support System. Paper presented at the annual meeting of the American Educational Research Association, San Francisco, April 2006.
21. Currie, J. (2000). *Early childhood intervention programs: What do we know?* Chicago: Joint Center for Poverty Research. Hillsdale, NJ: Lawrence Erlbaum.
22. Darrow, C.L. (2009, March). Language and literacy effects of curriculum interventions for preschools serving economically disadvantaged children: A meta-analysis. Paper presented at the annual meeting of the Society for Research on Educational Effectiveness, Alexandria, Virginia.
23. Domitrovich, C.E., Cortes, R.C. & Greenberg, M.T. (2007). Improving young children's social and emotional competence: A randomized trial of the preschool 'PATHS' curriculum. *The Journal of Primary Prevention*, 28(2), 67–91.
24. Engelmann, S. (1968). The Effectiveness of Direct Instruction on IQ Performance and Achievement in Reading and Arithmetic. In J. Hellmuth (ed.), *Disadvantaged Child* (vol. 3). New York: Brunner/Mazel.
25. Evans, E.D. (1985). Longitudinal follow-up assessment of differential preschool experience for low-income minority group children. *Journal of Educational Research*, 78, 197–202.
26. Fischel, J.E., Bracken, S.S., Fuchs-Eisenberg, A., Spira, E.G., Katz, S. & Shaller, G. (2007). Evaluation of curricular approaches to enhance preschool early literacy skills. *Journal of Literacy Research*, 39(4), 471.
27. Gettinger, M. & Stoiber, K. (2007). Applying a response-to-intervention model for early literacy development in low-income children. *Topics in Early Childhood Special Education*, 27(4), 198–213.
28. Gilliam, W.S. & Zigler, E.F. (2000). A critical meta-analysis of all evaluations of state funded preschool from 1977 to 1998: Implications for policy, service delivery and program evaluations. *Early Childhood Research Quarterly*, 15, 441–473.
29. Gorey, K.M. (2001). Early childhood education: A meta-analytic affirmation of the short- and long-term benefits of educational opportunity. *School Psychology Quarterly*, 16, 9–30.
30. Gray, S.W., Klaus, R.A., Miller, J.O. & Forrester, B.J. (1966). *Before first grade*. New York: Teachers College Press.
31. Karnes, M.B., Shwedel, A.M. & Williams M.B. (1983). A comparison of five approaches for educating young children from low-income homes. In Consortium for Longitudinal Studies, *As the twig is bent...Lasting effects of preschool programs*. (pp 133–170). Hillsdale, NJ: Lawrence Erlbaum.
32. Karoly L.A., Greenwood, P.W., Everingham, S.S., Hoube, J., Kilburn, M.R., Rydell, C.P. *et al.* (1998). *Investing in our children: What we know and don't know about the costs and benefits of early childhood interventions*. Santa Monica, CA: RAND.

33. Karweit, N. (1993). Effective preschool and kindergarten programs for students at risk. In B. Spodek (ed.), *Handbook of Research on the Education of Young Children* (pp385–411) New York: Macmillan Publishing Company.
34. Lipsey, M.W. & Wilson, D.B. (2001). *Practical meta-analysis*. Thousand Oaks, CA: Sage.
35. Magnuson, K., Meyers, M., Ruhm, C. & Waldfogel, J. (2003). *Inequality in preschool education and school readiness*. New York: Columbia University.
36. Miller, L.B. & Bizzell, R.P. (1984) Long-term effects of four preschool programs: Ninth- and tenth-grade results. *Child Development*, 55, 1570–1587.
37. Miller, L.B., Dyer, J.L. (1975). Four preschool programs: Their dimensions and effects, *Monographs of the Society for Research in Child Development*, 40(5–6), Serial No.162.
38. National Research Council and Institute of Medicine (2000). *From neurons to neighborhoods: The science of early childhood development..* Washington, DC: National Academy Press.
39. Neuman, S.B., Copple, C. & Bredekamp, S. (1999). *Learning to read and write: Developmentally appropriate practices for young children*. Washington, DC: National Association for the Education of Young Children.
40. Penn, H., Burton, B., Lloyd, E., Potter, S., Sayeed, Z. & Mugford, M. (2006). What is known about the long-term economic impact of centre-based early childhood interventions? Technical Report, In: *Research Evidence in Education Library*. London: ERRI-Centre, Social Science Research Unit, Institute of Education, University of London.
41. Preschool Curriculum Evaluation Research Consortium. (2008). *Effects of Preschool Curriculum Programs on School Readiness* (NCER 2008–2009). Washington, DC: National Center for Education Research, Institute of Education Sciences, U.S. Department of Education. Washington, DC: U.S. Government Printing Office.
42. Ramey, C.T. & Ramsey, S.L. (1998). Early intervention and early experience. *American Psychologist*, 53 (2), 109–120.
43. Reynolds, A.J. (1995). One year of preschool intervention or two: Does it matter? *Early Childhood Research Quarterly*, 10, 1–31.
44. Reynolds, A.J. (1994). Effects of a preschool plus follow-on intervention for children at risk, *Developmental Psychology*, 30(6), 787–804.
45. Reynolds, A.J., Temple, J.A., Robertson, D.L. & Mann, E.A. (2001). Long-term effects of an early childhood intervention on educational achievement and juvenile arrest: A 15-year follow-up of low-income children in public schools. *Journal of the American Medical Association*, 285(18), 2339–2346.
46. Roopnarine, J.L. & Johnson, J.E. (1999). *Approaches to Early Childhood Education*. Merrill.
47. Rothstein, H.R., Sutton, A.J. & Borenstein, M. (eds.) (2005). *Publication bias in meta-analysis: Prevention assessment, and adjustments*. Chichester, UK: John Wiley.
48. Salaway, J.L. (2008). *Efficacy of a direct instruction approach to promote early learning*. Unpublished Ph.D., Duquesne University.
49. Schweinhart, L.J., Barnes, H.V. & Weikart, D.P. with Barnett, W.S. & Epstein, A.S. (1993). *Significant benefits: The High/Scope Perry Preschool study through age 27* (Monographs of the High/Scope Educational Research Foundation No. 10) Ypsilanti, MI: High/Scope Press.
50. Sedlmeier, P. & Gigerenzer, G. (1989). Do studies of statistical power have an effect on the power of studies? *Psychological Bulletin*, 105, 309–316.
51. Shadish, W.R., Cook, T.D. & Campbell, D.T. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Boston: Houghton-Mifflin.

52. Slavin, R.E. (1986). Best-evidence synthesis: An alternative to meta-analytic and traditional reviews. *Educational Researcher*, 15 (9), 5–11.
53. Slavin, R.E. (2008). What works? Issues in synthesizing education program evaluations. *Educational Researcher*, 37 (1), 5–14.
54. Slavin, R.E., Cheung, A., Groff, C. & Lake, C. (2008a). Effective reading programs for middle and high schools: A best evidence synthesis. *Reading Research Quarterly*, 43 (3), 290–322.
55. Slavin, R. & Lake, C. (2008). Effective programs in elementary mathematics; A best-evidence synthesis. *Review of Educational Research*, 78 (3), 427–515.
56. Slavin, R.E. & Madden, N.A. (2008, March). *Understanding bias due to measures inherent to treatments in systematic reviews in education*. Paper presented at the annual meetings of the Society for Research on Educational Effectiveness, Crystal City, Virginia.
57. Slavin, R.E. & Smith, D. (2008, March). *Effects of sample size on effect size in systematic reviews in education*. Paper presented at the annual meetings of the Society for Research on Educational Effectiveness, Crystal City, Virginia.
58. Schweinhart, L.J. & Weikart, D.P. (1997). *Lasting differences: The High/Scope Preschool curriculum comparison study through age 23* (Monographs of the High/Scope Educational Research Foundation No. 12) Ypsilanti, MI: High/Scope Press.
59. Wasik, B.A. & Bond, M.A. (2001). Beyond the pages of a book: Interactive book reading and language development in preschool classrooms. *Journal of educational psychology*, 93(2), 243–250.
60. Wasik, B.A., Bond, M.A. & Hindman, A. (2006). The effects of a language and literacy intervention on Head Start children and teachers. *Journal of Educational Psychology*, 98(1), 63–74.
61. Whitehurst, G.J., Epstein, J.N., Angell, A.C., Payne, A.C., Crone, D.A. & Fischel, J.E. (1994). Outcomes of an emergent literacy intervention in Head Start. *Journal of Educational Psychology*, 86, 542–555.
62. Whitehurst, G.J., Zevenbergen, A.A., Crone, D.A., Schultz, M.D., Velting, O.N. & Fischel, J.E. (1999) Outcomes of an emergent literacy intervention from Head Start through second grade. *Journal of Educational Psychology*, 91(2), 261–272.
63. Xue, Y. & Meisles, S.J. (2004). Early literacy instruction and learning in kindergarten: Evidence from the early childhood longitudinal study- kindergarten class of 1998–1999. *American Educational Research Journal*, 41, 191–229.
64. Yoshikawa, H. (1995). Long-term effects of early childhood programs on social outcomes and delinquency. *The Future of Children*, 5(3) 51–75.



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