

WWC EVIDENCE REVIEW PROTOCOL FOR EARLY CHILDHOOD EDUCATION INTERVENTIONS, VERSION 2.0

Topic Area Focus

This What Works Clearinghouse (WWC) review focuses on early childhood education (ECE) interventions (curricula and practices, as defined below) designed for use in center-based settings with three- to five-year-old children who are not yet in kindergarten or are in preschool, with a primary focus on cognitive and language competencies associated with school readiness (cognition, language, literacy, and math). The review also includes center-based ECE interventions designed to improve the school readiness skills of preschool children with developmental delays or diagnosed disabilities and children who are English language learners (ELL).¹

A systematic review of evidence in this topic area addresses the following questions:

- Which ECE interventions improve preschool children’s cognitive and language competencies associated with school readiness (cognition, language, literacy, and math skills)?
- Does the effectiveness of ECE interventions differ by type of outcome?
- Which ECE interventions are particularly effective for which children?

Key Definitions

Early Childhood Education Intervention. The WWC ECE review examines evidence of the effectiveness of center-based early childhood education interventions (curricula and practices) designed to improve children’s school readiness, focusing on those interventions that have as their primary goal improving preschool children’s cognitive and language competencies.

- **Curriculum:** A curriculum is a set of activities, materials, and/or guidance for working with children in classrooms that has a clearly identified name; includes a thorough write-up/description; and can be replicated by others based on written guidance, staff training, or technical assistance. Some ECE curricula are the primary classroom curriculum, addressing multiple domains of development, whereas other ECE curricula are focused on one or two areas and, therefore, are used as supplements to a primary curriculum.
- **Practice:** A practice is a named approach to promoting children’s development that staff implement in interacting with children and materials in their classrooms. The

¹ Studies with samples including at least 50% of children with disabilities or delays will be reviewed by the Early Childhood Education for Children with a Disability topic area.

named approach must be clearly described and commonly understood in the field and literature.

Programs defined by funding streams or service delivery models are not considered interventions for this review. For example, Head Start programs and state-supported prekindergarten programs are not considered interventions, although specific curricula or practices used by these programs may be eligible for the review.

ECE policies that influence the conditions under which curricula and practices are implemented are not considered interventions for the review at this time. Examples include mandates concerning teacher qualifications or student-teacher ratios; however, to the extent possible, the association between these policies and the impact of an intervention is reviewed.

Short-term learning trials, which are relatively brief studies of systematic variations in parameters of how children are exposed to materials or assessed, are not considered interventions for the review at this time. Short-term learning trials often involve systematic manipulation of stimulus presentation, feedback type, or material content. Outcomes are generally measured immediately following the manipulation, which may last one or only a few sessions, often in a within-subjects experimental design.

School Readiness. Within the field of early childhood education, children’s school readiness is typically understood to encompass the following:

- Cognitive and language competencies associated with school readiness (cognition, language, literacy, math)
- Social-emotional development and approaches to learning (social relationships, self-concept, self-control, cooperation, reasoning and problem solving, engagement and persistence, initiative and curiosity)
- Physical well-being and motor development (for example, physical health, gross and fine motor skills)

Preschool curricula and practices may focus on cognitive and language competencies, social-emotional development, or both. Preschool curricula also may address explicitly the issues of physical health and motor development. The initial focus of this review is on curricula and practices that have cognitive and language competencies as their primary focus. A subsequent focus of the review may be on curricula and practices that have social-emotional development as their primary focus. Curricula and practices with a dual focus (that is, both cognitive and language competencies and social-emotional development as determined by a scope and sequence or other explicit statement of focus) are reviewed with other interventions that have a focus on cognition and language development. Curricula or practices that have a primary focus on physical health and motor development, although important, are not included in this review.

The WWC review of interventions for ECE addresses student outcomes in six domains: oral language, print knowledge, phonological processing, early reading and writing, cognition, and math.

- **Oral language domain.** This domain includes the ability to understand spoken language, express thoughts or ideas through speech, understand or produce vocabulary, and display grammatical knowledge or skill.
- **Print knowledge domain.** This domain includes a combination of the following:
 - Alphabet knowledge: knowledge of the names and sounds associated with printed letters
 - Concepts about print: knowledge of print conventions (directionality, difference between letters and words, uppercase and lowercase, punctuation) and concepts (common book characteristics such as the cover, illustrations, text, author)
 - Early decoding: simple sound-letter correspondence
- **Phonological processing domain.** This domain includes the following:
 - Phonological awareness: the awareness of larger spoken units such as syllables and rhyming words; the ability to notice and manipulate the sounds of spoken language as fundamental components of words and speech (such as the ability to blend words, syllables, or phonemes; segment and delete syllables or phonemes; and rhyme)
 - Phonological memory: the ability to hear a sequence of words or sounds and reproduce them within a short period of time
- **Early reading and writing domain.** This domain includes the following:
 - Early reading: the ability to read common sight words, to decode simple words, to read with fluency, or to read and comprehend simple texts
 - Early writing: the ability to copy shapes accurately, to write letters in isolation, or to write one's own name or other simple words
- **Cognition domain.** This domain includes memory, problem solving, cognitive processing and flexibility, general knowledge, and IQ.
- **Math domain.** This domain includes recognizing numbers, concepts of numerical order and one-to-one correspondence, simple operations such as addition and subtraction, pattern recognition, classification, size, measurement, and geometry.

Preschoolers. Preschoolers are three- to five-year-old children who have not yet entered kindergarten or are in preschool.

Preschoolers with Disabilities. Preschoolers with disabilities are three- to five-year-old children who have not yet entered kindergarten or are in preschool who are eligible for special education and related services under Part B of the Individuals with Disabilities Education Act (IDEA). Eligible children are those with diagnosed disabilities and developmental delays who need special education and related services.

Preschoolers Who Are Nonnative Speakers of English. These preschoolers are from homes in which English is not the primary language spoken by adults to the children.

GENERAL INCLUSION CRITERIA

Populations to be Included

The early childhood education review includes interventions for three- to five-year-old children who are not yet in kindergarten and who are attending center-based preschool programs. The children must attend a center-based preschool or child care program in the United States or its territories or tribal entities or in a country that is sufficiently similar to the United States that the study could be replicated in the United States (for example, English is the societal language). To be included, the children must speak English or be nonnative speakers of English who are ELLs.

Subpopulations of interest include children in different age groups (three to four years and four to five years), ELLs, children from different racial/ethnic groups, children from lower socioeconomic status (SES) families, and children with developmental delays or diagnosed disabilities.

Interventions to be Included

The determination of which interventions to include is made after an exhaustive search of the published and unpublished literature, as well as a review of the nominations submitted to the WWC. A primary goal of an intervention should be enhancing cognitive and language competencies associated with school readiness, but it may have other goals as well. It does not necessarily have to be referred to as a school readiness program. All reviewed curricula and practices must be able to be disseminated (that is, implemented by others besides the developers of the approach). To allow attribution of effects to practices, which may vary to some extent from implementation to implementation, the ECE team prioritizes practices for which there are at least two studies that meet WWC evidence standards, either with or without reservations.

Two broad types of interventions are to be included:

1. **Curricula.** A curriculum may be (1) intended as the primary instructional tool designed to meet children's learning needs in multiple areas or (2) designed to supplement the classroom material with differentiated instruction or to meet children's learning needs in specific areas. Both types of curricula are included in this review. Examples of ECE curricula follow:

- A curriculum that fosters cognitive, language, social, physical, and emotional development of three- and four-year-old children through a daily structure of thematic activities.
- A supplemental curriculum that features systematic, focused instruction in oral language, phonological and alphabetical awareness, and early reading concepts for three- and four-year-old children and includes a teacher's guide and materials needed for the instruction.
- A curriculum that consists of a set of guiding principles and practices that adults follow as they work with and care for three- and four-year-old children. These principles are intended as an "open framework" that teams of adults are free to adapt to the special needs and conditions of their group, their setting, and their community.

2. **Practices.** The review includes both general and targeted practices. A general practice is a named approach to promoting children’s development that program staff implement by interacting with children and materials in the classroom. A targeted practice is a named approach to promoting the development of a subset of children in the classroom with specific developmental issues, such as giftedness, delays, or diagnosed disabilities or children who are ELL. Both general and targeted practices must be clearly described and commonly understood in the field and in the literature. Examples of ECE practices include

- Dialogic reading, a general practice that increases stimulation of children’s language skills through interactive picture-book reading
- Time delay, a technique to increase language and facilitate generalization in children with mental retardation

Research Studies to be Included

The ECE literature search focuses on studies written in English that involve curricula and practices for preschool-age children in center-based settings. Please note that because conference proceedings typically include preliminary and unreliable drafts of papers, tables, and slides, we do not include conference papers in the literature search. To be included in the review, a study must meet several criteria for relevance:

- **Topic relevance.** The study must be focused on the effects of an approach on improving children’s cognitive or language outcomes.²
- **Time frame relevance.** The study must be published no earlier than 1985.
- **Sample relevance.** The sample must include three- and four-year-old children, not yet in kindergarten, or children in preschool at the time of the intervention. Outcomes may be measured at a later time.
- **Study location relevance.** Studies must include children attending preschools and child care centers in the United States or its territories or tribal entities, or in a similar country.
- **Study design relevance.** Studies must be empirical, using quantitative methods and inferential statistical analysis, and must take the form of a randomized controlled trial or a well-controlled quasi-experimental design. At this time, the WWC has not developed standards for reviewing or reporting on regression discontinuity or single-case design studies. Consequently, such studies are not currently included in this review.
- **Outcome relevance.** The study must focus on child outcomes, rather than teacher or classroom outcomes, and it must include at least one outcome measure focusing on a cognitive or language competency associated with school readiness with adequate face validity or reliability.

² A main task for the WWC is to answer the question of intervention effectiveness. To this end, the WWC may use the data provided in studies differently from the way the study author intended.

The WWC ECE review includes some studies that compare an intervention to a no-treatment or business-as-usual comparison group (for example, typical preschool curriculum) and some studies that compare two variations of the same intervention (for example, shared reading with a picture/vocabulary focus versus shared reading with a print/alphabet knowledge focus). In the latter case, the study does not allow the isolation of the effect of the particular intervention (for example, the impact of shared reading). However, a contrast of this type that provides useful information will be included in the intervention report because we believe that practitioners may find information about variations of an intervention useful to their classroom practices. In these cases, the study will be excluded from the overall rating of effectiveness and improvement indices, but the study findings will be described in the body of the report and the findings will be included in the technical appendices.

In most cases when a no-treatment comparison group is included in the study, “no-treatment” is not an entirely accurate label because in early childhood center-based settings, all children participate in other activities. The impact of any particular intervention is dependent on the comparison condition. In ECE, a number of different and appropriate comparisons could be made to isolate the effects of any particular intervention. The ECE review includes in its overall rating of effectiveness for any intervention the comparison that enables the best isolation of the effects of the intervention. In some cases, this means that the additive effects of a particular component of an intervention (for example, adult interaction with shared book reading) will be examined in relation to the intervention in absence of that additive component (for example, shared book reading).

SPECIFIC TOPIC PARAMETERS

The following parameters specify which studies are considered for analyses and which aspects of those studies are coded for the review.

1. Characteristics of ECE interventions.

We define ECE interventions for preschool-age children as curricula or practices with a theoretical and philosophical basis connecting the curriculum or practice with relevant child outcomes and implemented in center-based settings.

Theoretical and Philosophical Basis

- Primary goal is to enhance cognitive and language competencies associated with the school readiness of preschool children.

Implementation

- Implemented in a center-based setting (child care center, school- or community-based preschool, Head Start, or other center-based early childhood setting). The program may include other components (for example, parent training and education), but only those interventions that are implemented primarily in the center-based setting and evaluated as a distinct program component are included in the review.

2. Replication and dissemination of interventions.

Interventions must be replicable or able to be disseminated. Important characteristics of the intervention must be documented in the study to replicate the intervention with fidelity among different participants, in different settings, or at other times. For an intervention to be replicable, it must be branded or have sufficient documentation.

Branded interventions are particularly conducive to being reproduced with fidelity. A branded intervention is characterized by any of the following criteria:

- It has an external developer who provides technical assistance or sells/distributes the intervention.
- It is packaged or otherwise available for distribution/use beyond a single site with sufficient documentation to allow the program or practice to be implemented by individuals other than the developers (for example, it has a manual, curriculum guide, or other sufficiently detailed instructions for implementation).
- It is trademarked or copyrighted.

Interventions that are not branded must have the following characteristics documented:

- Target population.
- Characteristics of the center-based settings in which the intervention is implemented, including the qualifications and training of the center staff implementing the intervention.
- Characteristics of the intervention, including activities to change or maintain the center environment that are part of the intervention; the appropriate use of support materials and prescribed classroom structures; and specific pedagogical strategies or activities, the medium/media of delivery of the intervention.
- Duration and intensity of the intervention.

3. Outcomes relevant to early childhood education.

Primary outcome domains of interest include oral language, print knowledge, phonological processing, early reading and writing, cognition, and math. Although we acknowledge the importance of social-emotional development, approaches to learning, and physical development, we have focused this review solely on cognitive and language outcomes.

To be included in the review, a study must include at least one of the primary outcomes that is intentionally targeted by the intervention and measured via direct assessment. A study also may include other outcomes related to school readiness, such as social-emotional outcomes, approaches to learning, or physical development outcomes.

The alignment between the outcome and the intervention is another factor included in our analyses. We would expect that interventions that are aligned with or tailored to particular

outcomes (for example, interventions focusing mainly on letter recognition, with letter recognition as the outcome measure) would be more effective than those that are less aligned.

4. Reliability of outcome measures.

A study must include at least one relevant measure that demonstrates marginally acceptable or acceptable reliability according to the criteria listed below OR that shows evidence of face validity.

As part of the coding process, the reliability of each outcome measure is determined to be acceptable, marginally acceptable, or unacceptable according to the reliability measures and thresholds described in the following table:

Type of Reliability	Minimum to Be Considered Acceptable	Minimum to Be Considered Marginally Acceptable
Internal consistency	.70	.60
Temporal stability/test-retest reliability ^a	.60	.40
Inter-rater reliability		
% agreement	.80	.50
Correlation	.70	.50
Kappa	.70	.50

^aStandards for temporal stability are difficult to set without knowing the construct (and its theoretical stability) and the test interval. Reviewers are asked to record the test interval along with the test-retest reliability, and the principal investigator will review the appropriateness of these criteria when test-retest reliability falls below these thresholds.

If a study includes only measures that are marginally acceptable (no measures that are acceptable according to the given thresholds), that will be indicated in the intervention report’s discussion of the evidence base.

5. Time frame of review.

The Early Childhood Education Evidence Reports focus on interventions implemented within the most recent 25-year span (that is, published between 1985 and the present). This time frame adequately represents the current status of the field as well as allowing for a manageable project scope. Moreover, interventions implemented in the past 25 years are most likely to be available to practitioners today and were tested under conditions more likely to be similar to those existing today.

6. Defining characteristics of the target population.

- Children must be between the ages of three and five years and not yet enrolled in kindergarten, or the children must be in preschool.

- When the authors provide aggregated data for both preschool and kindergarten children and disaggregated data are unavailable, the ECE team will review the study as long as the majority of the children in the sample are in preschool.³
- Children reside and attend a preschool or child care center within the United States (including U.S. territories and tribal areas) or in a sufficiently similar country that the study can reasonably be considered replicable in the United States (for example, English is the societal language).

7. Effectiveness of the intervention across different groups.

An intervention’s effectiveness will likely vary by subgroups in the population, and, therefore, an effectiveness study should attempt to examine effects of the intervention within important subgroups. These subgroups include:

- Age (three to four and four to five)
- Gender
- Socioeconomic status
- Race/ethnicity
- ELLs
- Presence of a delay or disability

We will report subgroup results in the appendix.

8. Effectiveness of the intervention across different settings.

An intervention’s effectiveness will likely vary by location, and, therefore, an effectiveness study should attempt to examine the effects of the intervention across different settings. These settings include

- Location (urban, suburban, or rural)
- Center type (child care center, school-based prekindergarten, Head Start, community-based preschool)
- Staff education, qualifications (for example, certification, years of experience), and training

We will report results across different settings in the appendix.

³ There are at least two reasons for this parameter: (a) there is little evidence for a clear demarcation of predictive relations or impact in the transition from preschool to kindergarten and (b) the need to avoid overlap with other WWC topic areas (for example, Beginning Reading).

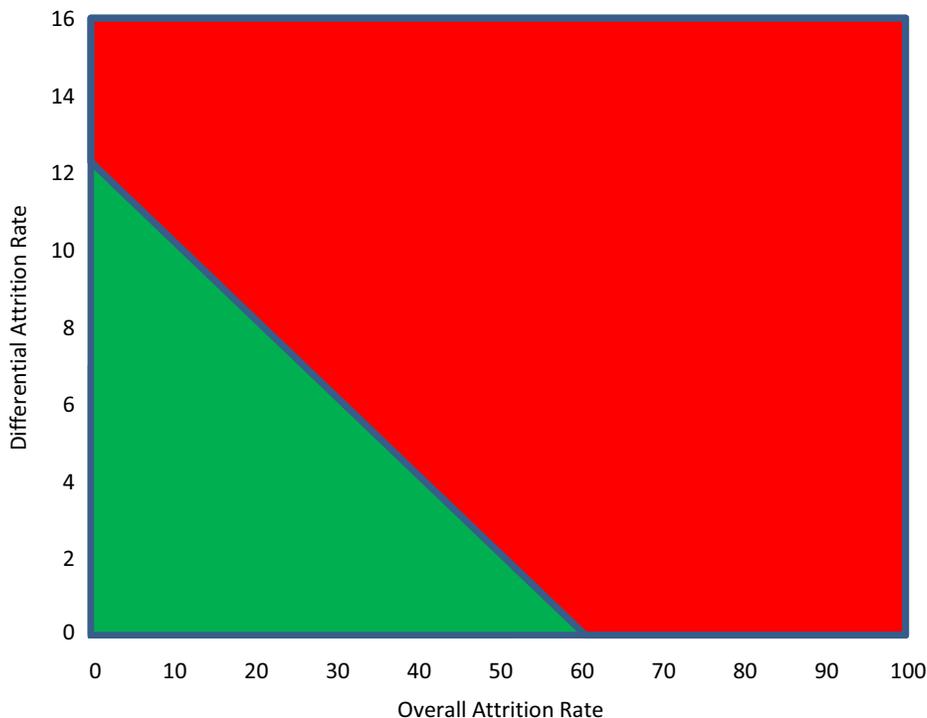
9. Appropriate interval for measuring post-intervention effects.

The benefits of an ECE intervention are intended to be retained well past the end of the intervention. Thus, measures at the end of an intervention, as well as any time thereafter, are admissible. Measures occurring several months or years after the intervention may provide strong evidence for an intervention’s effectiveness. The ECE team, however, prioritizes immediate posttest findings for developing intervention ratings and improvement indices because these findings are most prevalent in ECE studies, but the ECE team includes follow-up findings, when available and appropriate, in appendices to the report.

10. Acceptable levels of overall and differential attrition.

As described in the *WWC Procedures and Standards Handbook* (version 2.0), the WWC is concerned about overall and differential attrition from the intervention and comparison groups for randomized controlled trials (RCTs), as both contribute to the potential bias of the estimated effect of an intervention. The attrition bias model developed by the WWC is used in determining whether a study meets WWC evidence standards (see Appendix A of the *Handbook*).

When the combination of overall and differential attrition rates cause an RCT study to fall in the green area on the diagram shown below, the attrition will be considered “low” and the level of bias acceptable. This reflects the assumption that most attrition in studies of ECE is due to factors that are not strongly related to treatment status, such as parent mobility and absences on the days that assessments are conducted. However, for RCTs with combinations of overall and differential attrition rates in the red area, the attrition will be considered “high” with potentially high levels of bias, and, therefore, the studies must demonstrate equivalence.



Many studies reviewed by the WWC are based on designs with multiple levels. Bias can be generated not only from the loss of clusters (such as schools), but also from sample members within the clusters (such as students), if those sample members attrit because of their treatment status. A study must pass the attrition standard at two levels. First, it must pass at the cluster level, using the attrition boundary set in the diagram above. Second, the study must pass at the subcluster level, again using the attrition boundary set above, *with attrition based only on the clusters still in the sample*. That is, the denominator for the subcluster attrition calculation includes only sample members at schools or classrooms that remain in the study after cluster attrition.

11. Important characteristics that must be equated if a study does not employ random assignment or does employ random assignment but exhibits high levels of attrition.

If the study design is an RCT with high levels of attrition or a quasi-experimental design (QED), the study must demonstrate baseline equivalence of the intervention and comparison groups for the analytic sample. The onus for demonstrating equivalence in these studies rests with the authors. Sufficient reporting of pre-intervention data should be included in the study report (or obtained from the study authors) to allow the review team to draw conclusions about the equivalence of the intervention and comparison groups. Pre-intervention characteristics can include the outcome measure(s) administered prior to the intervention or other measures that are not the same as, but are highly related to, the outcome measure(s).

For the ECE review, the variables on which studies must demonstrate equivalence are the pretest score on the outcome measure or a highly related cognitive or language measure. In addition, since demographic and socioeconomic characteristics also should be similar for the study groups, any such reported baseline variables will be examined for equivalence.

Groups are considered equivalent if the reported differences in pre-intervention characteristics of the groups are less than or equal to one-quarter of the pooled standard deviation in the sample, regardless of statistical significance. However, if differences are greater than 0.05 standard deviations and less than or equal to one-quarter of the pooled standard deviation in the sample, the analysis must control analytically for the individual-level pre-intervention characteristic(s) on which the groups differ. If there are pre-intervention differences greater than 0.25 for any of the pretest scores, the study does not meet standards. In addition, if there is evidence that the intervention and comparison group populations are different based on reported demographic and socioeconomic characteristics or were drawn from very different settings (such as rural versus urban, or high-SES versus low-SES), the principal investigator (PI) may decide that the populations or environments are too dissimilar to provide an adequate comparison.

12. Statistical and analytical issues.

RCT studies with low attrition do not need to use statistical controls in the analysis, although statistical adjustment for well-implemented RCTs is permissible and can help

generate more precise effect size estimates. For RCTs, the effect size estimates will be adjusted for differences in pre-intervention characteristics at baseline (if available) using a difference-in-differences method if the authors did not adjust for pretest (see Appendix B of the *Handbook*). Beyond the pre-intervention characteristics required by the equivalence standard, statistical adjustments can be made by the study authors for other measures in the analysis as well, although they are not required.

For the WWC review, the preference is to report on and calculate effect sizes for post-intervention means adjusted for the pre-intervention measure. If a study reports both unadjusted and adjusted post-intervention means, the WWC review will report the adjusted means and unadjusted standard deviations. If adjusted post-intervention means are not reported, they will be requested from the author(s).

The statistical significance of group differences will be recalculated if (a) the study authors did not calculate statistical significance, (b) the study authors did not account for clustering when there is a mismatch between the unit of assignment and the unit of analysis, or (c) the study authors did not account for multiple comparisons when appropriate. Otherwise, the review team will accept the calculations provided in the study.

When a misaligned analysis is reported (that is, the unit of analysis in the study is not the same as the unit of assignment), the effect sizes computed by the WWC will incorporate a statistical adjustment for clustering. The default intraclass correlation used for this review is 0.20 for cognitive, language, literacy, and math outcomes.⁴ For an explanation of the clustering correction, see Appendix C of the *Handbook*.

When multiple comparisons are made (that is, multiple outcome measures are assessed within an outcome domain in one study) and not accounted for by the authors, the WWC accounts for this multiplicity by adjusting the reported statistical significance of the effect using the Benjamini-Hochberg correction. See Appendix D of the *Handbook* for the formulas the WWC uses to adjust for multiple comparisons.

All standards apply to overall findings as well as analyses of subsamples.

METHODOLOGY

Literature Search Strategies

The literature search strategy for the WWC ECE topic area is two-pronged. First, the review team conducts a keyword search using numerous databases to identify interventions with studies that may be eligible for review. Then, the team conducts focused intervention searches to ensure that all potentially eligible studies of the identified interventions are found. Each type of search is described next.

⁴ For intraclass correlation estimates for preschool cognitive outcomes, see Schochet, P. Z. (2005). *Statistical power for random assignment evaluations of education programs*. Princeton, NJ: Mathematica Policy Research.

1. Keyword Search

The primary objectives of the keyword search are to identify interventions with potentially eligible studies and to assess the number of studies on each intervention, so that interventions can be prioritized for review. The following keywords are meant to capture the breadth of literature that falls within the scope of the protocol. Targeted outcomes and study design terms are included to focus the search on identifying literature that will support an intervention report. Subsequent searches focus on the selected interventions and are designed to capture all potentially eligible studies, including any that the keyword search did not identify (described in next section).

Keyword List⁵

Target Ages:

Preschool* OR pre-school* OR
Prekindergarten* OR pre-kindergarten* OR pre-k OR
Early childhood OR
Young child* OR
Head Start OR
Early intervention

AND

Target Outcomes:

Communication OR
Comprehension OR
Language OR
Phonem* OR
Phonological OR
Vocabulary OR
Listening OR
Speech OR
Learning OR
Memory OR
Perception OR
Alphabet* OR
Letter* OR
Blend* OR
Oral OR
Print* OR
Rhyming OR
Segment* OR
Fluency OR
Reading OR
Writing OR
Decoding OR

⁵ The asterisk (*) in the keyword list allows the truncation of the term and will return any word that begins with the specified letters.

Literacy OR
Math* OR
Counting OR
Geometry OR
Measure* OR
Number* OR
Numer* OR
Pattern* OR
Sort* OR
Cognit* OR
Concept* OR
Intellig* OR
IQ OR
Knowledge OR
Problem solving OR
Reasoning OR
Early literacy OR
Emergent literacy OR
Academic OR
Science OR
School readiness

AND

Interventions:

Intervention* OR
Curricul* OR
Program* OR
Strateg* OR
Instruct* OR
Teach* OR
Train* OR
Technique* OR
Therap* OR
Approach*

AND

Study Design:

Control group OR
Comparison group OR
Matched groups OR
Treatment OR
Random* OR
Assignment OR
Baseline OR
Experiment OR
Evaluation OR
Impact OR
Effectiveness OR
Causal OR
Posttest OR post-test OR

Pretest OR pre-test OR
Randomized Control Trial OR RCT OR
Quasi-experimental Design OR QED OR
Regression discontinuity design OR
Single case design OR
Single subject design OR
ABAB design OR
Alternating treatment* OR
Simultaneous treatment OR
Meta analysis

Databases

The core list of electronic databases that are searched across topics includes the following:

- a. **ERIC.** Funded by the U.S. Department of Education, ERIC is a nationwide information network that acquires, catalogs, summarizes, and provides access to education information from all sources. All Department of Education publications are included in its inventory.
- b. **PsycINFO.** PsycINFO contains more than 1.8 million citations and summaries of journal articles, book chapters, books, dissertations, and technical reports in the field of psychology. Journal coverage, which dates back to the 1800s, includes international material selected from more than 1,700 periodicals in more than 30 languages. More than 60,000 records are added each year.
- c. **Campbell Collaboration.** C2-SPECTR (Social, Psychological, Educational, and Criminological Trials Register) is a registry of more than 10,000 randomized and possibly randomized trials in education, social work and welfare, and criminal justice.
- d. **Dissertation Abstracts.** As described by Dialog, Dissertation Abstracts is a definitive subject, title, and author guide to virtually every American dissertation accepted at an accredited institution since 1861. Selected master's theses have been included since 1962. In addition, since 1988, the database has included citations for dissertations from 50 British universities that have been collected by and filmed at the British Document Supply Centre. Beginning with Dissertation Abstracts International, Volume 49, Number 2 (Spring 1988), citations and abstracts from Section C, Worldwide Dissertations (formerly European Dissertations), have been included in the file. Abstracts are included for doctoral records from July 1980 (Dissertation Abstracts International, Volume 41, Number 1) to the present. Abstracts are included for master's theses from spring 1988 (Masters Abstracts, Volume 26, Number 1) to the present.
- e. **Academic Search Premier.** This multidisciplinary database provides the full text for more than 4,500 journals, including more than 3,700 peer-reviewed titles. PDF files back to 1975 or further are available for well over 100 journals, and searchable cited references are provided for more than 1,000 titles.

- f. ***EconLit.*** EconLit, the American Economic Association's electronic database, is the world's foremost source of references to economic literature. The database contains more than 785,000 records from 1969 to the present. EconLit covers virtually every area related to economics.
- g. ***Business Source Corporate.*** This database contains the full text from nearly 3,000 quality business and economics magazines and journals (including the full text of many only abstracted in other sources we search). Information in this database dates as far back as 1965.
- h. ***SocINDEX with Full Text.*** SocINDEX with Full Text is the world's most comprehensive and highest-quality sociology research database. It features more than 1,986,000 records with subject headings from a sociological thesaurus with more than 19,600 terms designed by subject experts and expert lexicographers. SocINDEX with Full Text contains the full text for 708 journals dating back to 1908. This database also includes the full text for more than 780 books and monographs and 9,333 conference papers.
- i. ***EJS E-Journals.*** E-Journals from EBSCO host[®] provide article-level access for thousands of E-Journals available through EBSCO's Electronic Journal Service (EJS). This resource covers journals to which Mathematica subscribes.
- j. ***Education Research Complete.*** Education Research Complete is the definitive online resource for education research. Topics covered include all levels of education from early childhood to higher education, and all educational specialties, such as multilingual education, health education, and testing. Education Research Complete provides indexing and abstracts for more than 1,840 journals, as well as the full text for more than 950 journals, and it includes the full text for more than 81 books and monographs, and for numerous education-related conference papers.
- k. ***WorldCat.*** WorldCat is the world's largest network of library content and services. It allows users to search the catalogs of more than 10,000 libraries, containing more than 1.2 billion books, dissertations, articles, CDs, and other media.
- l. ***Cochrane Central Register of Controlled Trials.*** The Cochrane Central Register of Controlled Trials is a bibliography of controlled trials identified by contributors to the Cochrane Collaboration and others, as part of an international effort to hand search the world's journals and create an unbiased source of data for systematic reviews.
- m. ***Cochrane Database of Systematic Reviews.*** The Cochrane Database of Systematic Reviews contains full-text articles, as well as protocols focusing on the effects of health care. Data are evidence-based medicine and often are combined statistically (with meta-analysis) to increase the power of the findings of numerous studies, each too small to produce reliable results individually.
- n. ***Database of Abstracts of Reviews of Effects.*** The Database of Abstracts of Reviews of Effects (DARE) includes abstracts of published systematic reviews on the effects of health care from around the world, which have been critically analyzed according to a

high standard of criteria. This database provides access to quality reviews in subjects for which a Cochrane review may not yet exist.

- o. ***Cochrane Methodology Register***. The Cochrane Methodology Register (CMR) is a bibliography of publications that report on methods used in the conduct of controlled trials. It includes journal articles, books, and conference proceedings; these articles are taken from the MEDLINE database and from hand searches. The database contains studies of methods used in reviews and more general methodological studies that could be relevant for systematic reviews. CMR records contain the title of the article, information on where it was published (bibliographic details), and in some cases, a summary of the article. CMR is produced by the UK Cochrane Centre, on behalf of the Cochrane Methodology Review Group.

2. Intervention Search

Once a keyword search has been conducted and interventions prioritized, the next search is designed to identify all effectiveness studies conducted for a specific intervention.

Search Strategy

- Conduct database search on the intervention name (for example, “Dialogic Reading”; see “Curricula and Practice Names” in next section).⁶
- For practices, scan references to identify possible synonyms for the practice name in the literature (for example, “shared book reading”). Conduct database searches of these terms.
- Request the full text of potentially eligible studies and review the reference lists to cross-check search results. Similarly, review relevant literature reviews.
- Identify seminal researchers associated with the intervention. Conduct full-text searches of the researcher name combined with the intervention name (for example, “Whitehurst AND dialogic reading”).

All references resulting from these searches are screened for eligibility.

“Fugitive” or “Grey” Literature

In addition to the search strategies described above, the review team seeks to identify other relevant studies through the following approaches:

- a. Public submissions:

⁶ A standard library search consists of searching titles and abstracts in each of the databases described earlier.

- 1) Materials submitted via the WWC website
 - 2) Materials submitted directly to WWC staff
- b. Solicitations made to key researchers by the review team.
 - c. Checking websites summarizing research on programs for children and youth, prior reviews, and research syntheses (that is, using the reference lists of prior reviews and research syntheses to make sure key studies have not been omitted).
 - d. Searches of the websites of all the developers of relevant interventions or practices for any research or implementation reports.
 - e. Searches of the websites of more than 50 think tanks, research centers, and associations that conduct research in this topic area (see “Research Organizations” and “Supplementary List of Organizations” later in this protocol).

References resulting from these searches are screened and sorted by intervention.

Curricula and Practice Names

Primary Curricula

A Beka	Language for Learning
Bank Street Developmental Interaction Approach	Learning Experiences: An Alternative Program for Preschoolers and Parents (LEAP)
Beyond Centers and Circle Time	Let’s Begin with the Letter People
Breakthrough to Literacy	Literacy Express
Bright Beginnings	Marazon system
Building Blocks for Literacy	Montessori Method
Core Knowledge Preschool Sequence	Opening the World of Learning
Creative Curriculum	Pebble Soup
Curiosity Corner	Primrose Schools
DLM Early Childhood Express	Project Construct
Doors to Discovery	Read, Play, and Learn!
Early Literacy and Learning Model (ELLM)	Ready, Set, Leap!
FunShine Express: Fireflies/Sprouts	Reggio Emilia
Funsteps, Inc.	Saxon Early Learning
Growing Readers Early Literacy Curriculum (High/Scope)	Scholastic Early Childhood Program
High Reach	School Readiness Express
High/Scope Curriculum	S.P.A.R.K.
Innovations Comprehensive Preschool Curriculum (Gryphon House Pub.)	Tools of the Mind
Language-Focused Curriculum	We Can! Curriculum
	Wee Learn

Supplemental Curricula

Active Learning	Lidcombe Program
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Big Math for Little Kids	Lindamood Phoneme Sequencing Program (LiPS)
Building Blocks for Math (SRA Real Math)	Links to Literacy Curriculum Kit
Building Early Literacy and Language Skills (BELLS)	My Magic Story Car
Building Language for Literacy (BLL-Scholastic)	Open Court Reading (OCR) Pre-K
Compass Learning Odyssey Pre-K/K	Phonemic Awareness in Young Children: A Classroom Curriculum
Daisy Quest	Phono-Graphix
Direct Instruction	Pre-K Mathematics
Direct Instruction Math	Project Approach
Fast ForWord Preschool	ReadingLine Kits
Headsprout Reading Basics	Rightstart/Numberworlds
Houghton Mifflin PreK	ScienceStart!
Journeys into Early Literacy (precursor to Destination Reading)	Sing, Spell, Read, & Write
Kaplan Planning Guide to the Preschool Curriculum	Sound Foundations
Ladders to Literacy: A Preschool Activity Book	Sounds Abound
LeapDesk Workstation	Spell, Read, PAT
Learningames—Abecedarian	Stepping Stones to Literacy
	Waterford Early Reading Program Pre-K
	Words and Concepts

General Practices

Dialogic Reading/Interactive Shared Picture-Book Reading
 Letter Knowledge Training
 Phonological Awareness Training
 Shared Book Reading

Targeted Practices

Classwide peer tutoring	Stimulus control procedure
Conversation-based language intervention	Syntax program
Conversational-recasting	Teaching phonological awareness
Explicit attention to articulation	Teaching rhyming
Functional communication training	Teaching-script
Graphics-based software tools	Teaching story grammar knowledge
Imitation-based language intervention	Text-based software tools
Peer-mediated intervention	Time delay
Peer training	Verbal labeling responses
Pragmatic teaching	Video discourse intervention
Redirects	Written text cueing
Self-initiated augmentative communication treatment	

Research Organizations

The websites of the research organizations conducting studies related to early childhood education are reviewed to identify studies for this review. Examples of these research organizations follow:

Abt Associates
Alliance for Excellent Education
American Enterprise Institute
American Institutes of Research
American Speech-Language-Hearing Association (ASHA)
Appalachian Education Laboratory (Edvantia)
Best Evidence Encyclopedia
Broad Foundation (Education)
Brookings Institution
Carnegie Corporation of New York
Center for Comprehensive School Reform and Improvement
Center for Data-Driven Reform in Education
Center for Research and Reform in Education
Center for Research in Educational Policy (CREP)
Center for Social Organization of Schools
Center on Education Policy
Center on Instruction
Chapin Hall Center for Children at the University of Chicago
Child Care and Early Education Research Connections
Congressional Research Service (via OpenCRS.org)
Council for Exceptional Children
Council for Learning Disabilities
Florida Center for Reading Research (FCCR)
Government Accountability Office (GAO)
Harvard Graduate School of Education
Heritage Foundation
Hoover Institution
Institute for Higher Education Policy
Institute for Public Policy and Social Research (IPPSR)
Johns Hopkins University School of Education
Learning Disabilities Association of America
Learning Point Associates
Linguistic Society of America (LSA)
Mathematica Policy Research homepage
MDRC
Mid-Continent Research for Education and Learning
National Association for Bilingual Education (NABE)
National Association of State Boards of Education
National Association of State Directors of Special Education
National Autism Center—National Standards Project
National Center for Learning Disabilities
National Center on Response to Intervention (RTI)
National Center on Secondary Education and Transition
National Child Care Information Center

National College Access Network
National Dissemination Center for Children with Disabilities (NICHCY)
National Dropout Prevention Center/Network
National Governors' Association
National Institute for Early Education Research (NIEER)
National Reading Panel
Pacific Resources for Education and Learning (PREL)
Pathways to College Network
Promising Practices Network
Policy Archive
Public Education Network
Public Policy Research Institute at Texas A&M University
Public/Private Ventures (PPV)
RAND
Southwest Educational Development Laboratory (SEDL)
SRI
Teachers of English to Speakers of Other Languages (TESOL)
Technical Assistance Center on Social Emotional Intervention for Young Children
The Education Resources Institute
Thomas B. Fordham Institute
U.S. Department of Education (includes Institute for Education Sciences, National Center for Special Education Research, and others)
Urban Institute
WestEd