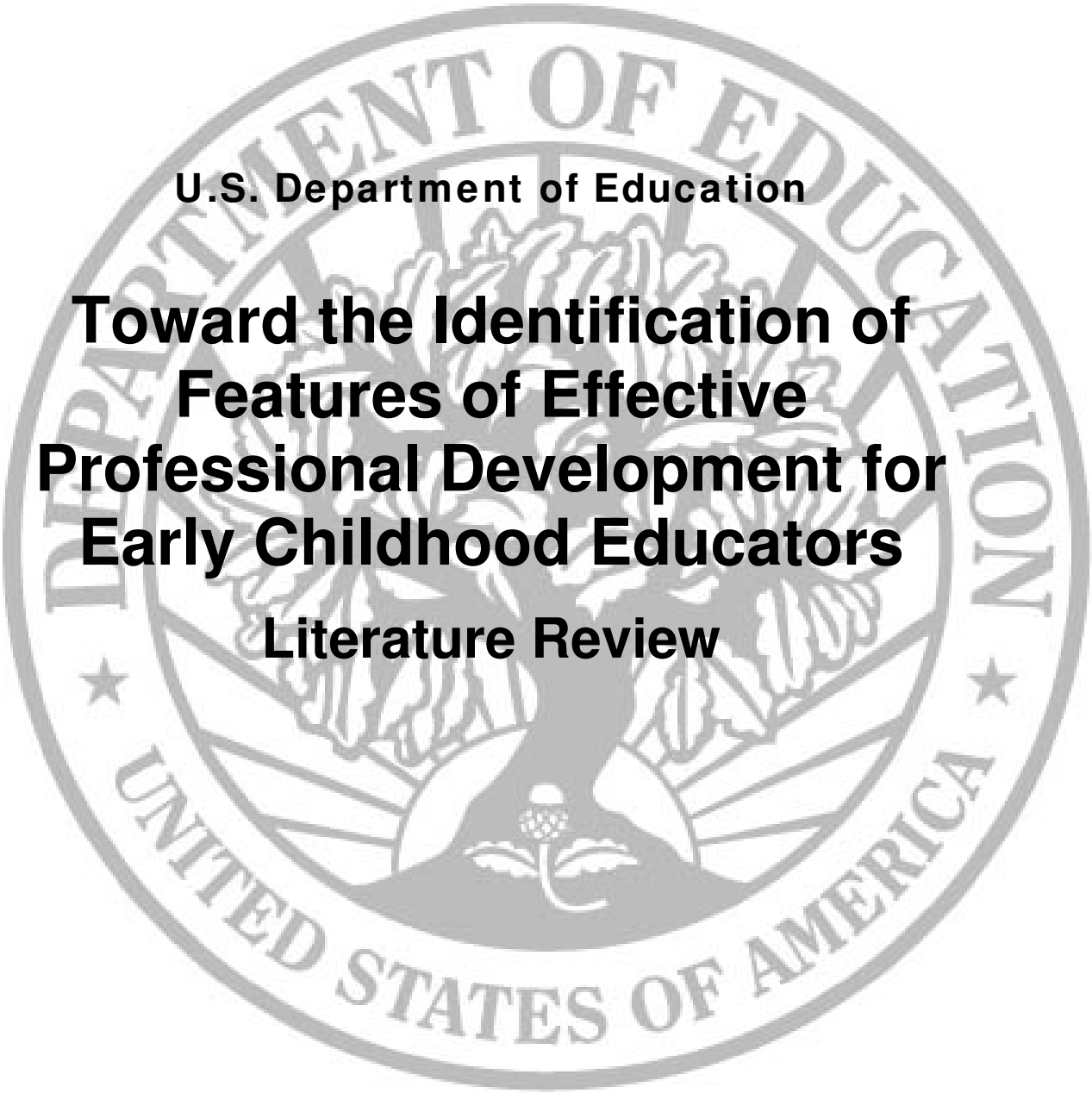

U.S. Department of Education

Toward the Identification of Features of Effective Professional Development for Early Childhood Educators

Literature Review

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Literature Review

Prepared for

U.S. Department of Education
Office of Planning, Evaluation and Policy Development
Policy and Program Studies Service

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Executive Summary

Programs and policymakers face numerous challenges as they develop and implement professional development strategies for the early childhood workforce. The field lacks consistent standards and requirements for professional preparation, and, as a result, low levels of education and a minimum of specialized training in early childhood education are the norm. Less than one-third of the institutions of higher education offering two- and four-year degrees have programs in early childhood education, and those programs that exist must address the needs of nontraditional students who are likely to be juggling family and work responsibilities and logistical issues that make it difficult to attend class and complete course requirements (Early and Winton 2001). And, low wages and benefits for early childhood educators are linked to high turnover of staff in both center-based and home-based programs.

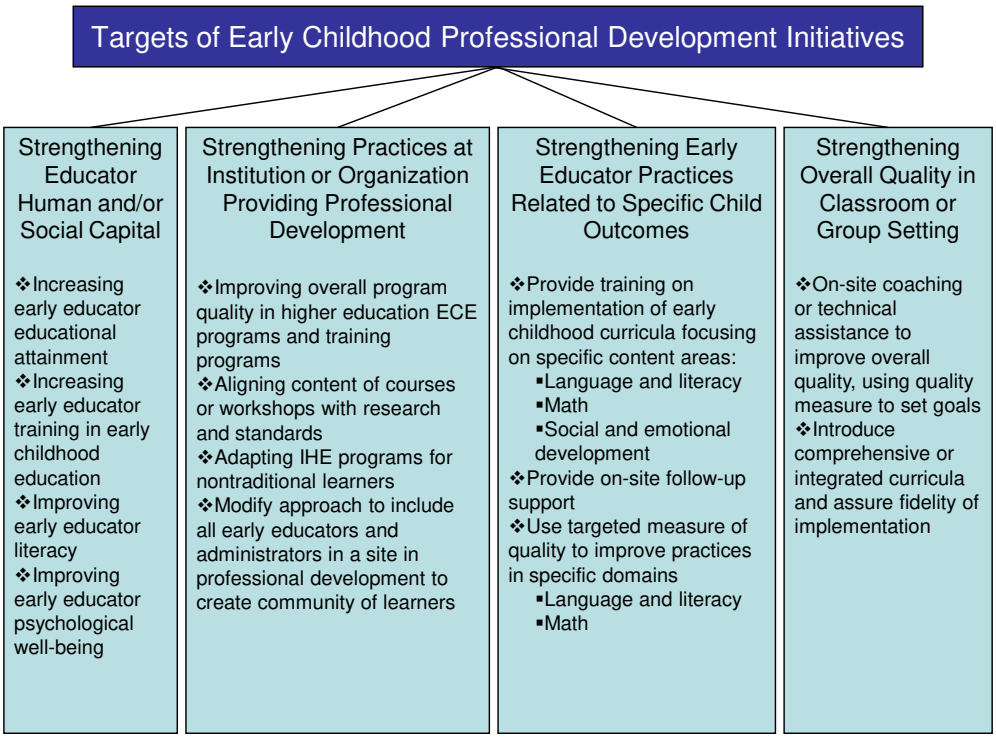
Yet, policymakers and parents have high expectations for the early childhood field and the children who are cared for in early childhood settings. There is an increasing recognition that the relationship a child has with a teacher or caregiver that is both sensitive and stimulating is the central and most critical component of quality in early care and education (National Research Council and Institute of Medicine, Shonkoff, and Phillips 2000). In a comprehensive review of what is known about how young children learn and develop and the implications of this knowledge for the care and education of children, the Committee on Early Childhood Pedagogy concluded, "There is a serious mismatch between the preparation (and compensation) of the average early childhood professional and the growing expectations of parents and policy makers" (National Research Council 2001, p. 261). Current strategies of professional development do not adequately prepare all educators for the array of responsibilities, knowledge, and skills they are expected to demonstrate in their work with young children and their families.

Methods

This review incorporates findings from research on four *targets* of early childhood professional development: 1) strengthening human or social capital; 2) strengthening practices at institutions or organizations providing professional development; 3) strengthening early educator practices related to specific child outcomes; and, 4) strengthening overall quality in classroom or group settings (see Figure 1). Research in each target area was reviewed, and for the two last areas (on specific content areas and overall quality of education and care for young children) for which there is a body of evaluation research, details about the specific studies were analyzed.

The literature review analyzed the research on professional development of early childhood educators to work toward identification of a set of core features that characterize effective professional development.

Figure 1. Targets of Early Childhood Professional Development Initiatives



Note:
ECE: Early Childhood Education
IHE: Institutions of Higher Education

The research team gathered relevant materials for the review (1) by conducting database searches using strategic search terms; (2) by pursuing sources included in earlier reviews; and (3) by following up on leads of relevant work suggested by the project officers and members of the Technical Work Group.

Various combinations of the following key words were used as criteria for inclusion: professional development; training; preschool teachers; curriculum; literacy; language; early; prekindergarten; preschool; day care; child care; preschool age group. The following databases were searched for relevant articles: (1) Child Care and Early Education Research Connections (CCERC); (2) Educational Resources Information Center (ERIC); (3) National Child Care Information Center (NCCIC); (4) Psychology and Behavioral Sciences Collection; (5) PsycInfo; (6) Social Sciences Abstracts; and (7) Sociological Collection.

The evaluation studies in the third and fourth target areas were subject to the following inclusion criteria:

- *Peer-reviewed Journals, Edited Volumes, or Government Report of Evaluation Studies*—In order to be summarized in both text and table, a study had to have gone

through a rigorous review process, by being published in either a peer-reviewed journal or in an edited volume, or reported on in a reviewed government report.

- *Rigor of Evaluation*—Evaluations summarized in both text and table were rated as falling in one of five different methodology levels, including experimental, quasi-experimental, pre-post with comparison group, pre-post without comparison group, and descriptive. Although relying strictly on experimental evaluations would have been preferable, the relative infrequency of these evaluations forced reviewers to include all relevant evaluations, and to consider the rigor when weighing and comparing results.
- *Age Range*—Evaluations of professional development programs involving children from birth through kindergarten were included in the review. Most of the studies reviewed pertained to children in the 3–5 age range.
- *Early Educator*—For the purpose of the review, "early educator" included preschool teachers, prekindergarten teachers, kindergarten teachers, and child care staff caring for children 0–5. Educators in both private and public settings were included. Workers in family child care settings were not excluded from the review, although few evaluations focused on these environments.
- *Professional Development*—Evaluations included in the review had to include some form of professional development as part of the treatment intervention. For example, they had to include credit bearing classes, training on a curriculum, in-class coaching, or other activities aimed to improve educators' knowledge of child development or practice in the classroom or home-based child care setting.
- *Assessment of Effectiveness*—Evaluations had to measure or evaluate changes in at least one of three key areas: early educator knowledge; practice; and child outcomes.

For each document reviewed summary tables were prepared (see Appendix A) summarizing the study findings in tables focusing on *study methodology* (research questions, research design, sample, measures, rigor of the evaluation), *content of professional development* (mode of delivery, linkages with infrastructure such as state early learning standards, temporal aspects of the professional development such as number, frequency and length of sessions, outreach approach for example to including providers in low income areas, research base of the professional development approach, description of the content or curriculum used in the professional development), and *outcomes* (outcomes for educator knowledge, for educator practice and for children's development).

Also summarized are the extent and rigor of the evidence for each of the four identified targets of early childhood professional development, emerging patterns of findings and their implications, and notes on research needs.

Findings

With input from the Technical Work Group for this project, it was determined that the research on early childhood professional development is at an early stage. Much of the

research is descriptive and correlational rather than involving rigorously executed experimental studies. When evaluations have been carried out, the focus is much more on curricula and their implementation than on the preparation of early childhood educators to use them. Significant questions remain about which features of professional development for early childhood educators, singly and in "packages," are most effective for improving both educator and child outcomes.

The literature does point to an initial set of conclusions that can serve as a starting point toward the identification of effective practices in early childhood professional development. These initial conclusions are in accord with the conclusions of the Committee on Early Childhood Pedagogy (National Research Council 2001) and the findings from other evaluations of professional development programs (Epstein 1993; Garet et al. 1999). These initial conclusions can serve as hypotheses for future work. The evidence suggests that professional development for early childhood educators may be more effective when:

- *There are specific and articulated objectives for professional development.* A meta-analysis of studies in which there was "specialized caregiver training with a focus on interaction skills with children" found a statistically significant effect of specialized training on caregiver competence overall, with a medium effect size (*d=.45)* (Fukkink and Lont 2007, p. 297). When the content of the training was more specific, rather than open in content, effects on early educator practice were larger (Fukkink and Lont 2007). Use of an observational measure of quality can help to provide specific and articulated goals for quality improvement (QUINCE Research Team 2009). The content of the measure of quality chosen to guide efforts needs to be aligned with the areas of practice in which improvement is sought and the child outcomes considered of importance (Zaslow et al. April, 2009, under review). Consensus documents that summarize research about what is appropriate and important for young children to know in the areas of language and literacy and early mathematics provide a strong research basis for developing appropriate curricula and approaches for preparing early educators to implement the curricula (National Reading Panel 2000; Snow, Burns, and Griffin 1998; National Early Literacy Panel 2008).

- *Practice is an explicit focus of the professional development, and attention is given to linking the focus on early educator knowledge and practice.* Multiple studies are reviewed which focused not only on strengthening early educator knowledge but on strengthening practice. This emphasis is in keeping with the principles of adult learning summarized by the National Research Council (National Research Council 2001). In the studies reviewed, such approaches usually combined course work or training with individualized modeling and feedback on interactions with children in the early educator's classroom or home-based care setting. However, in some instances, the professional development involved only the individualized on-site component. In others,

the individualized modeling and feedback was provided through the Internet rather than on-site, or practice in applying new techniques was incorporated directly into course work or training without on-site modeling and feedback (Assel et al. 2007; Campbell and Milbourne 2005; Clements and Sarama 2008; Dickinson and Brady 2006; Dickinson and Caswell 2007; Fantuzzo 1996; Fantuzzo et al. 1997; Gettinger and Stoiber 2007; Landry 2002; Neuman and Cunningham 2009; Palsha and Wesley 1998; Pianta et al. 2008; Raver et al. 2008). Not all evaluation studies involving individualized professional development showed positive effects on practice or child outcomes, yet there is promising evidence for these approaches. It is important to identify the specific processes underlying positive effects in practice-focused professional development approaches (Zaslow 2009; Smith et al. 2001). More thought is being given to the issue of whether or not the presentation of information through course work or training alone is effective in changing early educator practice and child outcomes (Burchinal, Hyson, and Zaslow 2008; Early et al. 2007), or whether professional development aimed at strengthening knowledge needs to be closely tied to practice. (see for example, the discussion of timing of training and practice opportunities and intentional interspersing of group training and opportunities for application in Dickinson and Brady 2006).

- *There is collective participation of teachers from the same classrooms or schools in professional development*. Joint participation can help to support a professional culture and ensure the sustainability of new techniques and skills. Professional development that includes administrators helps to assure that early educators do not receive contradictory messages about what practices to implement or emphasize. Likewise, including teachers of different age groups or grades can foster continuity in the children's experiences as they move through classrooms in the future (Baker and Smith 1999; Assel et al. 2007; Burchinal, Hyson, and Zaslow 2008; Donovan, Bransford, and Pellegrino 1999; Birman et al. 2000; Bierman et al. 2008).

- *The intensity and duration of the professional development is matched to the content being conveyed*. The appropriateness of the length of time spent in professional development activities depends on the goals of the activities themselves. A one-time workshop is not effective if the goal is to convey theory and practice to improve multiple aspects of early language and literacy development, such as oral language, phonological awareness, alphabetic principle, and awareness of print. It may, however, be appropriate for preparation on a single specific activity or strategy (Whitehurst, Arnold et al. 1994; Donovan, Bransford, and Pellegrino 1999; Raikes et al. 2006).

- *Educators are prepared to conduct child assessments and interpret their results as a tool for ongoing monitoring of the effects of professional development*. Assessments can help early childhood educators view their knowledge and skills as contributing to improvement in children's outcomes, and can serve as a source of feedback for how to target instruction overall and

for individual children (Foorman and Moats 2004; Garet et al. 2008; Gettinger and Stoiber 2007; O'Connor et al. 2005).

- *It is appropriate for the organizational context and is aligned with standards for practice.* The effectiveness of professional development approaches will differ according to features of organizational context, articulated standards for practice and with the extent of ongoing monitoring and supervision (Vu, Jeon, and Howes 2008; Fulgini et al. 2009). Increasingly, approaches to professional development also need to take into account state standards regarding pedagogy (for example in early language and literacy, Roskos et al., 2006; and early learning guidelines, Strickland and Riley-Ayers, 2006).

As noted above, a number of gaps were identified in the research on early childhood professional development that need to be addressed:

- Coordinated secondary analyses carried out with the data from seven major studies of early care and education provide little indication of stronger observed classroom quality or larger gain scores on children's academic achievement when early educators had completed a higher education degree, according to the highest education level among those with an early childhood major, or according to whether those with a bachelor's degree had an early childhood major (Early et al. 2007). The quality of the educators' degree-granting higher education programs could not be examined in these analyses and may be an important underlying factor (Burchinal, Hyson, and Zaslow 2008; Hyson, Tomlinson, and Morris 2008). We are only beginning to see evaluations of planned variations in higher education approaches for early childhood educators. There is a clear need for careful examination of the features and overall quality of higher education programs. We need to ask if higher education programs that incorporate specific course content and approaches are associated with stronger outcomes.

- The literature tends to focus on the content that should be conveyed to children, rather than on the specific processes that can be used to guide early educators in implementing practices to convey or engage children with this content effectively (Sheridan et al. 2009).

- The literature does not adequately address the issue of cultural and linguistic competence for early childhood educators. This review did not reveal any peer-reviewed articles that examined or evaluated professional development strategies to improve cultural and linguistic competence despite the growing diversity of the early childhood population. Early childhood educators are calling for improvements in their preparation on these topics and are looking for strategies to improve their abilities to address the needs of diverse children and families (Daniel and Friedman 2005). Strategies to improve teacher preparation in cultural and linguistic competence cited by Daniel and Friedman (2005) include increasing faculty knowledge and willingness to adapt and respond to the diversity in early childhood education, requiring

practica and internships in diverse settings, integrating issues of diversity into course content, and requiring Teachers of English to Speakers of Other Languages (TESOL) courses for teachers. There is a need for research focusing on the effectiveness of these strategies.

- Further focus is needed on the language and literacy skills that early educators bring to their work, and possible approaches to strengthening these. Although low literacy is not universal among early care and education providers, and may vary by the requirements for those working in different types of early care and education settings (such as child care, Head Start and pre-kindergarten), the 1992 National Adult Literacy Survey found that between 44 percent and 57 percent of child care workers perform at the lowest levels of proficiency on standardized literacy assessments (Kaestle et al. 2001). A more recent study of child care providers in Alameda County, Calif., indicated that almost one-third (31 percent) of the providers in that county had "limited proficiency" in English, based on their scores on the Test of Applied Literacy Skills (TALS) (Phillips et al. 2003). Research is needed focusing on the potential of professional development to strengthen the spoken language and literacy skills of early childhood educators. For children who are dual language learners, consideration should be given to the language and literacy skills of educators in both the child's home language and English.

- The literature focuses heavily on professional development for educators working in center-based settings including Head Start and prekindergarten programs. Yet, this group of educators constitutes only 24 percent of the workforce. The majority of paid educators in early childhood care and education work in licensed (28 percent) and unregulated (48 percent) home-based settings (Burton et al. 2002). Home-based early educators often have less formal education and access to training opportunities and serve more and larger percentages of low-income children than educators working in center-based settings., It is important to consider strategies to improve the professional development of those working in home-based as well as center-based settings, and to conduct rigorous evaluation research across both types of settings (e.g. Neuman and Cunningham 2009).

- Likewise, the literature emphasizes professional development for educators working with preschool-age children: most of the studies covered in this review focused on children in the year or two years before entry into kindergarten. There is a need to expand understanding of the strategies that are most effective for educators working with infants and toddlers.

- Further research is needed on how best to target professional development approaches, both in terms of timing (whether the professional development is offered preservice or in-service) and in terms of the settings the early educators work in (prekindergarten within public schools, prekindergarten in

community-based settings, Head Start, center-based child care, and home-based child care). Different professional development approaches may be more effective when included as part of early educators' preservice preparation or alternatively once they are already working in early childhood settings, and for early educators working in particular settings.

- The methods and analytical strategies used in evaluations of professional development need more rigor. There is a small but growing body of experimental studies contrasting different professional development strategies. Effect sizes are rarely reported in the literature, and provisions are often not made to account for the "nested" nature of studies that include children within classrooms within programs.

- A final gap to note in the literature is the need for further work on integrating content across topical areas. For example, how should early childhood educators blend early literacy, math and social behavior strategies to achieve the best results for children? What professional development strategies are most effective at helping teachers balance multiple content areas to create learning environments that promote development of the "whole child"? This is a challenge for the next generation of studies on professional development for early childhood educators.

I: Introduction

Programs and policymakers face numerous challenges as they develop and implement professional development strategies for the early childhood workforce. Currently, the field of professional development for early childhood educators is "a patchwork of preservice and in-service education opportunities and credentials, characterized by various state and local requirements across types of programs, auspices, and roles" (National Research Council 2001, p. 276). Across the nation, only 23 states have any early childhood education preservice requirements for teachers (14 states) or master or lead teachers (9 states) in child care centers (LeMoine 2005). Most states require ongoing clock hours of education or training for early childhood educators, but the range of hours required across states varies widely (from 0 to 30 hours per year) (LeMoine 2005). Likewise, according to the Committee on Early Childhood Pedagogy which reviewed the literature on early childhood education and teacher preparation, "the amount, scope, and quality of professional development provided to early childhood teachers is inconsistent, fragmented, and often chaotic" (National Research Council 2001, p. 276). Without consistent standards for professional preparation, the early childhood workforce continues to have low levels of education and a minimum of specialized training in early childhood education (Ackerman 2004; National Research Council 2001).

The capacity for training new early care and education teachers in the United States is low. Fewer than 30 percent of the institutions of higher education (IHEs) that offer two- and four-year degrees have early childhood programs (that is, 1,244 IHEs, with only about 300 offering bachelor's degrees) (Early and Winton 2001). In addition, early childhood programs at two- and four-year institutions may not represent adequately the ethnic diversity of the early childhood workforce or children in early childhood programs (Early and Winton 2001). In a survey of 438 IHEs, over 80 percent of the full-time and part-time faculty members in early childhood education programs were white, non-Hispanic (Early and Winton 2001). While one study (Saluja, Early, and Clifford 2002) estimated that the early childhood workforce is also predominantly white (78 percent), the study only surveyed center-based programs serving 3- and 4-year-olds, and it achieved only a 43 percent response rate. An estimate of the workforce that includes the full range of family child care programs and center-based programs serving birth to 5-year-olds would likely yield a more diverse picture.

Because the average early childhood teacher is 39 years old (Saluja, Early, and Clifford 2002), teacher preparation programs are also challenged to address the needs of nontraditional students who are likely to be juggling family and work responsibilities and logistical issues that make it difficult to attend class and complete course requirements (Ackerman 2004). Finally, the wages and benefits for early childhood teachers are extremely low and are linked to high rates of teacher turnover (Whitebook et al. 2001). The median hourly wages for child care workers and preschool teachers are $8.37 and $10.67 respectively, compared to $20.38 per hour for kindergarten teachers (Center for

the Child Care Workforce: A Project of the American Federation of Teachers Educational Foundation 2004). These low levels of compensation make it difficult for the field to attract and maintain high quality early childhood educators.

Despite the minimal standards for educators and the poor wages and benefits available to them, early childhood educators are responsible for providing high quality care and education for young children. A consensus has emerged in the developmental sciences that the relationship a child has with a teacher or caregiver—including the degree to which the child experiences care that is sensitive and responsive, and ample in verbal and cognitive stimulation, attention and support—is the central and most critical component of child care quality (National Research Council and Institute of Medicine, Shonkoff, and Phillips 2000). Acknowledging this centrality of early childhood educators in child care quality, the Committee on Early Childhood Pedagogy concluded:

> "There is a serious mismatch between the preparation (and compensation) of the average early childhood professional and the growing expectations of parents and policy makers….Teachers of young children are being asked to promote high levels of achievement among all children, respond sensitively and appropriately to a wide array of diverse student needs, implement complex pedagogy, have a deep understanding of subject-matter disciplines, engage in serious reflection about their practices, and work collaboratively with colleagues and families."
>
> (National Research Council 2001, p. 261)

What professional development strategies are most effective at addressing the mismatch between the preparation of early childhood educators and the expectations of parents and policymakers for their knowledge and skills in early childhood settings? The purpose of this literature review is to analyze the research on professional development of early childhood educators. As noted by the Technical Work Group for the Evaluation of the Early Childhood Educator Professional Development Program, this body of research is at an early stage of development. Significant gaps in the evidence base as well as methodological limitations hinder the capacity of a review to reach firm conclusions about the core features that characterize effective professional development. As such, we review the available evidence to reach a preliminary set of conclusions, acknowledging that these conclusions should be further examined in future rigorous research. Our preliminary conclusions are intended also to provide a framework for future reports from the Evaluation of the Early Childhood Educator Professional Development (ECEPD) program. In these reports, we will examine the extent to which activities supported by the ECEPD program have incorporated the features we propose as starting points in the identification of effective professional development. We also believe that the findings of this literature review can generally inform professional development for early childhood educators who serve children from birth through kindergarten.

A. The Literature on Professional Development of Early Childhood Educators

It is important to acknowledge at the outset that the body of research on professional development of early childhood educators is growing though as yet quite limited. Zaslow

and Martinez-Beck (2006) point out that policymakers and practitioners pose specific questions that "often outstrip the research base" (p. 10). For example, what is the most important content to highlight in the preparation of early childhood educators? What is the most important investment—training or formal education—to make in the early childhood workforce? The extant literature does not offer the precision needed to compare different approaches to professional development and their implications for children's outcomes.

The literature on early childhood professional development has four broad areas of emphasis. We refer to these as "targets of professional development initiatives" because professional development efforts and evaluated interventions are targeted at strengthening one or more of these. The research on early childhood professional development focuses on approaches targeted at:

- improving the human and social capital of early childhood educators;
- strengthening the institutions or organizations providing the professional development;
- improving children's outcomes in specific developmental domains; and
- improving the overall quality of children's experiences in early childhood settings.

The approach taken in this review is to summarize the research in each of the four areas targeted by early childhood professional development efforts and to conclude with an integrated summary of the professional development features that emerge as most promising in improving the knowledge and skills of early childhood educators and outcomes for young children.

Research on the first target of early childhood professional development considers the degree to which qualifications of early childhood educators are related to the quality of the environment, interactions with children, and in a subset of studies, children's outcomes. In addition, recent research in this area is beginning to examine the social and emotional well-being of early childhood educators, including their stress and depression, as important to the quality of the care and education they provide and as targets of professional development efforts. However, this literature does not evaluate strategies to increase the human or social capital of early childhood educators, examining changes in early educator practices or child outcomes in light of differing intervention approaches. Rather, as yet, this body of research examines naturally occurring associations between early educator human and social capital and these outcomes. As such, key conclusions drawn from recent reviews of this literature (Barnett 2003; Tout, Zaslow, and Berry 2006; Whitebook 2003; Zaslow et al. 2004) will be described below without a detailed discussion of the individual studies or inclusion of the studies in tables.

Research on the second target of early childhood professional development focuses on the quality of higher education programs in early childhood as well as the quality of training provided outside of institutions of higher education. Recent research focuses also on the potential effects of tailoring programs of higher education and of training to the needs of nontraditional learners. The research in this area is at a preliminary stage,

primarily documenting the need to develop programs appropriate for this population of learners rather than providing systematic evaluations of such efforts. The emerging descriptive research in this area is summarized, but in the absence of evaluation studies, we do not provide tables profiling individual studies.

The third target of early childhood professional development efforts focuses on the effectiveness of various approaches to improving children's outcomes in specific developmental domains, such as early literacy, mathematics, and social behavior. This set of studies usually involves implementation of specific curricula or activities and an examination of early educator practices or children's outcomes after implementation. There are multiple evaluation studies focusing on whether children's experiences change and whether their development is affected when early educators are, or are not, given preparation to implement a specific curriculum or set of activities. Given the availability of multiple evaluation studies, this literature is discussed in detail, with separate subsections focusing on specific developmental domains. In addition, to complement the discussion in the text, results of evaluation studies for each developmental domain (early literacy, mathematics, and social behavior) are presented in tables.

Fourth, we look at approaches to professional development aimed at improving the overall quality of children's experiences and outcomes. This area covers diverse studies that vary in their scope and methodology. It also includes discussions of best practices proposed by individual researchers or expert review panels. In contrast to approaches that emphasize the *content* that early childhood educators should convey to children, this area of research provides insights into the *processes* of professional development that are most effective: the specific activities engaged in with early educators during education, training and work with early educators at the workplace that are effective in bringing about change in early childhood environments and child outcomes.

B. Strategy of Review

The research team for this review gathered relevant materials for the review (1) by conducting database searches using strategic search terms; (2) by pursuing sources included in earlier reviews the research team and others had conducted; and (3) by following up on leads of relevant work suggested by the project officers and members of the Technical Work Group.

The database search aimed to identify evaluation articles relating to approaches to professional development for early educators, with the heaviest emphasis on the topic of professional development focusing on children's language and literacy development during the preschool years. Articles that directly evaluated strategies for professional development were preferred, but documentation of best practices and evaluations for specific curricula or classroom activities that included educator preparation on use of the curriculum as a key element of the intervention was also pursued.

Various combinations of the following key words were used in the course of literature searches: professional development; training; preschool teachers; curriculum; literacy; language; early; prekindergarten; preschool; day care; child care; preschool age group. The following databases were searched for relevant articles: (1) Child Care and Early Education Research Connections (CCERC); (2) Educational Resources Information Center (ERIC); (3) National Child Care Information Center (NCCIC); (4) Psychology and Behavioral Sciences Collection; (5) PsycInfo; (6) Social Sciences Abstracts; and (7) Sociological Collection.

Research was reviewed pertaining to all four target areas identified in Figure 1. However a body of work in involving evaluation studies was found only for the targets involving improving children's outcomes in specific developmental domains, and improving the overall quality of children's experiences in early childhood settings (the third and fourth target areas noted above). We provide detailed appendix tables summarizing the evaluation research in these two target areas to support the discussion of the research in these two areas in the text. Brief summary tables are also included in the text identifying the studies profiled in the detailed appendix tables. For the target area of improving children's outcomes in specific developmental domains, there are separate sets of appendix tables focusing on:

- early literacy,
- early mathematics, and
- child social behavior.

For the target area of improving the overall quality of children's experiences in early childhood settings, we provide separate sets of appendix tables focusing on:

- comprehensive curricula, and
- general approaches to professional development.

The evaluation studies in the third and fourth target areas that are summarized in table format as well as in the text of the review were subject to the following inclusion criteria:

- *Peer-reviewed Journals, Edited Volumes, or Government Report of Evaluation Studies*—In order to be summarized in both text and table, a study had to have gone through a rigorous review process, by being published in either a peer-reviewed journal or in an edited volume, or reported on in a reviewed government report.
- *Rigor of Evaluation*—Evaluations summarized in both text and table were rated as falling in one of five different methodology levels, including experimental, quasi-experimental, pre-post with comparison group, pre-post without comparison group, and descriptive. Although relying strictly on experimental evaluations would have been preferable, the relative infrequency of these evaluations forced reviewers to include all relevant evaluations, and to consider the rigor when weighing and comparing results.
- *Age Range*—Evaluations of professional development programs involving children from birth through kindergarten were included in the review. Most of the studies reviewed pertained to children in the 3–5 year age range.

- *Early Educator*—For the purpose of the review, "early educator" included preschool teachers, prekindergarten teachers, kindergarten teachers, and child care staff caring for children from birth through kindergarten entry. Educators in both private and public settings were included. Workers in family child care settings were not excluded from the review, although few evaluations focused on these environments.
- *Professional Development*—Evaluations included in the review had to include some form of professional development as part of the treatment intervention. For example, they had to include credit-bearing classes, training on a curriculum, in-class coaching, or other activities aimed to improve educators' knowledge of child development or practice in the classroom or home-based child care setting.
- *Assessment of Effectiveness*—Evaluations had to measure or evaluate changes in at least one of three key areas: early educator knowledge; practice; and child outcomes.

In addition to evaluations, summaries have also been provided of discussions of best practices in which reviewers considered them to provide foundations for the evaluations reviewed and to add insight into strategies for effective professional development. Statements of best practice come from consensus development groups in which researchers and practitioners reach agreement on standards for positive practice based on their review of research findings and knowledge of practice issues. Examples include such efforts by the National Research Council as *How people learn: Bridging research and practice* (Donovan, Bransford, and Pellegrino 1999), and *Eager to learn: Educating our preschoolers* (National Research Council 2001) as well as the standards for professional development developed by the National Association for the Education of Young Children (Hyson and Biggar 2006), As noted by Strickland and Riley-Ayers (2006), state early learning guidelines also provide consensus documents based on the work of researchers and practitioners regarding what young children should know and be able to do in specific domains of development, including early language and literacy.

C. Orientation to the Tables

Accompanying the written summary for each of the two target areas in which a body of evaluation research is available are tables summarizing the relevant studies. The full set of tables appears in Appendix A. Brief summary tables, listing the studies covered, the research design (e.g., experimental, quasi-experimental), and outcome areas covered (early educator knowledge, early educator practice, and child outcomes) are included in the text. Three sets of tables are prepared for each of the topical areas of early language and literacy, early mathematics, behavior and social skills, comprehensive curricula, and general approaches. The first table summarizes the *methodology* of each study, the second table summarizes the *content of the professional development,* and the third summarizes the studies' *outcomes*.

In some cases a single project may have resulted in multiple published articles or chapters (e.g. a pre-post study and a follow-up study two years later), and in these cases, each has been tabled separately. In other cases, a single published chapter or article may contain information on multiple studies, and these have been tabled separately.

The elements of the three sets of tables are described in greater detail below.

C. 1. Methodology Table

1. The ***study*** column indicates the authors of the study and the year in which it was published.
2. The ***research questions*** column summarizes the key questions the authors aimed to answer by conducting the study. Depending on the focus of the study, the question may or may not directly address the effectiveness of the professional development approach; however, those studies that address professional development indirectly were chosen because the effectiveness of the professional development may be inferred from the outcomes measured.
3. The ***research design*** column provides a general overview of the evaluation, including a brief description of the intervention as well as the type of data collected at different points during the evaluation, and whether or not participants were randomly assigned.
4. The ***sample*** column notes the number and characteristics of participants, and, if relevant, the size of the intervention and control groups.
5. The ***measures*** column describes the data collected in the evaluation, including the names of standardized assessment or structured observation tools used, if any, as well as questionnaires or interviews. If the study reported reliability or validity of measures used, this information was also included.
6. The ***rigor of the professional development evaluation*** column identifies the strength of the evaluation design. Evaluations designated as Experimental (random assignment to treatment and control groups) are the most rigorous, and the results from these evaluations should be considered the most robust. Other categorizations include: Quasi-Experimental (intervention and comparison groups not randomly assigned); Pre-Post with Comparison Group (not randomly assigned); Pre-Post without Comparison Group; and Descriptive.
7. The ***general comments*** column provides comments on relationships of the studies with one another, methodological issues, reasons for caution in interpreting findings or other concerns.

C. 2. Table on Content of Professional Development

1. The ***study*** column repeats the information in the parallel column in the first table, indicating the authors of the study and the year in which it was published.
2. ***Mode of delivery*** is the first of three columns indicating the type of professional development in the intervention. The mode of delivery column describes what elements were included in the delivery of the professional development intervention (e.g. workshop, coaching, etc.).

3. ***Linkages with infrastructure*** indicates the ways in which the professional development is supported through connections with the educator's colleagues, through ties to curriculum or learning standards already in place, or to a larger system of professional development.
4. The ***temporal aspects*** of the professional development column indicates (1) the number of sessions of professional development; (2) the frequency of sessions or the spacing between them; (3) the length of each session; and (4) the total duration of the professional development intervention.
5. The ***outreach*** column indicates whether the intervention aimed to provide professional development to early educators serving a disadvantaged group of children or who themselves were from disadvantaged backgrounds.
6. The ***grounded in research*** column indicates whether the professional development content has been validated by prior research. In some cases, this may mean that educators are being taught research-based information on aspects of child development. In other cases, this may mean that the curricular approach or set of activities the early educator is prepared to use through the professional development has been shown to be, or is expected to be, effective due to prior research.
7. ***Description of content/curriculum*** describes the categories of information conveyed to educators via professional development or the elements of the curricula or activities encouraged through the professional development.

C. 3. Table on Outcomes

1. The three columns in this table indicate the outcomes assessed after the implementation of the professional development and, in some cases, specific curricula or activities in classrooms. The first column in this table focuses on ***educator knowledge***. This column indicates whether researchers measured associations between assignment to receive the professional development and increases in what educators know about child development or strategies to support it through specific curricula or classroom activities.
2. The column focuses on ***educator practice***. This indicates whether or not researchers measured a change in educators' activities in the classroom, how they interacted with children, or how they set up the classroom.
3. The final column focuses on ***child outcomes***. This column indicates whether researchers measured linkages between the professional development intervention and child outcomes, and if so, the associations that were found.

Additionally, each of these tables has a summary table found in the text. The summary table highlights the design of each of the reviewed studies and the outcome areas it focuses on.

II: Toward the Identification of Features of Effective Professional Development for Early Childhood Educators

In this section, findings regarding each of the four identified targets of early childhood professional development are discussed. We turn first to strengthening the human and social capital of early childhood educators as targets of professional development activities, and then to strengthening the entities that provide early childhood professional development as a focus. In the most detailed sections, supported by tables, we summarize the evaluation research on efforts to strengthen children's development in specific content areas (in which the research provides a focus on preparing the early childhood educator on curricula or activities in a content area), and professional development efforts targeting the overall quality of early childhood settings.

A. Enhancing the Human and Social Capital of Early Childhood Educators as Targets of Early Childhood Professional Development

The first set of studies examines links between the human capital (education, training, and literacy level) and the social capital (especially psychological well-being) of early childhood educators and the quality of center-based programs or family child care homes. Of the different forms of capital that have been conceptualized, including also, for example, cultural and economic capital (Bourdieu 1972), the two forms that have been considered as possible targets for strengthening the professional development of early educators and for which there is a research base are human and social capital. This body of work is primarily correlational. The question asked across this body of work is whether or not more human or social capital is related to higher levels of observed program quality; that is, does quality improve as qualifications improve (Tout, Zaslow, and Berry 2006; Zaslow et al. 2004)?

A.1. Education of Early Educators

Formal education attainment is measured in total years of education, by highest degree attained, and by whether the degree is in a major related to early childhood development. Reviews of the research focusing on the linkages between education and quality in early childhood settings have generally concluded that higher levels of educational attainment, and education with specialization in early childhood education, are related to higher observed quality (Tout, Zaslow, and Berry 2006; Barnett 2003; Whitebook 2003). However, in an important recent development, new analyses of existing data from seven major studies of early care and education have raised questions about the strength and consistency of this association (Early et al. 2007). Early and colleagues (2007) as well as Burchinal, Hyson and Zaslow (2008) consider several possible reasons for this difference in findings regarding the linkages between education and quality. Below we provide a brief overview of the key conclusions of earlier reviews, and then note in greater detail the way in which more recent research is challenging the conclusions of these reviews.

A.1a.Earlier and more recent evidence linking the education of early educators with educator knowledge, educator practice and child outcomes. Previous reviews pointed to studies as finding a linkage between educational attainment and the quality of the early care and education settings in center-based child care (Blau 2000; Honig and Hirallal 1998; Howes, Whitebook, and Phillips 1992; Phillipsen et al. 1997; de Kruif et al. 2000); family child care (Clarke-Stewart et al. 2002; Weaver 2002); and other studies including both center and home-based settings (NICHD Early Child Care Research Network 2000, for quality at 24 and 36 months). These reviews did, however, identify a few studies in which no linkage was found between quality of the environment and years or level of formal education (Phillips et al. 2000; Burchinal et al. 2002; NICHD Early Child Care Research Network 1996, for quality at 6 months). Further, the earlier reviews also identified a set of studies in which having more education specifically with early childhood content was found to be related to higher program quality (Howes 1997; Weaver 2002), though here too there were some exceptions for programs serving preschoolers (Clarke-Stewart et al. 2002; Phillips et al. 2000).

As noted above, however, in recent work, a consortium of researchers from seven major studies of early care and education has reexamined this issue in a set of rigorous, coordinated secondary analyses (Early et al. 2007). Following up on analyses specifically focusing on the National Center for Early Development and Learning studies of prekindergarten that appeared to challenge assumptions about the role of early childhood educator educational attainment (Early et al. 2006), Early and colleagues jointly analyzed the data from the Early Head Start Follow-up Study, the Head Start Family and Child Experiences Survey, the Georgia Early Care Study, the More at Four Evaluation, the National Center for Early Development and Learning studies of Pre-kindergarten (the Multi-State Study of Pre-kindergarten and the Study of State-Wide Early Education Programs), the Study of Early Child Care and Youth Development (the NICHD Study) and the Preschool Curriculum Evaluation Research (PCER) Program. Their analyses considered highest level of education attained by the lead teacher or caregiver, whether the early educator or caregiver had a bachelor's degree, and the student's major for the highest degree attained (in child development or early childhood education, any other education major, or noneducation related major). Analyses examined the three different markers of educational attainment in relation to observed quality of early childhood classrooms using the Early Childhood Environment Rating Scale–Revised or the Observational Record of the Caregiving Environment and in relation to gain scores on measures of academic achievement of 4-year-olds, using a common set of control variables across analyses of the different datasets. For the analyses of classroom quality, control variables included site, ratio, class size, length of day, teacher ethnicity, proportion of white students in the class, and proportion of poor students in the class. Analyses of child achievement gains controlled for site, child gender, ethnicity, years of maternal education, poverty, family income, and previous assessment score.

These replicated secondary analyses provided little indication that degree, highest education level among those with an early childhood major, or having an early childhood

major among those with a bachelor's degree were related either to observed classroom quality or to children's gain scores on measures of academic achievement:

> Using seven recent major studies of classroom-based educational programs for 4-year-olds, these analyses, taken together, do not provide convincing evidence of an association between teachers' education or major and either classroom quality or children's academic gains. Most of the analyses yielded null findings. Although there were some statistically significant associations, no clear pattern emerged. (p. 573).

A.1b. Possible Interpretations of the Recent Findings. The consortium of researchers considers three possible interpretations of these unexpected findings. First, they note that the teacher preparation programs in which these early educators participated may not have prepared the teachers adequately. Indeed these teachers may have completed their education during a time when expectations for children's learning during the year prior to kindergarten were lower. A second interpretation is that while teachers may have received high quality formal education, they may not have received sufficient supports to implement what they had learned when actually interacting with and teaching young children. That is, their formal education may have focused on knowledge but not sufficiently on practice. A third interpretation concerns the recent expansion of publicly funded prekindergarten and the market forces this may be creating. The higher wages and better supports of such programs may be attracting the most skilled and experienced early educators without bachelor's degrees, while those early educators who do have bachelor's degrees may find it easier to climb the ladder to elementary education programs. That is, there may be different selection effects than in other time periods, as reflected in earlier studies.

Burchinal and colleagues (2008) point to the further possibility that there may be moderating factors that these analyses could not examine. For example, the quality of the educators' degree-granting higher education programs could not be examined and may be an important underlying factor (Hyson, Tomlinson, and Morris 2008). In addition, they note emerging evidence that the early childhood educators' educational attainment may play a differing role depending on the type of program. They summarize recent findings from a study in California by Vu and colleagues (2008) indicating that having a bachelor's degree did predict quality in programs with fewer resources and supports, such as community-based child care, but did not predict quality in programs with more resources as well as ongoing supports and monitoring, such as state-funded prekindergarten. Thus the overall program context may be important to the relationship between educator educational attainment and program quality. Burchinal and colleagues also note that studies to date have considered the educational attainment of lead teachers in isolation, not also considering whether program administrators, other lead teachers, and assistant teachers in the program have received similar content in their education. It may be important to consider whether those working together in a program have similar preparation and orientation. Methodological differences, and especially the degree to which studies consistently control for key background characteristics that may be associated both with education and with observed quality or child outcomes, may be a

further factor in helping to explain the differences between earlier studies and the coordinated analyses reported on by Early and colleagues.

The issue of whether higher education in general (or higher education with specific content), is associated with improved early educator knowledge, practice, and child outcomes needs further examination through experimental evaluation studies in which early educators are, or are not, offered the opportunity to pursue higher education (or higher education covering specific content) and outcomes considered include not only educator knowledge but also educator practice and child outcomes. Interestingly, the need for such research has been identified in the work on the preservice education of K–12 educators as well. The National Reading Panel (National Institute of Child Health and Human Development 2000), focusing specifically on teacher preparation in the area of reading instruction, found that while there was a small set of rigorously conducted studies examining the effects of preservice teacher education, these studies examined effects on teacher knowledge but did not extend out to an examination on teacher instructional practice or student achievement. The report underscores the importance of examining effects on teacher practice and student outcomes as well as teacher knowledge in confirming the effectiveness of higher education in preparing teachers for reading instruction. The National Reading Panel concluded that there is a critical need for rigorous studies focusing on the preservice education of teachers.

In an update and extension of the review conducted for the National Reading Panel, Pang and Kamil (2006) note that there are more descriptive correlational studies of preservice teacher education in reading than experimental or quasi-experimental studies. They note that there is a need for both types of studies. Descriptive research can provide a context for understanding effects of preservice education that may be important for understanding underlying processes explaining the effects of preservice education. For example, they point to descriptive research that suggests that teachers with certain initial attitudes and motivation (for example, willingness to experiment, sense of efficacy, and philosophical acceptance of an instructional approach) may be more responsive to instruction on the use of an instructional approach. Pang and Kamil's review (2006) concludes that there is a continuing need *both* for rigorous evaluation research examining the role of higher education in preparing teachers to provide instruction in reading as well as for descriptive research that will yield a better understanding of how and for whom preservice education is effective.

In other respects as well, the research to date on educational attainment by early childhood educators mirrors discussions on the preparation of K–12 teachers. Thus, for example, the possibility that the preparation that early educators receive in higher education might be undermined if they return to early education settings in which other teachers and administrators are not informed or supportive of the approaches they have learned is clearly reflected in these other bodies of research. The National Research Council report *How People Learn* (Donovan, Bransford, and Pellegrino 1999), in considering how broad principles of learning apply to teacher preparation, concluded that many professional development opportunities for teachers are pursued in isolation, by

individual teachers who may not go on to have sustained contact with others who have experienced similar preparation. Further:

> School administrators at the individual school and school district level are responsible for facilitating teacher learning and evaluating teacher performance. If they are to support teachers' efforts to incorporate the principles of learning into classroom practice, they will need professional development opportunities that provide an understanding of the principles and their enactment in a classroom environment (Donovan, Bransford, and Pellegrino 1999 p. 48).

In sum, the new findings on the educational attainment of early childhood educators challenge us to go beyond the markers of formal educational attainment, such as having completed a bachelor's degree, to consider in greater depth the initial characteristics of the educators, the content and quality of the higher education program, and the context into which the early educator takes the degree and seeks to apply what has been learned. We concur with the conclusion of Pang and Kamil (2006) that complementary research approaches, both rigorous evaluations and in-depth descriptive studies, are needed. Such research will yield a more complete understanding of the potential impact of different facets of the educational attainment of early childhood educators on program quality and children's development in different early childhood settings. Finally, the strongest evidence on the effects of higher education as well as of other approaches to early childhood professional development will involve all three sets of outcomes: educator knowledge, educator practice and child outcomes.

A. 2. Training of Early Educators

Training refers to professional development that does not result in credits toward a higher education degree. Training may be provided through workshops or professional meetings. Ongoing training may be an in-service requirement in different types of early care and education. There may also be initial or preservice training requirements for licensing in child care.

There is a limited body of correlational research examining the associations between extent of training and observed program quality. There is also an emerging body of evaluation research examining the effects of training on both program quality as well as child outcomes. This body of research has recently been reviewed by Fukkink and Lont (2007).

A. 2a. Studies of Association. In studies of the association between participation in training and observed quality in early childhood settings, whether or not an early childhood educator has received training has been found to be related to the quality of programs and sensitivity of interactions between educators and children (Burchinal et al. 2002; Burchinal, Howes, and Kontos 2002; Clarke-Stewart et al. 2002; Kontos, Howes, and Galinsky 1996; Norris 2001). These studies offer almost no specific information about how variation in the type, mode, dosage, and content of training is related to quality. There are a few important exceptions to this generalization, with more precise

information emerging about the dosage of training in relation to quality. Thus, for example, there is some evidence that it is more recent training that is important to quality, raising the possibility that the effects of training may fade out over time and that training needs to be ongoing or renewed periodically (Norris 2001; Burchinal et al. 2002). In addition, Raikes and colleagues (2006) found that more intensive training, involving sequenced rather than stand-alone workshops, may be more closely linked with observed quality (Raikes et al. 2006). Here too, results from recent research on early childhood professional development agree closely with the broader conclusions of the National Research Council regarding aligning teacher education with the research on how people learn:

> For teachers to change their practice, they need professional development opportunities that are in-depth and sustained. In the words of one workshop participant, a one-shot workshop simplifies complex ideas until they become "meaningless mantras sold as snake oil." Many of the learning opportunities provided for teachers and other professionals violate the principles for optimizing learning. Teachers need opportunities to be involved in sustained learning… (Donovan, Bransford, and Pellegrino 1999, p. 27)

A. 2b. Evaluation Studies. We turn now from descriptive research looking at naturally occurring associations between training and quality, to evaluation research looking at the effects of training using comparative research designs. In this research, training has been more carefully defined, and a broader set of outcomes has been examined. Fukkink & Lont (2007) recently completed a meta-analytic examination of experimental and quasi-experimental evaluations of the effects of specialized training of early childhood educators. They included only studies in which there was "specialized caregiver training with a focus on interaction skills with children …in a regular childcare setting" (p. 297). They examined effect sizes for outcomes on caregiver knowledge, attitudes and skills. They also summarized effects on child outcomes, however, noting the number of studies in which child outcomes were considered to be limited.

Overall, the aggregated results indicated a statistically significant effect of specialized training on caregiver competence, with a medium effect size (*d=.45).* Considered separately, effect sizes for findings regarding caregiver knowledge, attitudes and skills were .43, .65 and .40 respectively. There was substantial variation in effect sizes across studies, with about a quarter of the effects falling within the negative to zero range. Thus, while the results point overall to the effectiveness of specialized training on caregiver competence, not all approaches are effective and there is variation across approaches in the degree of effectiveness. Effect sizes were larger when the training involved a fixed curriculum rather than open content, when the outcome measures aligned more closely with the content of the training, and when there were fewer training sites. The small sample size of studies examining child outcomes limited the strength of the conclusions for this set of outcomes. The few studies included in the analysis that did focus on child outcomes showed positive, but not statistically significant, effects. Fukkink and Lont conclude that:

> Training seems to matter. Taken together, the current empirical evidence demonstrates that specialized training improves the pedagogical competencies of caregivers in childcare, including their professional attitude, knowledge and skills. Further study is still needed to reach firmer conclusions with regard to the effects of caregiver training at the child level.…Despite the positive general outcome of caregiver training at the caregiver level, it should be stressed that not all interventions are equally effective. (Fukkink and Lont 2007, p. 305-306)

We note several important cautions to this encouraging conclusion regarding training. A meta-analysis uses summary data presented in published reports of studies as they were executed, including whatever control variables were taken into account in the analyses. The consistent replicated secondary analyses carried out by Early and colleagues introduced a set of standard and rigorous covariates across the studies of the association of education with quality and child outcomes. The introduction of a similarly broad and consistent set of covariates might change the conclusions for the studies of training. We urge caution when comparing the summary of studies of education and of training, especially urging readers not to conclude that only the latter is effective. To make this comparison in a rigorous way, one would need to conduct comparable analyses across the two sets of evidence. We also underscore the lack of rigorous evaluation research that focuses on the potential impact of early educators' education level on program quality. Finally, it is difficult to confirm that all of the studies included in the Fukkink and Lont meta-analysis define training as it is defined in this review—as professional development outside of credit-bearing courses for a higher education degree.

A. 2c. Needed Next Steps in Research on Training. In sum, an important next step in the research on training is to distinguish among different approaches to training to discern which specific features of training interventions show the strongest evidence of desirable outcomes. Coordinated secondary analyses of the data from training studies using a common set of covariates would also be extremely useful. The recommendation of the National Reading Panel (2000), and subsequently by Pang and Kamil (2006), that professional development needs to be studied across three sets of outcomes: educator knowledge, educator practice, and child outcomes, is clearly important, with limited study as yet especially of child outcomes.

A. 3. Literacy Levels of Early Educators

Another potential objective of professional development for early educators focuses on improving their literacy levels. Research on the intergenerational transmission of illiteracy would suggest that children are placed at risk for low levels of literacy and academic attainment if their caregivers do not themselves have strong literacy skills (Askov 1991; Poff Roman 2004).

A. 3a. Low Literacy as an Issue Among Early Educators. Although low literacy is not universal among early care and education providers, and may vary by the requirements for those working in different types of early care and education settings (such as child

care, Head Start and prekindergarten), the 1992 National Adult Literacy Survey (NALS)[1] indicates that a substantial proportion of child care workers (44 percent to 57 percent) perform at the lowest levels of proficiency on standardized literacy assessments (Kaestle et al. 2001). A more recent study of child care providers in Alameda County, Calif., indicated that almost one-third (31 percent) of the providers in that county had "limited proficiency" in English, based on their scores on the Test of Applied Literacy Skills (TALS) (Phillips et al. 2003). Given the emphasis on promoting early language and literacy skills among preschool children (Halle et al. 2003), the literacy skills of early childhood educators has recently been identified as a target for intervention (Halle et al. 2008). However, few if any professional development efforts have yet to be focused on supports for this aspect of the early care environment.

A. 3b. Possible Approaches to Strengthening Literacy Among Early Educators. Unfortunately, much of the literature on adult literacy lacks a clear focus on the literacy needs of early childhood educators, and many of the evaluations of adult literacy programs lack rigor in their evaluation design. Despite these limitations, a recent review of the research on adult literacy programs (Halle et al. 2008) identifies possible emphases for efforts to enhance the literacy levels of those early childhood educators for whom this is an issue. This review suggests that professional development efforts to support early childhood educators' literacy development should focus on specific content, and have an instructional approach well-matched to the adult learners' goals (Beder 1999).

For example, Phillips and colleagues (2003) point out that the current measures of adult literacy do not fully take into account aspects of literacy that are important for supporting children's language and literacy development. Specifically, they recommend that studies of adult literacy assess child care providers' oral language and book reading in addition to the traditional prose, document, and quantitative assessments. Indeed, adult literacy programs generally cover the major elements of language and literacy development, such as alphabetic knowledge, phonological awareness, word recognition, reading comprehension and fluency, vocabulary development, writing, speaking, and listening; they also often cover mathematical computation, use of computers, and the development of critical thinking skills (Kruidenier 2002). However, they typically do not address the language and literacy skills specifically needed to work with young children. For instance, interactive book reading and providing a rich oral language environment are two important components of the child's literacy environment that support young children's vocabulary growth (Halle et al. 2003).

In sum, a recommendation for future studies of caregiver literacy would be to supplement traditional measures of adult literacy with measures of both oral language and book reading skills of the early childhood educator. An additional recommendation is to develop and evaluate programs aimed at improving early educators' literacy. Finally, it will be important to explore whether improving an early childhood educator's literacy

[1] The 1992 NALS is the last national assessment of adult literacy conducted prior to the 2003 National Assessment of Adult Literacy (NAAL). The 2003 NAAL is the most recent national assessment of adult literacy.

affects the overall quality of the literacy environment in the early education setting, or the literacy skills of the children in the providers' care.

A. 4. Early Educators' Psychological Well-being

A small set of studies is beginning to suggest that stress and depressive symptoms may be issues for early childhood educators that affect the quality of the education and care they provide. These issues may be especially troubling for those working in isolation (as in home-based care settings), and those working with groups of children who are themselves stressed because of such issues as exposure to violence at home or in the community and ongoing family financial stress. We are beginning to see the emergence of evaluation studies focusing on the provision of professional development with a component involving the psychological well-being of early educators. Thus, consideration of the human capital of early educators is now being complemented with a focus on social capital.

A. 4a. Descriptive Studies of Depressive Symptoms and Stress and Their Correlates. A study of children's expulsions from preschool in the state of Massachusetts by Gilliam and Shahar (summarized in Gilliam 2005) found that the likelihood of a teacher expelling at least one child was significantly related to teacher self-report of job stress. Preschool expulsions were also higher when class size was larger and when there were more 3-year-olds mixed in with 4-year-olds in a class. Expulsions were also more likely in for-profit child care programs or other community-based programs than in public school or Head Start programs, raising the possibility that supports available to teachers through their programs may be important. In addition, expulsion rates were related to teacher access to an expert who could help them in working with children with emotional or behavioral difficulties. Expulsion rates were lowest in programs in which teachers had regular on-site visits from a mental health consultant, followed by those in which teachers had access to such consultation on-call, and were highest when teachers had no access to mental health consultation.

Analyses of the data from the NICHD Study of Child Care and Youth Development underscore the potential role of isolation versus support for early educators in affecting program quality. Hamre and Pianta (2004) found that about 10 percent of caregivers in this large study of early care and education reported clinically significant levels of depressive symptoms for themselves. Across different types of early care and education, those caregivers reporting higher levels of such symptoms were observed to be less sensitive in their interactions with children, to engage less often in affectively positive verbal interactions, and to be rated as more withdrawn. In addition, in home-based care only, caregivers with higher levels of depressive symptoms also showed more affectively negative and intrusive interactions. The link between negative interactions and depressive symptoms was stronger when caregivers spent a majority of the observational period as the only adult interacting with the child. The authors raise the possibility that when a

caregiver has another adult present, she can more readily withdraw from a frustrating interaction with a child than when she is alone with the child.

Raver and colleagues (2008) note that early educators working in low-income communities may be especially prone to emotional burnout. Higher rates of child exposure to stressors such as domestic and community violence and economic hardship are associated with higher levels of behavior problems, with between 20 and 23 percent of young children in low-income communities showing elevated rates of externalizing (acting out, aggressive) and internalizing (depressed, withdrawn) behavior problems Elevated rates of behavior problems among multiple children in a class can pose ongoing challenges to early educators.

A.4b. Initial Findings from Intervention Studies. The initial findings from a randomized trial involving a mental health consultant providing training as well as in-class coaching on behavior management for early educators in low-income communities indicate positive effects of the intervention on classroom climate. In its next stages, the research will analyze the impact of the mental health consultant focusing on strategies for stress reduction with the educators.

Future research should examine whether professional development approaches directly targeting the psychological well-being of early childhood educators result in increased instructional time and achievement gains for children.

III: Strengthening the Institutions and Organizations Providing Professional Development

The second major target for strengthening early childhood professional development focuses on the institutions or organizations providing the professional development. There is emerging research suggesting the need for strengthening higher education programs, strengthening the content of course work provided either through higher education or training, and for engaging early educators who are nontraditional learners in higher education. Rather than assessing the effects of such efforts on key outcomes (the knowledge and practice of early educators and children's development), the research is at an early stage, primarily providing evidence of the need for efforts targeting this area.

B. 1. Quality of Higher Education Programs

Early and colleagues (2007) and Burchinal and colleagues (2008) have suggested that it is important to look directly at the quality of degree granting early childhood higher education programs in order to understand the associations (or lack of associations) between attainment of a higher education degree, program quality, and child outcomes in early care and education. A new study by Hyson, Tomlinson and Morris (2008) provides further insight into the potential need to target higher education program quality in efforts to improve early childhood professional development.

Hyson and colleagues note that there are about 1,200 institutions of higher education with programs in early childhood, with about 60 percent providing associate degrees, and 40 percent providing bachelors' degrees. Approximately 36,000 students graduate from these programs each year, making the quality of the programs a concern just from the perspective of the number of students affected by them.

B. 1a. Accreditation of Higher Education Programs for Early Educators. The quality of early childhood programs offering bachelor's and graduate degrees can be evaluated through the accreditation process of the National Council for the Accreditation of Teacher Education (NCATE). Program review is carried out in light of the set of standards for early childhood professional development developed by the National Association for the Education of Young Children (NAEYC). A new process for accreditation of associate degree programs is under development by NAEYC. Hyson and colleagues note that of the approximately 450 institutions of higher education offering bachelors' degrees and graduate programs, fewer than half are recognized for quality by NAEYC through the NCATE accreditation process. Some institutions of higher education do not participate in the NCATE accreditation process. Of those that do participate in the review process, over the past three years, approximately 25 percent have been unsuccessful in their first application for accreditation.

Hyson and colleagues note that unsuccessful applications for accreditation can reflect how application materials were prepared and presented rather than quality per se. However their review of comments from the applications that were not successful also reveals some recurring tendencies that reflect concerns about quality. These include:

student assessments and assignments that are not in keeping with goals for teacher competencies identified in the NAEYC standards; assessments that focus on general teacher knowledge rather than knowledge of early childhood; assessments of students that focus on knowledge but not also application in practice; field placements that are not of high quality or that lack supervision; and faculty without appropriate background in early childhood.

B. 1b. Perspectives of Directors of Higher Education Programs. In order to learn about the perspectives of program administrators and faculty members, Hyson and colleagues carried out a Web-based survey. There was a response rate of 46 percent, with 250 program leaders completing the survey from among 546 invited to participate. Results help to identify both the strengths of these programs and the challenges they face.

When asked for program priorities for strengthening student competence, program directors most often indicated that their goal was to have students be able to implement high quality early childhood curricula effectively. Other priorities included using early childhood assessments appropriately, working effectively with families, and addressing challenging behaviors in children. Hyson and colleagues note with concern that project directors infrequently prioritized strengthening educators' capacity to have supportive interactions with individual children or imparting the ability to access and use research in practice.

When asked what quality improvement activities they were currently undertaking, a majority of program directors identified improving assessments of student competencies, improving field placements for students, and designing or redesigning courses. Most programs indicated placing little or no effort on building faculty capacity, citing lack of budget or lack of institutional support. However, when asked what programs needed to assist their quality improvement efforts, program directors noted as most central the need for more faculty, more instructional time, and more institutional support for their programs.

The authors note with concern that 40 percent of the respondents did not reply to a question about the research resources that they used to guide program improvement. Those that did reply did not always actually point to research sources. Further raising concerns about program quality, 18 percent of programs described themselves as in "survival mode," just teaching courses and advising students but not progressing in terms of quality.

The researchers conclude by noting that the priority placed by program directors on strengthening their students' ability to implement high quality early childhood curricula is in keeping with research. The directors' current focus on improving assessments of students and improving the quality of field placements is closely aligned with the comments of reviewers during the NCATE accreditation process. However there are reasons for concern about the lack of emphasis placed on research as a resource for guiding program improvement and lack of emphasis being placed on improving students'

capacity to access and build on research in their practice. There are also reasons for concern about lack of institutional support and resources to build faculty capacity.

In sum, the results of this survey suggest that efforts to improve early childhood professional development might also target overall quality improvement in institutions of higher education. Future research might focus on knowledge and observed quality of classrooms in which the lead teachers have and have not graduated from NCATE-accredited programs as well as the gains in achievement made by children in the classrooms of these teachers.

B. 2. Content of Course Work

The survey reported on by Hyson and colleagues raises concerns about the degree to which faculty in institutions of higher education are accessing the research base in guiding the development of courses, as well as emphasizing student reliance on research. A pilot study by Roskos, Rosemary and Varner (2006) further underscores the possibility that there may be variability in course content and emphases within the Child Development Associate credential (CDA), associate degree, and bachelor degree levels.

Their research examined materials from course work focusing on instruction in early literacy including such materials as syllabi, course descriptions, and field work assignments in light of differing standards. We summarize the evidence of this pilot study with respect to two of the standards applied: first, a review of curricular materials in light of state sponsored professional education curricula in reading pedagogy (called "external alignment"); and second, a review of the "extent to which a curriculum offers a comprehensive treatment of early literacy pedagogy through coverage of curricular components that emphasize…knowing, assessing, planning, and teaching…and content that emphasizes both knowledge and direct application" (p. 271-1) (called "horizontal alignment").

B. 2a. Exploratory Findings on Course Content and External Standards. Results point to strong alignment to external standards for the early literacy curricula at the bachelor degree level but diminishing alignment for programs at the associate degree level (which showed only minimal or moderate alignment) and at the CDA level (which showed only weak or minimal alignment). There was greater variation across programs at the associate degree and CDA levels than the bachelor degree levels. The authors note that this variation may be positive, indicating that some programs are accessing and utilizing the research base on reading and the standards that have been developed based on them.

B. 2b. Exploratory Findings on Balance of Course Focus on Knowledge, Assessment, Planning and Teaching. None of the programs showed strong horizontal alignment or a focus on how to teach reading through a balance of knowledge, assessment, planning, and teaching. Programs without balance may overemphasize theoretical topics or practice and may fail to connect knowledge to practice. This concern with imbalance between conveying knowledge and guiding its application is in keeping with some of the concerns expressed in the NCATE review process noted earlier.

Due to its limited size, this study cannot be taken to mean that programs as a whole do not rely enough on standards and research in developing course content, or do not implement a balanced emphasis on knowledge and practice in course work. Yet taken together with the findings reported by Hyson and colleagues, the findings here do provide sufficient basis to raise the possibility that an appropriate target for improvement of early childhood professional development programs may be to help implement course work that is informed by and aligned with recent research and with relevant standards. Assistance in designing appropriate course work may be particularly appropriate at the associate degree or certificate levels.

B. 3. Strategies to Engage Adult Learners

Another possible target for strengthening early childhood professional development is addressing the needs of nontraditional students in pursuing higher education. Whitebook and colleagues (2008) have recently reported on the first year results of a five-year longitudinal descriptive study of an approach intended to support such nontraditional students. In the study, six college programs in California have developed cohort approaches in which small groups of students in early childhood bachelor's programs enroll in courses together, receive financial assistance, are given flexibility in scheduling courses and field placements, and are offered tutoring and advising on how to fulfill degree requirements. Interviews have been conducted with 90 percent of the 124 participating students, administrators, and faculty at three of the institutions of higher education.

B. 3a. Characteristics of "Nontraditional" Students. Whitebook and coauthors note that students with an early childhood focus in California's college and university programs are often "nontraditional" students, defined as having four or more of the following characteristics:

- having a GED or other certificate rather than high school diploma or lacking formal completion of a certificate;
- delayed enrollment in college beyond the last year in high school;
- part-time attendance in college;
- full-time work while attending college;
- financial independence according to the criteria for financial aid;
- responsibility for a dependent; and
- being a single parent.

According to the researchers, nontraditional students face challenges that result in their being more likely to leave college before completing a degree than other students. They may face competing demands from work or home, limited financial resources, or limited understanding of college requirements. Those who are learning English may be challenged by written assignments in English. This longitudinal study will be tracking retention and graduation rates.

B. 3b. Early Perceptions of Participants in Cohort Approaches to Supporting Nontraditional Students. At this early point in time, it is interesting to note that nearly all of the students (96 percent) indicated that the program's cohort structure helped them to be successful in their course work, and more than two-thirds indicated that they benefited from the personal support of cohort members and helped each other in their courses. Only about one-quarter indicated that there was something about the cohort structure that did not work well for them, and this was usually something related to group dynamics. Faculty members also felt the cohort structure was beneficial.

The authors note that the additional supports provided for nontraditional students can involve additional costs, and faculty members were concerned about sustainability. They note that the research involved here is primarily descriptive in nature and cannot help to determine which of the multiple elements of the approach used (including joint scheduling of classes for the cohort, advising, tutoring, access to technology, financial supports, and accommodations to the students' work schedules) are most important to sustain if budget cuts are necessary. It will be important to continue to follow the results of this longitudinal study especially in terms of degree completion. Future research might consider examining and evaluating specific variations of the cohort approach to determine the specific program elements that are of greatest importance.

B. 4. Need for Focus on Strengthening the Institutions That Provide Training as Well as Higher Education

In concluding this section, we note that we have emphasized targeting professional development efforts primarily to strengthening programs in institutions of higher education, yet much professional development occurs through training. We note that the National Association of Child Care Resource and Referral Agencies has recently developed a set of standards for accrediting child care resource and referral agencies' training programs. Components focus on both the qualifications of those providing the training and the content of workshops. Another focus for future research might be to evaluate the skills of those early childhood educators pursuing training through accredited and nonaccredited agencies.

IV: Professional Development Targeting Improvement in Specific Developmental Domains for Children

This section of the review turns to efforts to strengthen professional development through focusing on specific domains of children's development. We turn first to efforts to strengthen professional development in early language and literacy, then in early mathematics, and finally in children's social development. Because the research in each of these areas includes a body of evaluation studies, we support the summary of the evidence in the text with detailed tables providing an overview of each study's methodology, a description of the professional development approach, and results for each major outcome (educator knowledge, practice, and child outcomes).

C. 1. Early Language and Literacy

C. 1a. Overview of Studies Reviewed

Table 1. Characteristics of Language and Literacy Studies Reviewed

Study Number	Citation	Design*					Outcome Areas Examined†		
		Exp	Quasi-Exp	P/P With Comp	P/P Without Comp	Desc	EK	EP	CO
1	Adger, Hoyle & Dickinson (2004)					X	✓		
2	Assel, Landry, Swank & Gunnewig (2007)	X						✓	✓
3	Baker & Smith (1999)			X					✓
4	Byrne & Fielding-Barnsley (1995)			X					✓
5	Dickinson & Brady 1 (2006)					X		✓	
6	Dickinson & Brady 2 (2006)			X				✓	✓
7	Dickinson & Brady 3 (2006)		X					✓	
8	Dickinson & Brady 4 (2006)		X					✓	
9	Dickinson & Brady 5 (2006)							✓	
10	Dickinson & Caswell (2007)		X					✓	
11	Foorman & Moats (2004)				X		✓	✓	✓
12	Fountain, Cosgrove & Wood (2008)	X						✓	✓
13	Gettinger & Stoiber (2007)			X					✓
14	Jackson, Larzelere, St. Clair, Corr, Fichter & Egertson (2006)		X					✓	✓

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Table 1. Characteristics of Language and Literacy Studies Reviewed (Continued)

Study Number	Citation	Design*					Outcome Areas Examined†		
		Exp	Quasi-Exp	P/P With Comp	P/P Without Comp	Desc	EK	EP	CO
15	Justice, Mashburn, Hamre & Pianta (2008)					X		✓	
16	Justice, Pence & Wiggins (2008)	X						✓	
17	Landry (2002)			X				✓	✓
18	Landry, Assel, Gunnewig & Swank (2008)	X						✓	✓
19	Landry, Swank, Smith, Assel & Gunnewig (2006)		X				✓	✓	✓
20	Lonigan & Schatschneider (2008)	X						✓	✓
21	Lonigan & Whitehurst (1998)	X							✓
22	McCutchen, Abbott, Green, Beretvas, Cox, Potter et al. (2002)		X				✓	✓	✓
23	McGill-Franzen, Allington, Yokoi & Brooks (1999)	X						✓	✓
24	National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences (2007)		X				✓	✓	✓
25	Neuman (1999)			X				✓	✓
26	Neuman & Cunningham (2009)	X					✓	✓	
27	O'Connor, Fulmer, Harty & Bell (2005)			X				✓	✓
28	Podhajski & Nathan (2005)			X			✓		✓
29	Pence, Justice & Wiggins (2008)	X						✓	
30	Roskos, Rosemary & Varner (2006)					X	✓		
31	Wasik & Bond (2001)	X						✓	✓
32	Wasik, Bond & Hindman (2006)	X						✓	✓
33	Whitehurst, Arnold, Epstein, Angell, Smith, & Fischel (1994)	X							✓
34	Whitehurst, Epstein, Angell, Payne, Crone, & Fischel (1994)	X							✓
35	Whitehurst, Zevenberegen, Crone, Schultz, Velting, & Fischel (1999)	X						✓	✓
36	Yaden, Tam, Madrigal, Brassell, Massa, Altamirano & Armendariz (2000)		X						✓

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Table 1. Characteristics of Language and Literacy Studies Reviewed (Continued)

Study Number	Citation	Design*					Outcome Areas Examined†		
		Exp	Quasi-Exp	P/P With Comp	P/P Without Comp	Desc	EK	EP	CO
37	Zevenbergen, Whitehurst & Zevernbergen (2003)	X							✓
Total Studies Reviewed: 37		**15**	**8**	**8**	**1**	**4**	**8**	**26**	**26**

(*Exp= Experimental, Quasi-Exp= Quasi-Experimental, P/P With Comp= Pre-Post with comparison group, P/P Without Comp= Pre-Post without comparison group, D= Descriptive; †EK= Educator Knowledge, EP= Educator Practice, CO= Child Outcomes)

The preschool years play a critical role in children's literacy development (Neuman and Dickinson 2002; Snow, Burns, and Griffin 1998). Not surprisingly, then, professional development strategies for improving the teaching of early literacy skills are abundant in the literature. A total of 37 studies were reviewed that reported on evaluations of professional development approaches aimed at promoting children's early language and literacy development. As mentioned in the orientation to the tables, some studies in the table discuss related projects. Of the 37 literacy studies, there are 22 studies with no relation to others and four groups of related studies. One of these groups, by Dickinson and colleagues, documents the progression of the project known as the Literacy Environment Enrichment Program (LEEP). There is one paper describing the pilot project that provided the foundation of later steps of the LEEP project, three papers on different evaluations of LEEP training, and three papers reporting on evaluations of LEEP's predecessor professional development programs, T-LEEP, STARS-LEEP, and PD-LIT (Adger, Hoyle, and Dickinson 2004; Dickinson and Brady 2006). Another group of studies, by Whitehurst and colleagues, are evaluation studies of a dialogic reading intervention as administered in 4-year-old Head Start classrooms by videotape-trained educators. The five studies documenting this project and its outcomes vary in their precise research questions. The third group of related studies is part of the Institute of Education Sciences' PCER initiative, designed to conduct experimental evaluations of preschool curricula (U.S. Department of Education 2008). The initiative focused on the impact of curricula on child outcomes, as well as preschool classroom quality, teacher-child interaction, and instructional practice. Finally, in a set of two studies by Wasik and colleagues (Wasik and Bond 2001; Wasik, Bond, and Hindman 2006), the researchers examine the effects of an interactive book reading curriculum on children's language and literacy skills.

Many of the interventions reviewed were directed primarily at children from low-income families, or children most at risk for language or reading delays. Virtually all of the interventions targeted educators in center-based settings (such as Head Start, child care centers, or kindergarten classrooms).

A recurring comment in the best practices literature on professional development is that all professional training for early childhood educators should be research-based. Without exception, all of the professional development approaches reviewed were based on the

most recent theory and research on reading development and effective literacy intervention. That research base is reviewed very briefly here.

Experts note that effective literacy instruction should address the components of reading that have been linked to reading improvement in experimental studies. These components include phonemic awareness (i.e., the ability to isolate and manipulate the sounds of spoken words), phonics (i.e., the linkage of speech sounds to alphabet letters and letter combinations), vocabulary (i.e., the meanings of words), fluency (i.e., the rate of reading), and comprehension (i.e., understanding sentences and the overall meaning of a passage) (National Reading Panel 2000; Snow, Burns, and Griffin 1998; National Early Literacy Panel 2008). However, early language development also needs support, with the provision of rich adult-child conversation to build vocabulary and learn other oral language skills such as the pragmatics (i.e., functioning) and semantics (i.e., meaning) of verbal communication.

With regard to professional development in particular, the Committee on the Prevention of Reading Difficulties in Young Children suggests that early childhood educators should be trained in:

- How to provide rich, conceptual experiences that promote growth in vocabulary and reasoning skills;
- Lexical development, from early referential (naming) abilities to relational and abstract terms and finer-shaded meanings;
- The early development of listening comprehension skills, and the kinds of syntactic and prose structures that preschool children may not yet have mastered;
- Young children's sense of story;
- Young children's sensitivity to the sounds of language;
- Developmental conceptions of written language (print awareness);
- Development of concepts of space, including directionality;
- Fine motor development; and
- Means for inspiring motivation to read. (Snow, Burns, and Griffin 1998, p.280)

The National Reading Panel (National Institute of Child Health and Human Development 2000) concluded that in-service training was beneficial in improving teachers' skills in teaching reading. Studies of preservice education for teachers focused on changes in knowledge but did not examine classroom practice once teachers were placed in classrooms.

The professional development approaches reviewed conveyed information that had basis in scientific research. For example, the training provided by McCutchen and colleagues (2002) included a component that "outlined...the typical sequence of development in children's phonological awareness," and this information was based on published research articulating the progression of children's phonological awareness (p. 73). Similarly, activities recommended by the professional development strategies reviewed had evidence of effectiveness in scientific research or through field testing of the curriculum. For example, in Wasik and Bond (2001), on-site mentors trained educators

to use interactive book reading strategies and themed vocabulary building with 4-year-olds. This intervention was based on multiple previous studies that showed that interactive book reading could improve preschoolers' language skills (Whitehurst, Arnold et al. 1994; Whitehurst, Epstein et al. 1994), and studies that showed that children need repeated exposure to words to integrate them into their vocabulary (Huttenlocher, Levine, & Vevea, 1998, and Robbins and Ehri, 1994, as cited in Wasik and Bond 2001).

Furthermore, three professional development programs reported sharing actual research articles with educators to inform them about current research findings in children's early language and literacy development (Dickinson and Brady 2006, Example 1; Baker and Smith 1999; O'Connor et al. 2005). A superficial change in teachers' practice may have little sustainability, but changing how teachers think about their practice by providing them with research-based information may support a more permanent change in practice and continued self-reflective practice.

A previous review of the literature that the authors conducted for the Child Care and Early Education Research Connections Web site (Halle et al. 2003) identified three targeted strategies implemented in early childhood care and education settings that show evidence of improving children's language and literacy skills in preschool and beyond. These include (in no particular order of importance): (1) reading aloud to children in an interactive style, (2) phonological skill development, and (3) increasing access to books and environmental print in early childhood settings. Similarly, but using more stringent review criteria, The Institute of Education Sciences' What Works Clearinghouse identified two recommended practices that had evidence of supporting preschoolers' language and literacy development: (1) development of phonological awareness skills and (2) interactive reading and dialogic reading.[2] In the current review, which focuses on evaluations of professional development to improve literacy development in early care and education settings, similar topics were addressed in professional development activities and materials.[3] However, additional strategies and content areas covered in professional development were found as well. These are outlined below.

Content of Professional Development to Improve Language and Literacy. Across the reviewed studies, one of the content areas within the professional development curricula was fostering strong interactive book reading practices; specific strategies included having educators engage children by asking open-ended questions, discussing

[2] See http://dww.ed.gov/topic/topic_landing.cfm?PA_ID=7&T_ID=15&Tab=2.

[3] Although there is overlap in the articles reviewed for the Halle, Calkins, Berry, and Johnson (2003) literature review and this literature review, the information assessed in the publications and the conclusions drawn reflect the different aims of the two literature review tasks. The focus of the literature review for *Research Connections* was to identify research evidence for effective activities within early care settings that promoted early literacy skills in young children. The focus of the current review is an analysis of the foundation for and implementation of professional development strategies for early childhood educators as they relate to three outcomes across a range of educational domains (reading, math and social behavior). The three outcomes include improving educators' knowledge, improving educator practice, and improving child outcomes. Consequently, some of the articles in the previous literature review were not relevant for the current review, due to lack of information on professional development (or lack of including early childhood educators in the intervention at all). In addition, publications not included in the previous review are reviewed here, due to the different search and inclusion criteria employed for this review.

illustrations, and extending the story into art and writing activities (Wasik and Bond 2001; Wasik, Bond, and Hindman 2006; Whitehurst, Arnold et al. 1994; Landry et al. 2006). Another content area stressed in professional development was using book reading and environmental print to support children's print awareness (Neuman 1999; McGill-Franzen et al. 1999; e.g. Lonigan and Whitehurst 1998). A third content area included in professional development activities in multiple studies was developing supports for children's phonological awareness (e.g., Podhajski and Nathan 2005; Starkey et al. 2008), and in some cases, forging a connection between sound and print and including phonemic awareness and letter knowledge (McCutchen et al. 2002; e.g., Adger, Hoyle, and Dickinson 2004; Assel et al. 2007). The importance of developing children's vocabulary and oral language was stressed in multiple studies, and rich educator-child dialogue was encouraged (Whitehurst, Arnold et al. 1994; Dickinson and Brady 2006). Supports for emergent writing were encouraged such as integrating literacy activity into play by using literacy props (McGill-Franzen et al. 1999). Another recurring element of professional development in the studies reviewed included strategies for creating literacy-rich environments, including modifying the physical setup of the classroom, creating a separate book area, and utilizing attractive environmental print (McGill-Franzen et al. 1999; Neuman 1999). Finally, some studies included educating teachers on screening and monitoring children's literacy skills, and providing differentiated instruction (Gettinger and Stoiber 2007; Garet et al. 2008).

In some cases, professional development activities were focused on single components of literacy development, such as phonological awareness (Byrne and Fielding–Barnsley 1995), or interactive book reading (Lonigan and Whitehurst 1998; Wasik and Bond 2001). However, it was much more common for professional development models to take a more comprehensive approach. That is, the majority of the reviewed studies addressed multiple components of children's early literacy skills, and employed various strategies to address the development of these skills. For example, several interventions covered a wide range of topics and instructional strategies through intensive in-service training, the sharing of commercially available curricula, role playing, lesson planning, and ongoing coaching and mentoring in the classroom (e.g., Landry 2002; McGill-Franzen et al. 1999; Podhajski and Nathan 2005; Assel et al. 2007; Gettinger and Stoiber 2007). Topics covered in these more comprehensive formats included phonological awareness, phoneme segmentation, interactive book reading, effective read aloud sessions, extending stories through class projects and discussion, developing vocabulary through book reading, print and book awareness, motivation to read, letter knowledge and early word recognition, environmental print, literacy activity during play, relationships between speech and print, comprehension, and emergent writing. Collectively, training in these comprehensive instructional models provided professional development that encouraged supports for multiple aspects of early language and literacy development.

Thus, one of the emerging themes within this area of professional development is an acknowledgement that early literacy encompasses multiple skills, and consequently, early childhood educators need a variety of strategies with which to address these multiple components of early literacy. Interestingly, the research base has not clearly articulated whether there is a distinct sequencing of skills that should be fostered in children during

the preschool years to promote language and literacy development. Rather, the literature indicates that multiple components are important during the preschool years (e.g., oral language, vocabulary development, phonemic awareness, letter knowledge, concepts of print and book knowledge, early word recognition, and motivation to read). Implicitly, the amount of focus on phonemic awareness within the literature suggests that this particular skill is foundational for other literacy skills. However, it remains an empirical question whether phonemic awareness is indeed more important to the development of reading skills than, say, oral language development. Only one of the reviewed studies introduced different aspects of early literacy development in a sequenced manner during professional development sessions, and this was a study that was designed for teachers in kindergarten through third grade (O'Connor et al. 2005). Specifically, the content of professional development sessions shifted across the four-year study, as teachers in the later grades were gradually included in professional development. In kindergarten and first grade, topics covered during professional development sessions included phonemic awareness, phonics, and vocabulary. In first and second grades, topics included the alphabetic principle, vocabulary, word study, and fluency. In second and third grades, topics included multisyllabic word reading approaches and comprehension strategies such as retelling and summarizing. Studies that sequence the introduction of literacy instruction within the early childhood years (from birth through kindergarten entry) were not identified in this literature search. However, it would be important to determine whether this type of sequencing of skill development could be successfully extended downward to the preschool age range.

Several professional development interventions taught educators how to utilize assessments of children's language and literacy development to identify developmental delays and to assess progress with the implementation of the new techniques learned through professional development (Foorman and Moats 2004; O'Connor et al. 2005; Gettinger and Stoiber 2007; Garet et al. 2008). Training early childhood educators on the proper use and interpretation of child assessments for ongoing program monitoring may be a particularly useful component of professional development. The ability to match child progress on outcome measures with changes in classroom practice over time would give early childhood educators immediate feedback and validation for successful implementation of professional development activities. Additionally, this information would provide teachers with the information necessary to differentiate their approaches to instruction. For example, Gettinger and Stoiber (2007) use a three-tiered approach. They begin by providing educators with professional development training sessions on literacy activities, and then in Tier 2, daily small group instruction is targeted toward children needing additional assistance. Finally, in Tier 3, individual tutoring is provided to children who are identified as being at the highest risk for reading difficulties.

At least five studies in this review mention inclusion or outreach to parents as part of the intervention. For example, a series of studies by (Whitehurst, Arnold et al. 1994) examined whether training parents in dialogic reading, in addition to exposure to dialogic reading in the classroom, was more effective than exposure to dialogic reading in the classroom alone. Similarly, a study by (Lonigan and Whitehurst 1998) examined differences in three training conditions for dialogic reading: school reading, home

reading, and school-plus-home reading. Finally, Yaden and colleagues (2000) examined whether providing English-language and literacy supports to parents, extended family members, and child-care center employees, including a book-lending library and offering parent workshops at home, could affect Spanish-speaking children's literacy outcomes. A few additional studies reference outreach to families or family involvement as part of their curricula (e.g. Assel et al. 2007; Fountain, Cosgrove, and Wood 2008). However, in all of these examples, the professional development offered to early childhood educators does not train them on strategies to involve or engage parents in literacy techniques to support children's language and literacy development. Research suggests important connections between school and home literacy practices and child outcomes among English-speaking children (Baker et al. 1996; Dickinson and Tabors 1991; Snow et al. 1991; Weigel, Martin, and Bennett 2005) and among English language learners (August and Shanahan 2006). This is a topic for teachers' professional development that may warrant further attention.

Finally, more study is needed of professional development efforts geared to working with early sequential bilingual children and English language learners (ELLs). Although several of the studies reviewed included children who spoke a language other than English at home (Assel et al. 2007; Garet et al. 2008; Landry et al. 2008; U.S. Department of Education 2007) with one notable exception, none of the studies included cultural and linguistic competence as part of their professional development. Yaden et al. (2000) examined whether in-classroom support and ongoing in-service training regarding English-language and literacy support to early childhood educators improved Spanish-speaking children's literacy skills. Results suggested that children who participated in a full year of the intervention showed significant gains in literacy skills. However, there is little methodological detail provided, and it is unclear which components of the intervention led to positive outcomes in the intervention group. Not only was there a lack of focus on professional development training related to supporting ELL students, but researchers also did not control or test for differences in child outcomes based on ELL status. Assel et al. (2007) note that they were not able to assess differences in children's outcomes for ELL versus non-ELL children due to the varying number of children across sites. A review of this research suggests that cultural and linguistic competence is not a focus of professional development, nor are researchers examining the differential impacts of various professional development approaches based on children's ELL or bilingual status. A major barrier to making the linkage between professional development efforts and ELL children's developmental outcomes is the paucity of child outcome measures that are reliable and valid for use with ELL children and that permit adequate assessments of individual strengths and weaknesses (August and Shanahan 2006).

Professional Development Strategies to Improve Language and Literacy. A variety of approaches to professional development were found in the reviewed studies on language and literacy, including workshops, course work, on-site work, and, in one instance, combinations of these approaches. Many of the professional development sessions included workshops or course work with a didactic element of conveying information on children's language and literacy development to educators (Foorman and Moats 2004; McCutchen et al. 2002; Pence, Justice, and Wiggins 2008), and some taught educators

specific classroom activities and strategies or curricula (Byrne and Fielding–Barnsley 1995; Whitehurst, Epstein et al. 1994; Landry et al. 2008). Sometimes this took the form of lectures or readings (Taylor and Pearson 2004; Dickinson and Brady 2006, Example 1); other times researchers showed educators video-tape vignettes of book reading or other activities (Taylor and Pearson 2004; Whitehurst, Epstein et al. 1994). In one instance, the professional development consisted of a satellite broadcast that allowed for dial-in questions, and an interactive Web site for further support and collaboration (Jackson et al. 2006). Some of the professional development sessions included more open-ended aspects, such as encouraging discussion between educator colleagues regarding their experiences in the classroom, or collaboratively designing lesson plans based on their new knowledge of language and literacy development (Landry 2002; McCutchen et al. 2002; Fountain, Cosgrove, and Wood 2008). Sometimes when there were multiple sessions, educators completed homework that encouraged self-reflective practice and linked their classroom experiences to what they learned in the training (Dickinson and Brady 2006, Example 2).

On-site mentoring or coaching was a professional development approach used in many studies (Baker and Smith 1999; Landry 2002; Podhajski and Nathan 2005; Assel et al. 2007; Gettinger and Stoiber 2007; Landry et al. 2006). A new study by Neuman and Cunningham (2009) is one of the first that examines empirically a coordinated approach to professional development (that is, combining course work with ongoing coaching). In this case, the coaching specifically supported the content conveyed in a 15-week course and provided ongoing on-site assistance for 17 weeks beyond the end of the course. This study is also one of the few that provides some detail on the characteristics of the coaches and their training, as well as detail about how the on-site work was carried out.

Another innovative approach to providing professional development was involving cohorts of early childhood educators within a single institution. In a few cases, the professional development was given to teams of educators, such as teacher-assistant-teacher teams, or teacher-director teams, so that educators could mutually support each other during implementation (Dickinson and Brady 2006; Dickinson and Caswell 2007). In still other cases, administrators as well as special education providers were included in the professional development intervention along with regular classroom educators (O'Connor et al. 2005; Taylor and Pearson 2004).

C. 1b. Study Designs and Methodologies. The majority of studies reviewed use an experimental design with random assignment to treatment and control groups (e.g. Assel et al. 2007; Garet et al. 2008; Justice, Pence, and Wiggins 2008; Lonigan and Schatschneider 2008; Whitehurst et al. 1999). The PCER studies, the studies on dialogic reading by Whitehurst and colleagues, and several others use this rigorous design, and therefore contain the most robust evidence for the effectiveness of professional development strategies. There is a group of studies that utilize quasi-experimental designs in evaluating professional development relating to early language and literacy (e.g., Dickinson and Brady 2006, Examples 3 & 4; McCutchen et al. 2002; Yaden et al. 2000). There is one (O'Connor et al. 2005), that uses a longitudinal, lagged design, that addresses a typical confound with professional development studies: Can the effects of

professional development be disassociated from level of teacher competence in general? Because data on child outcomes were gathered from these teachers' classrooms before and after the teachers' exposure to the professional development, this confound was eliminated in the study. Several studies also used a pre-post design with a comparison group that was not randomly assigned, and analyses do not control for baseline differences between groups (e.g., Baker and Smith 1999; Byrne and Fielding–Barnsley 1995; Landry 2002; O'Connor et al. 2005; Podhajski and Nathan 2005; Gettinger and Stoiber 2007). The findings of these studies contribute useful information about strategies for effective professional development, but because they are not experimental, the findings should be considered preliminary evidence of what later should be confirmed through more rigorous evaluation designs. The few descriptive (e.g. Adger, Hoyle, and Dickinson 2004; Dickinson and Brady 2006; Roskos, Rosemary, and Varner 2006) and pre-post studies without comparison groups (e.g., Foorman and Moats 2004; Taylor and Pearson 2004) should likewise be considered preliminary evidence.

C. 1c. Patterns of Findings. In this section we provide a summary of findings relating professional development to differing outcomes. We turn first to results separated out by whether the outcome focused on is educator knowledge, educator practice, or child outcomes, noting the proportion of the studies reviewed showing effects in each area and briefly describing them. We then look across those studies that reported effects in at least one of these areas, describing the professional development approaches in these studies with the aim of gleaning which approaches were most consistently linked with key outcomes.

Examination of Educator Knowledge. Six of the 37 studies reported effects for educator knowledge (Adger, Hoyle, and Dickinson 2004; Foorman and Moats 2004; Garet et al. 2008; McCutchen et al. 2002; Podhajski and Nathan 2005; Roskos, Rosemary, and Varner 2006). Typically, participation in professional development was found to increase caregiver knowledge, although one study only descriptively evaluated alignment of one state's early childhood credentialing programs' curricula with the recommendations of scientifically based reading research and with the goals for child outcomes in reading and writing, as defined by that state's early learning guidelines (Roskos, Rosemary, and Varner 2006). An exception was the study by Neuman and Cunningham (2009) which found no significant differences in teacher knowledge between teachers who received course work plus coaching, course work alone, or "business as usual."[4]

Examination of Educator Practice. Twenty-six of the 37 studies measured educator practice, and typically participation in professional development was found to improve educator practice, although not in all cases (McCutchen et al. 2002; see, for example, Foorman and Moats 2004; Fountain, Cosgrove, and Wood 2008). In studies that found significant differences between treatment and control groups, effect sizes ranged from small or moderate (d = .13 and .45) (Gettinger and Stoiber 2007) to large (d = 1.26 and 1.41; (Lonigan and Schatschneider 2008).

[4] A more elaborated discussion of outcomes can be found in the following sections.

Examination of Child Outcomes. Twenty-six of the studies measured child outcomes, and typically outcomes for treatment participants were found improved at post-test compared to controls. The sustainability of improved outcomes was rarely measured; when child outcomes were measured, they proved difficult to sustain (Neuman 1999; Whitehurst, Epstein et al. 1994; Garet et al. 2008). Sustainability of results will be discussed in more detail below.

Measurement approaches in studies examining these outcome areas. A notable feature of this corpus of studies is the use of standardized measures of child language and literacy outcomes (e.g., PPVT), as well as standardized measures of the literacy environment in the classroom (e.g., the ELLCO) to measure the effectiveness of professional development efforts. Unlike other content areas, such as mathematics, measures of children's language and literacy development are widely available and readily called upon for use in evaluations of early childhood interventions and professional development training. As mentioned earlier, a particularly promising feature of several professional development models was the training of early childhood educators in the use and interpretation of standardized measures of children's language and literacy development for the purpose of monitoring progress for individual children and for the effective implementation of the professional development program.

The creative use of discourse analysis to analyze discussions among educators and trainers within professional development sessions was also described in one study (Adger, Hoyle, and Dickinson 2004). Although descriptive in nature, this study goes a long way in addressing the *processes* by which professional development takes place and describes explicitly the type of educator knowledge that is acquired or consolidated in professional development settings.

Professional Development Approaches Most Consistently Linked With Outcomes. This section will describe patterns in professional development approaches that were associated with positive effects in at least one of the three outcome categories. It is important to note that while positive outcomes were found in many of the studies reviewed here, most of these studies combine multiple features of professional development (knowledge transfer, ongoing mentoring, self-reflective practice, etc.) into a single implementation, and thus it is impossible to tease apart which features of professional development are responsible for the programs' effectiveness. Ideally, planned variation experiments would isolate individual factors of professional development programs to understand the functioning of each factor in isolation. Some studies are making progress in this area, as they test competing curricula that differ on only one feature. For example, (Landry et al. 2008) compared child outcomes on two curricula that are similar, but one has more of a focus on phonological awareness. Another group of studies compared professional development that provided just training, to a training plus mentoring approach (e.g. Garet et al. 2008; Jackson et al. 2006). The studies under review are informative for understanding what professional development approaches help to improve educators' knowledge or skills in the teaching of early literacy, with the ultimate goal of improving literacy outcomes among children.

The major components of a strong foundation for professional development relate to defining the goals and objectives that educators will learn or the strategies they will take away from the training: Are the goals firmly established before the training begins, or will participants be included in establishing goals and objectives? Have information and strategies dispensed during the training been demonstrated by rigorous research to be effective with children? Will the professional development consider the educators' experiences, including current practice, population served, and resources available? What sorts of resources are educators provided to support implementation of new information and activities? The foundation of each professional development program may be just as important as the method by which it is implemented.

Establishing Goals and Objectives. Across the studies reviewed, there exists some tension between establishing clear program goals and objectives before educators begin training and encouraging educators to develop their own goals during the course of the training. The dialogic reading professional development program conducted by Whitehurst and colleagues took a highly didactic approach, presenting educators with book reading guidelines, showing them vignettes of strong dialogic book reading, and giving them opportunities to practice via role-playing but did not encourage educators to shape their own approaches to language and literacy supports (Whitehurst, Epstein et al. 1994; Whitehurst, Arnold et al. 1994). Evaluations showed that this straightforward dialogic reading training program was successful in improving child outcomes (teacher knowledge and practice were not assessed). Those few programs that primarily focused on collaborative development of language and literacy strategies instead of providing pre-established strategies suggest that more structure may have given the program more focus. After piloting a professional development approach in which teachers were encouraged to discuss their language and literacy practices, and given some readings on children's development to deepen their discussion, Dickinson and colleagues found that teachers wanted more clear-cut, didactic guidance on specific strategies to strengthen their practice (Dickinson and Brady 2006, Example 1).

In another program that combined prescriptive and more open-ended approaches to establishing the goals and objectives of professional development, researchers found that "teachers welcomed the structure imposed by...pacing guides, lesson scripts, and lesson plans...many protested that they had been overwhelmed by too many choices of activities in publishers' teaching manuals and too little assistance choosing essential lesson components" (Foorman and Moats 2004, p. 56). The majority of the successful studies under review use some combination of the two approaches: articulating information about children's language and literacy development and strategies for supporting it, and allowing educators to discuss and modify strategies as they are applied in the naturalistic classroom setting. Combining approaches makes sense because providing clear recommendations for practice can help ensure that the activities are aligned with the research on children's language and literacy development, while encouraging educators to adapt practices to their own classrooms promotes teacher buy-in to the new techniques and continued self-reflective practice.

Understanding the Current Classroom Context. Another important foundational element is for the people who are implementing the professional development strategies to gain a general understanding of the classroom contexts of the educators in training prior to initiating changes in classroom context and teaching behavior. This practice serves two key purposes. First, it establishes a respectful and reciprocal tone to the trainer-trainee relationship, which aids transmission of information and strategies later in the professional development program. Baker and Smith (1999) found that, "Learning about teachers' classrooms...helped establish a sense of trust and collegiality. As we began to introduce ideas about instructional changes, this positive atmosphere contributed to teachers' willingness to experiment with new approaches" (p. 248). Similarly, Assel et al. (2007) developed a training that was "learner-centered and knowledge-based" and built upon what teachers already knew and were practicing in their classrooms. In addition, sometimes researchers found that the approach to professional development or even the classroom strategies themselves had to be tailored to the context of the teachers. The Books Aloud training program (Neuman 1999) originally had planned to train all participating teachers in group sessions at local libraries. However, due to the "great variability among centers" (some had "highly trained staff and were accredited....others were extremely needy, suffering from tremendous turnovers in personnel, little curriculum planning, and paltry budgets"), trainers had to revise the original professional development approach to make it much more "context-specific" than originally planned (Neuman 1999, p.294). Similarly, Baker and Smith concluded that they "needed a firm understanding of teachers' current practices before initiating changes" (Baker and Smith 1999, p.248). Interestingly, only these two studies addressed the importance of establishing an understanding of existing classroom contexts prior to implementing professional development programs within classrooms. This approach is consistent with the National Research Council Report *How People Learn* (Donovan, Bransford, and Pellegrino 1999), which has as one of its three principles for learning that the starting point needs to be understanding the preconceptions of learners that can serve as the foundation for new learning, or that involve misconceptions that may need to be changed before progress can be made.

Provision of Resources. Instructional materials provide another key foundational piece for strong professional development programs. Materials that may facilitate the effectiveness of professional development include resources on children's language and literacy development, such as summaries of key principles or timelines of developmental benchmarks; materials that outline suggested activities, such as a curriculum manual or activity guide; and resources to which educators may refer further questions or go to for more information, such as a Web site. Several but not all of the studies under review explicitly mention instructional materials that educators take with them after the training is completed. For the studies that did not mention instructional materials, this omission may demonstrate an oversight of the importance of these materials by the evaluation teams when reporting on their study rather than an absence of them from professional development programs. These materials may be extremely valuable to the sustainability of the training, as they can remind the educator about key take-home points of the training long after memory of its details has begun to fade. The clarity and ease of utility of these materials is important in determining whether or not educators will use them as a

resource when planning classroom activities. The types of materials that were mentioned include: a page of examples of open-ended questions to use during interactive book reading (Wasik and Bond 2001); prop boxes which contain books and related concrete objects representing target words (Wasik, Bond, and Hindman 2006); a handout of book reading tips (Neuman 1999); a handout of recommended books for reading aloud (Neuman 1999); written instructions for activities that reinforce themed vocabulary (Wasik and Bond 2001); copies of lesson plans developed cooperatively during training to develop early language and literacy (McCutchen et al. 2002); copies of instructional suggestions developed by researchers (McCutchen et al. 2002); handouts defining important components of early literacy (such as fluency and letter-sound sequences) as well as descriptions of methods for teaching these components (Baker and Smith 1999); overhead transparencies and videotapes (Dickinson and Caswell 2007); a Web site with suggestions of books and activities to support children's phonological awareness and early literacy (Dickinson and Brady 2006, Example 3); and materials to send home with parents to practice skills that children are learning in the classroom (Assel et al. 2007). The element that all these materials have in common is creating a bridge between the educator's training and his or her classroom practice. Unfortunately, the study designs do not permit an analysis of the linkage between provision of these foundational elements of professional development and educator knowledge, educator skill, or child outcomes.

C. 1d. Implementation of Professional Development. Our analysis of the effectiveness of implementation of professional development included several key aspects of implementation: (1) the target audience for the professional development program (i.e., was the scope of professional development narrow or broad?); (2) any incentives or supports provided to educators for attending; (3) the content covered within the professional development model (i.e., was there narrow or comprehensive coverage of topics within the area of children's early literacy development?); (4) the mode or modes of delivery of the professional development content; (5) the intensity or duration of the professional development activities (i.e., dosage); and (6) the fidelity of implementation carried out by the educators during and after the receipt of professional development.

Target Group. The majority of studies targeted individual educators or child care providers in their professional development interventions. However, several studies included administrators and other support staff (such as speech or English language development specialists) in the training (Adger, Hoyle, and Dickinson 2004; Baker and Smith 1999; Dickinson and Brady 2006; O'Connor et al. 2005; Taylor and Pearson 2004). In almost all cases in which administrators were included in the professional development training, the researchers articulated a desire to increase institutional capacity more broadly for improved instruction of early literacy skills within the child care center or preschool classroom. In one study, the senior research team met monthly with the head administration of the program, citing the need for "buy in" from administrators, as ownership of a program can be crucial to its success (Assel et al. 2007). Results indicate that this more inclusive approach to professional development helped to foster joint knowledge building across staff within an institution, and was related to beneficial improvements in classroom literacy environments as well as improvements in child outcomes over time.

Incentives. Seven studies reported using incentives such as academic credits and tuition coverage in support of teacher attendance at the professional development programs (Adger, Hoyle, and Dickinson 2004; Dickinson and Brady 2006; Foorman and Moats 2004; McCutchen et al. 2002; Neuman 1999; Podhajski and Nathan 2005; Dickinson and Caswell 2007). While such incentives are likely to have had a direct effect on levels of attendance (and thus, dosage of the professional development intervention), it is not clear how incentives might have affected outcomes in terms of educator knowledge, practice, or child outcomes. That is, study designs and analysis plans did not permit a direct analysis of the effects of incentives on dosage or on outcomes.

Coverage of Content. As discussed earlier, many professional development models for early literacy addressed multiple aspects of early literacy in the content of their professional development programs. Such comprehensive models of professional development were generally associated with positive outcomes in terms of educator knowledge, educator practice, or child outcomes. One drawback of the comprehensive approach to professional development in the area of literacy development is that it is unclear which components of the intervention were responsible for the positive outcomes identified for the intervention group. This was true even when only two components of early literacy (interactive book reading and phonemic awareness) were combined within a single professional development intervention (e.g., Whitehurst, Epstein et al. 1994; Whitehurst et al. 1999). As noted earlier, there was a study that compared two different curricula with emphasis on different language and literacy skills. Assel and colleagues (2007) compared *Let's Begin with the Letter People* with a strong focus on letter knowledge and phonological awareness to *Doors to Discovery*, which places more emphasis on language comprehension. They found that, as expected, children receiving the *Let's Begin* curriculum showed more robust growth in letter knowledge and phonological awareness. Studies like these, that compare two interventions or curricula that are similar overall, but differ in their focus, may provide clues as to which components of various interventions lead to desired child outcomes.

Mode of Delivery. The mode of delivery of professional development tended to align with the content being conveyed. That is, in professional development programs in which comprehensive information on children's early literacy development was covered, the approach for delivering the professional development information tended to be multi-modal. For example, Baker and Smith (1999) describe a professional development approach that included (1) in-service training sessions; (2) meetings with teachers in large-group, small-group and individual settings; (3) classroom observations; and (4) informal and formal interviews with teachers. Furthermore, within each of these modalities, multiple activities were carried out. To use Baker and Smith (1999) as an example again, the in-service training sessions included the sharing of research-based benchmarks for critical skills, the introduction of commercial curricula that targeted specific components of early literacy, the demonstration of specific behaviors to be performed by educators, and time for practice and feedback on the use of new teaching techniques, materials, and strategies. Conversely, professional development programs that had a much narrower focus on a single aspect of literacy development tended to have

less-elaborated methods of delivering the professional development. At the extreme was an intervention that merely gave teaching materials and a teaching manual to preschool teachers with the instruction to "work from the program's manual in whatever way best fitted the school's regimens, consistent with the aim of increasing phonemic awareness in the children" (Byrne and Fielding–Barnsley 1995, p. 498). However, typically, even professional development programs that focused on a single aspect of literacy development tended to include workshops as well as ongoing feedback and assistance via coaching or mentoring in the classroom.

Several of the studies reviewed compared an instruction-only approach with instruction plus an on-site approach to help assure implementation practices, which the researchers refer to sometimes as mentoring and sometimes as coaching. We use the terminology chosen by the researchers themselves here, while noting that there is a clear need for clarification and consistent use of terminology. (Assel et al. 2007) compared a mentoring and non-mentoring condition and found that the impact of mentoring depended on the type of skill being measured and the type of early childhood program being implemented. For example, they found that mentoring had the greatest impact on child outcomes in Title I or universal pre-K programs compared to Head Start programs, and that the advantage of mentoring was greater for literacy rather than language skills. In a study by Neuman and Cunningham (2009), a coordinated approach to professional development that combines course work and ongoing coaching in early language and literacy development was compared to course work alone and "business as usual" in center- and home-based settings. They found no significant differences in teacher knowledge between teachers who received course work plus coaching, course work alone, or "business as usual." Specifically, neither treatment group outperformed the control group on post-test knowledge scores (accounting for pre-test scores as a covariate). The two control groups had equivalent post-test scores, indicating that coaching did not provide additional benefit for teacher knowledge. However, significant improvements in language and literacy practices were found for teachers who received both the three-credit course on language and literacy and the ongoing coaching. The effect size was large and considered to be educationally meaningful for both center-based and home based settings (Cohen's $d = .77$ for center-based and $d = .82$ for home-based settings). This study provides compelling evidence for the impact of professional development models that combine course work with ongoing, on-site coaching that is coordinated with the course work in such a way as to reinforce the concepts and teaching strategies being emphasized in the course work. Although this study clearly demonstrates that course work plus coaching obtains greater impacts on teacher practice than course work alone or "business as usual," it does not rule out the possibility that equivalent gains in teacher practice could be obtained with coaching alone.

Although coaching is becoming an increasingly popular mode of professional development, more research needs to be done to determine the most effective strategies for providing coaching, and determine who may benefit the most and in what settings. In addition, one of the important inquiries in designing interventions targeted at improving children's language and literacy skills (or any area of children's development) is the efficiency and cost-effectiveness of the intervention. Although more intensive

interventions that involve coaching and mentoring may be more time-consuming and expensive, if they lead to greater gains in child outcomes, they may be worth the cost.

Dosage. The discussion of mode of delivery of professional development is closely related to the intensity and duration of professional development. Many of the professional development programs reviewed started off with intensive workshops or kick-off sessions, which tended to last for several full days or weeks, followed by shorter follow-up sessions or classroom observations at regular intervals over the course of several weeks or months (e.g., Adger, Hoyle, and Dickinson 2004; Landry 2002; McCutchen et al. 2002; McGill-Franzen et al. 1999; O'Connor et al. 2005; Podhajski and Nathan 2005; Justice, Pence, and Wiggins 2008; Landry et al. 2008). In general, models with a high "dosage" of professional development tended to be associated with positive outcomes for both educators (increased support for children's language and literacy development) and children (improvements on language assessments). However, it was also true that models with a lower "dosage" of professional development were also associated with positive outcomes. Most notably, the series of studies by Whitehurst and colleagues involved a one-time, 30-minute training in dialogic reading, a specific interactive book reading technique, which resulted in mostly favorable child outcomes at post-test, although there were some mixed results (Whitehurst, Epstein et al. 1994), and effects did not last through first and second grade (Whitehurst et al. 1999).[5] Similarly, Wasik and Bond (2001) employed a four-week professional development training (not necessarily implemented in consecutive weeks) on interactive book reading. The training resulted in significant effects on both educator practice, such as using relevant vocabulary words during book reading, and children's vocabulary and expressive language development.

Dickinson and colleagues (2006) experimented with different levels of duration and dosage of their professional development model. Across a series of studies described in Dickinson and Brady (2006), the LEEP training was administered in the following dosages: two three-day sessions of discussions separated by three months, ten sessions spaced two to three weeks apart over a six-month span of time, three two-day sessions spaced five weeks apart, and eight four-hour modules. Regardless of these variations in duration, timing, and dosage of the professional development, results indicated positive changes in the literacy environment of the classroom, such as the presence of a book area, words and letters displayed in the classroom, facilitation of children's language, interactive book reading. Further, children performed better compared to controls on various measures of language and literacy development. Given the consistent positive results regardless of timing and dosage, it is likely that dosage is not the decisive factor in determining positive effects of the LEEP training.

Taken together, these studies' findings suggest that intensive and extensive administration of professional development tends to be associated with positive outcomes for both educators and children, but even small dosages of professional development have been associated with positive child outcomes. These seemingly inconsistent

[5] A more thorough review of results of the Whitehurst et al. (1999) study is presented in our later discussion regarding sustainability of effects.

findings can be explained if we look more closely at the goals of the professional development in these studies. Professional development targeted on a *discrete set* of skills (such as dialogic reading) may only require short-term and brief professional development activities. But professional development that has a *broad focus* (e.g., programs that aim to affect change across a wide range of language and literacy skills) appears to require more extensive professional development activities, perhaps spread over time. In addition, professional development that aims to teach early childhood educators *new* skills may require professional development models that are more intensive or longer in duration. While the studies reviewed above suggest that the appropriate dosage of professional development depends in part on the goals or focus of the professional development, additional studies are needed to examine this hypothesis systematically.

This conclusion is in keeping with the perspective presented by Joyce and Showers (2002) based on their work in providing training and structuring peer coaching for teachers of K–12 classrooms. They conclude that trainers need to be able to gauge both the complexity of what teachers are being instructed to implement, and the newness of the content in terms of previous knowledge and practice of the teachers. "Trainers need to be able to gauge the difficulty level to help plan the intensity and duration of training and select the components they will use accordingly" (Joyce and Showers 2002, p. 2).

Fidelity of Implementation. Relatively few studies addressed fidelity of implementation. One explicit strategy for assessing fidelity of implementation was conducting classroom observations on a regular basis after delivery of the professional development training (Baker and Smith 1999; Byrne and Fielding–Barnsley 1995; O'Connor et al. 2005; Podhajski and Nathan 2005; Assel et al. 2007).[6] Such observations at times yielded information on important deviations from the original professional development activities (O'Connor et al. 2005; see Baker and Smith 1999). Several researchers reported analyses of "high compliant" versus "low compliant" centers or teachers (e.g., Lonigan and Whitehurst 1998; Whitehurst, Epstein et al. 1994) or "high-reform-effort" versus "low-reform-effort" schools (Taylor and Pearson 2004), which suggests that some centers or schools were not applying the professional development strategies in a manner or intensity that was anticipated given the original professional development training. Pence and colleagues (2008) tracked fidelity of preschool teachers' adherence to a language-focused curriculum over time, and reported that treatment teachers' fidelity to the intervention transitioned from high scores in the fall to low scores in the winter and then to a rebound in high scores in the spring (matching those in the fall). These findings suggest that it may be important to assess treatment fidelity at multiple time points in order to get a complete understanding of teachers' adherence to an intervention.

In a few instances research suggests that low adherence to the instructional methods taught in professional development was responsible for lack of improved child outcomes.

[6] Not all classroom observations were conducted for the explicit purpose of monitoring fidelity of implementation. For example, McCutchen et al. (2002) conducted classroom observations to provide feedback on instructional practices. However, implicit in this feedback could be redirection of teacher practice to better align with models imparted through the original professional development training.

Specifically, Whitehurst and colleagues (1994) reported that children in the least compliant Head Start centers (i.e., those with the lowest frequency of classroom dialogic reading) did not benefit from the intervention as did those children in the other, more compliant centers. In a study designed to examine the impact of procedural fidelity on the quality of instruction, Justice, Mashburn, Hamre, & Pianta (2008) found that although teachers were able to implement a language and literacy curriculum with a high degree of fidelity to routines (e.g., calling children's attention to the lesson), this was not linked to quality of instruction. However, fidelity to teaching aspects of the lessons (e.g., teacher makes explicit attempts to engage the children's participation in the lesson) was a positive predictor of quality of literacy instruction. The results of this study suggest that measures of procedural fidelity alone may not be sufficient indicators of the quality of language and literacy instruction (Justice et al. 2008). Overall, most researchers did not analyze how fidelity of implementation was linked to child outcomes.

In sum, many aspects of the implementation of professional development can influence outcomes in educator knowledge, educator practice, and child outcomes. However, the current corpus of studies does not permit us to disentangle which aspects of the implementation of professional development are causally linked to outcomes. Some features that can be considered potential contributors in this set of studies include: a strategy that includes supervisors as well as early childhood educators in professional development activities; comprehensive coverage of content in early literacy research and literacy instruction; multi-modal approaches to delivering professional development; intensive and extensive administration of professional development (rather than a one-time, short dosage for comprehensive professional development content); and ongoing monitoring of fidelity to the implementation of professional development training through on-site follow-up observations and mentoring.

C. 1e. Sustainability of Effects. The Committee on the Prevention of Reading Difficulties in Young Children noted that staff development efforts often lack the systematic follow-up necessary for sustainability (Snow, Burns, and Griffin 1998, p. 331). Although studies of the sustainability of professional development efforts to improve early literacy instruction and early literacy outcomes are rare, the few that exist can be informative to guide future professional development efforts.

Sustainability of Teacher Practice. Of the 37 articles reviewed, only three studies explicitly addressed the sustainability of improved teacher practice over time in their analyses. Baker and Smith (1999) reported on a three-year project to improve kindergarten teachers' literacy practices in two different schools. The three-year project included a base year, an implementation year, and a sustainability year. The intervention targeted primarily kindergarten teachers but also included Title I and English language development specialists as well as principals in the two schools. Intervention activities focused on introducing phonemic awareness and alphabetic understanding in the kindergarten classrooms. Activities included experimentation with commercially available research-based curricula, the reading of academic articles to provide a research-based grounding in the importance of phonemic awareness and alphabetic understanding, and individual, small group, and large group meetings with the researchers on a regular

basis. Researchers also conducted observations in the classrooms and provided coaching during the implementation year. The teachers involved in the intervention were actively engaged in decision-making regarding the type of intervention activities that would be conducted within the classroom. In addition, teachers from first, second, and third grades were included in large-group discussions to inform these teachers who were not involved in the intervention about the intervention activities so that they could assist with sustaining those activities once children moved into the older school grades. The research found that children in one school's intervention classroom out-performed the control classroom in the same school during both the Implementation and the Sustainability years. Children in the intervention classroom during the Sustainability year in the other school did significantly better than the children in the intervention classroom in the same school during the Implementation year (effect sizes were small but improved over time). These findings suggest that not only were changes being sustained, but the overall program was improving with growing teacher expertise. However, there was some uncertainty regarding whether the reading program in first grade would support the gains children made in kindergarten.

A study described in Dickinson and Brady (2006, Example 4) found that information imparted during two intensive three-day training sessions (separated by three months) resulted in enduring changes in Head Start providers' classroom practices with regard to child language and literacy development. Specifically, informal observations of teachers two to three years after the training indicated sustained changes in how and how often books were read, the types of books read, and the use of thematic instruction. Supervisors who had attended the trainings with the teachers were found to provide positive feedback and encouragement to the teachers two to three years later.

Building on this study, Dickinson and colleagues are expanding the scope of the training of book reading to include all members of a child care center (Dickinson and Brady 2006, Example 5). Their method involves training one teacher who becomes the in-house expert responsible for training the rest of the child care staff. Overhead transparencies and videotapes on children's language and literacy development were given to the center as permanent training materials. While this evaluation study is ongoing, preliminary results indicate that classrooms in centers that experienced this type of group training had higher ratings of the literacy environment (according to the ELLCO) than did comparison classrooms. It is still unclear whether this strategy will result in long-term, sustained improvements in teacher knowledge or practice.

A common thread among the above-mentioned studies is the explicit intent on the part of the researchers to have the teachers as collaborators in the professional development intervention and to have the teachers and the educational institutions take ownership of their reform efforts. This model is akin to the concept of *professional learning communities* in K–12 settings (DuFour, Eaker, and DuFour 2008). It is noteworthy that the Baker and Smith (1999) and Dickinson and Brady (2006) studies involved all relevant educators within the institution, including the principal or center director. This suggests that interventions that engage a wide range of early childhood educators are more likely to result in sustainable change in teacher practice. Although this is in keeping with recent

thinking about the nature of systems change in schools (Fullan 2007), this hypothesis warrants empirical testing in early care and education settings.

There were no studies that examined sustainability of teacher knowledge about supporting children's early language and literacy development.

Sustainability of Child Outcomes. Three studies addressed whether positive child outcomes that resulted from professional development interventions were sustained over time. Two of these studies address the long-term sustainability of joint book reading techniques. Neuman (1999) found that the effects of the Books Aloud program, which involved the provision of high-quality children's books to child care centers, along with 10 hours of professional development to center staff focused on book-reading strategies and thematic instruction, resulted in sustained child outcomes six months later. Specifically, children exposed to the Books Aloud program scored above comparison children on five of six measures of language and literacy development, such as letter name knowledge, at this six-month follow-up. Whitehurst et al. (1999) conducted an experimental study that assessed the effectiveness of an intervention introduced during the Head Start year. The intervention included a 30-minute, one-time training of Head Start teachers and parents in dialogic reading techniques, as well as the implementation of curriculum in phonemic awareness. Pre- and post-tests of child language and literacy outcomes were gathered during the Head Start year, and follow-up child assessments were also collected at the end of kindergarten, first, and second grade. Results indicated that children in the intervention groups performed significantly better than the control group on measures of language and literacy development at the end of the Head Start and kindergarten years, but there were no significant differences between experimental and control groups at the end of first or second grades. In sum, the results of these two studies indicate short-term rather than long-term effects of joint book reading techniques. Whitehurst and colleagues (1999) suggest that for interventions to have a long-term effect on children's reading ability, they should include a focus on pre-reading skills such as letter recognition and letter-sound matching (alphabetic principle).[7] It is important to note that studies examining long-term effects of interventions must adequately control for the quality of the subsequent learning environments.

The third study that addressed sustained child outcomes was the Baker and Smith (1999) study mentioned above. Results indicated that children in the intervention classrooms in one of the two schools had higher scores on phonemic awareness and alphabetic understanding than did the comparison groups at the end of the intervention year as well as at the end of the sustainability year. The children in the second school showed significant gains in both phonemic awareness and alphabetic understanding across both years but did not reach the level of performance of their peers in the other school in either year. It should be noted that the children in the latter school were part of an intervention

[7] As noted in Taylor and Pearson (2004), the relationship between story book reading and children's reading achievement is complex. While children's knowledge of word meanings and story comprehension can be improved through exposure to story book reading (Dickinson et al. 2003; DeTemple & Snow, 2003, and Stahl 2003, as cited in Taylor and Pearson 2004), adults rarely focus on word recognition during story book reading.

for one hour after regular kindergarten because they were identified as being at particular risk for reading difficulties. On the other hand, all kindergartners in the intervention group in the former school were exposed to the literacy interventions within the regular kindergarten classroom.

Taken together, these studies examining sustained effects on child outcomes suggest that professional development for literacy instruction can have short-term, sustained effects on child outcomes. Long-term effects may in part depend on the introduction of additional elements of literacy instruction that build on the mastery of earlier elements, as well as supports for continued language and literacy growth received in later years of schooling.

C. 1f. Overall Summary of Findings for the Early Language and Literacy Studies Reviewed.

The 37 studies examining the promotion of young children's early language and literacy skills that were reviewed provide a great deal of information about professional development strategies in this area. In particular, because early language and literacy encompasses multiple skills (including, for example, the development of oral language skills, vocabulary development, phonological awareness, letter knowledge, print awareness, and emergent writing skills), early childhood educators need to be trained and supported in the faithful execution of a variety of strategies to support children's language and literacy development in early childhood settings. Such strategies include—but are not limited to—the use of interactive book reading practices, arranging a separate and inviting book area, increasing environmental print, using props such as writing materials in play areas, and assessing individual children's language and literacy skills for the purpose of monitoring progress for individual children and for the effective implementation of the professional development program. Many of the 37 studies reviewed emphasized more than one of these strategies within the same professional development intervention. As such, it is difficult to disentangle which strategies are related to specific outcomes for educators and children. It should be noted that although engaging parents was acknowledged as an important part of promoting children's language and literacy development and was explicitly mentioned in at least five studies, none of the professional development examples in this set of studies provided early childhood educators with training on strategies to involve or engage parents in literacy techniques to support children's language and literacy development.

Not only did many of these studies address multiple language and literacy practices at the same time, they also *often used a variety of professional development delivery methods* to convey the knowledge and practice components of early language and literacy development. Specifically, many studies employed course work or workshops to convey the research base supporting the promotion of language and literacy practices, as well as on-site support in the classroom or periodic workshops after the more intensive initial training to provide ongoing support for the establishment of new practices in the early childhood setting. Only one study systematically compared providing course work plus on-site professional development activities to course work alone or "business as usual"

(Neuman and Cunningham 2009). This study indicated that there were no differences in educator knowledge across the different conditions, but there are benefits to educator practice by providing on-site work in addition to course work. Further research is needed to assess whether on-site work alone could achieve comparable levels of benefit for teacher practice.

In addition to combining modes of professional development delivery, there are several additional "promising practices" that emerged from the review of the findings from this body of studies focused on promoting children's early language and literacy skills. First, *establishing goals and objectives* for the professional development appears to be important. The majority of the successful studies provided early childhood educators with clear recommendations based on research for practices that should be adopted in the early childhood setting but also permitted educators to set their own goals during the course of the training and encouraged them to engage in self-reflection throughout the process. Another key element of successful professional development is *understanding the current classroom context* and being responsive to and respectful of the educator's current set of skills and contextual constraints. In addition, *provision of resources* may be important for successful professional development programs. Resources could come in the form of summaries of key take-home points of a training, curriculum manuals, activity guides, sample handouts to send home with parents, and lists of reference materials (e.g., links to websites or developmental timelines). Although no studies specifically assessed the effectiveness of these additional resources for the success of the professional development intervention, provision of resources has the potential to sustain knowledge and practice components delivered through professional development activities within the early childhood setting. More research would be helpful to empirically examine the benefits of provision of resources within professional development programs.

Another "promising practice" includes *engaging a cohort of educators* in professional development together within an institution. Involving administrators as well as early childhood educators and additional support staff (Dickinson and Brady 2006, Example 5) has many benefits, including establishing "buy-in" from all levels of the organization, creating a "learning community," creating in-house experts who can be used as resources for current and future staff, and providing sustainability of the professional development in light of staff turnover. More empirical examination of whether this method of providing professional development is related to change throughout an early care and education setting is warranted.

Assessing the *fidelity of implementation* was another important component of professional development interventions. Fidelity was examined in 9 of the 37 studies. In general, fidelity of implementation was not examined in relation to child outcomes but rather in relation to educator practice. Collectively, the findings suggest that it may be important to assess treatment fidelity at multiple time points through ongoing, on-site observations in order to get a complete understanding of teachers' adherence to an intervention. Furthermore, *procedural* fidelity does not necessarily translate into

improved *quality* of educator practices. Follow-up on-site professional development may be necessary to insure quality improvements in educator practice.

There were several features of professional development programs to promote language and literacy that did not result in a clear conclusion about their benefits for educator or child outcomes. One example is the use of *incentives* to engage participants. There was no clear effect on either fidelity of implementation or on outcomes of the studies that used incentives. Another is the intensity of the *dosage of professional development* delivered. As a whole, the studies seem to suggest that intensive and extensive administration of professional development for language and literacy practices tends to be associated with positive educator and child outcomes, but there were several examples in which even a small dosage of professional development (e.g., 10 hours in one case, 30 minutes in another) was associated with positive child outcomes (Neuman 1999; Whitehurst et al. 1999). Our examination of the studies for which this was the case suggests that short-term or brief dosages of professional development may suffice when a *discrete set of skills* is targeted (such as joint book reading), but professional development that has a *broad, comprehensive focus* (such as a combined focus on phonological awareness, print knowledge, and oral language skills) may require more long-term and intensive professional development activities.

Sustainability of improved outcomes for educators and children is related to issues of dosage of professional development, and also to the breadth and depth of the strategies that are being newly introduced to the early childhood setting. However, the sustainability of improved outcomes was rarely measured in this set of studies. Specifically, out of 37 studies, only three studies examined sustainability of education practices, and another four studies examined sustainability of child outcomes; no studies examined the sustainability of educator knowledge; no studies examined the sustainability of educator knowledge. The key for sustaining educator practice outcomes appears to be engaging educators in the intervention process and encouraging them to "own" the changes they are making. When child outcomes were measured, they proved difficult to sustain beyond six months or a year (Neuman 1999; Whitehurst, Epstein et al. 1994; Garet et al. 2008; Whitehurst, Arnold et al. 1994; Whitehurst et al. 1999). It is important to note that these few studies that examined long-term effects of interventions did not always adequately control for the quality of the subsequent learning environments. Future research examining sustainability of child outcomes should attempt to capture those aspects of subsequent learning environments which might affect child outcomes, including subsequent educator characteristics.

A major limitation of this body of work is the lack of detailed information on the *process* of professional development to support young children's language and literacy development. In general, the studies provided sufficient detail on the *content* of the curriculum or literacy practice to be implemented, but provided little detail on what it took to get the early childhood educators to be able to implement the new curriculum or practice with fidelity. There were, however, a few notable exceptions. A study by Adger and colleagues (2004) used discourse analysis to analyze discussions among educators and trainers within professional development sessions, which permits an explicit

description of the type of educator knowledge that is acquired or consolidated in professional development settings and the processes by which professional development takes place (Adger, Hoyle, and Dickinson 2004). In addition, a study by Neuman and Cunningham (2009) is one of the few that provides some detail on the characteristics of on-site professional development staff and their training, as well as detail about how the on-site work was carried out (Neuman and Cunningham 2009). The field would benefit greatly if future research studies would include greater detail on the characteristics and qualifications of the staff used to deliver the professional development, the training and ongoing support offered those providing the professional development, and detailed information on how the professional development was delivered to early childhood educators. By providing such information, we may be able to determine in future work the most effective strategies for providing on-site professional development activities, and the most efficient and cost-effective combination of professional development strategies.

Finally, more research is needed on the particular language and literacy practices that will support ELLs in the preschool years. As stated earlier, with one notable exception, none of the studies included cultural and linguistic competence as part of their professional development (Yaden et al. 2000). Furthermore, researchers tended not to control or test for differences in child outcomes based on ELL status. Better measures of the aspects of the early childhood environment that support ELL children, as well as better measures of individual ELL children's developmental status, are needed in order to examine the effects of professional development in support of ELL in early childhood settings (August and Shanahan 2006).

C. 2. Early Mathematics

C. 2a. Overview of Studies Reviewed.

Table 2. Characteristics of Early Mathematics Studies Reviewed

Study Number	Citation	Design*					Outcome Areas Examined†		
		Exp	Quasi-Exp	P/P With Comp	P/P Without Comp	Desc	EK	EP	CO
1	Arnold, Fisher, Doctoroff & Dobbs (2002)	X					✓		✓
2	Casey, Erkut, Ceder & Young (2008)	X							✓
3	Clements & Sarama (2008)	X						✓	✓
4	Sophian (2004)		X						✓
5	Starkey, Klein, Clements & Sarama (2008)	X						✓	✓
6	Starkey, Klein & Wakeley (2004)			X					✓
7	Young-Loveridge (2004)			X					✓
Total Studies Reviewed: 7		**4**	**1**	**2**	**0**	**0**	**1**	**2**	**7**

(*Exp= Experimental, Quasi-Exp= Quasi-Experimental, P/P With Comp= Pre-Post with comparison group, P/P Without Comp= Pre-Post without comparison group, D= Descriptive; †EK= Educator Knowledge, EP= Educator Practice, CO= Child Outcomes)

Recent descriptive as well as evaluation research is documenting the linkages between early educators practices in early mathematics and children's skills in this area.

Descriptive Research Linking the Focus on Mathematics in Early Childhood Settings and Children's Early Mathematics Skills. A recent descriptive study points to the potential importance of providing professional development to early childhood educators in the area of early mathematics. Klibanoff and colleagues (2006) note that by kindergarten entrance there are substantial, individual differences in young children's early mathematics achievement scores and, further, that there is already a gap by socioeconomic status. While more than two-thirds of young children in the United States attend a formal early care and education program (center-based child care, pre-kindergarten, Head Start or preschool) during the year prior to kindergarten, they observe that "…very little is known about the nature and frequency of mathematical input in preschool classrooms or about the effects of such input variations on children's mathematical development" (p. 59). This study asked whether children's gain scores in early mathematics were related to the amount of teachers' talk about mathematics

concepts during and immediately after "circle time" [8] in 26 preschool and child care classrooms in which children varied as to socioeconomic status and ethnicity. To rule out the possibility that talk about mathematics was one marker of overall classroom quality or the complexity of teacher speech, they considered gain scores in math achievement in relation to classroom quality and the general complexity of teacher speech, as well as to teachers' talk about mathematics concepts.

The findings of this study replicate previous reports of wide individual difference in early mathematics achievement as well as the early emergence of differences in mathematics achievement by socioeconomic status. In addition, the early childhood educators in the study showed substantial variation in both the amount and quality of their spontaneous talk about mathematics. Children's fall to spring gain scores in mathematics achievement were significantly related to the amount of teacher talk about mathematics as recorded during the middle of the school year. However, overall observed classroom quality and the syntactic complexity of teacher speech did not predict gain scores in early mathematics once the amount of teacher talk about mathematics was controlled, indicating that children's gain scores in mathematics were responsive specifically to input focusing on mathematics. The pattern of prediction to children's gain scores in mathematics was similar for a measure of the quality of teacher talk about mathematic and the measure of amount of teacher talk about mathematics. These findings, while correlational, nevertheless point to the possibility that increasing both the amount and the quality of early childhood educators' talk about mathematical concepts may improve young children's math achievement scores and narrow the early-emerging gap by socioeconomic status in math achievement.

Evaluation Studies Focusing on Professional Development in Early Mathematics. A small set of evaluation studies is beginning to provide evidence in support of this hypothesis. Across these recent studies, children's achievement scores either on specific aspects of early mathematics knowledge or on broad measures of early mathematics achievement were significantly improved when early childhood educators were given professional development in early mathematics instruction. As will be noted, the studies tend to focus on the content of the activities or curriculum provided to strengthen this aspect of the early childhood environment. There is limited detail across the studies in terms of the specific nature of the professional development provided. Further, the research does not focus on the extent to which teacher knowledge and skill were affected by the introduction of a set of activities or a new curriculum, with only a few studies examining changes in teacher practice. As Griffin (2004) describes, the emerging research in this area tends to focus on the new tools provided to early childhood educators in the area of mathematics, but not how educators are themselves instructed in the use of the tools.

Seven studies were identified in peer-reviewed journals or reports that analyzed the evaluations of professional development for early childhood educators focusing on

[8] Circle time is a time during formal early care and education programs when the full group meets together, often sitting in a circle. Activities may include singing together, reviewing a calendar and completing a chart of the weather, planning for the day, sharing, and reading a book.

mathematics. Two further papers were identified that described new early mathematics curricula but did not report on evaluations of them (Greenes, Ginsburg, and Balfanz 2004; Griffin 2004). These evaluations are anticipated in the future. There was substantial information on the professional development provided in coordination with one of these, the *Big Math for Little Kids* curriculum, but the work to date provides only preliminary data on the effects of this approach for teachers and children (Ginsburg et al. 2006), with an evaluation of this curriculum in process. While this section will focus on the evaluations of professional development coordinated with early mathematics curricula that have been completed, the insights on professional development issues concerning early mathematics reported thus far by the Ginsburg research group will be summarized to provide further context.

In this set of studies, it is impossible to separate out whether the findings on outcomes are related to the curriculum or activities that have been introduced, or to the professional development that was provided about implementation of the curriculum or activity. The studies present these elements as a package. As noted, they often provide much more detail about the curriculum or activities and how and why they were developed than on the process used to prepare early educators to implement them. [9]

Evidence of Young Children's Spontaneous Interest in Mathematics. Across the articles reviewed concerning professional development for early mathematics, a consistent theme is that young children have spontaneous interest in mathematics and informal knowledge of mathematical concepts. Researchers noted that this interest and informal knowledge can provide a foundation for extending and deepening young children's mathematical skills through a systematically developed set of activities. This set of articles stressed that learning early mathematics can be both absorbing and fun for young children; it does not need to be approached through didactic instruction but can involve engagement in exploration of materials, stories, games, and physical activities. The researchers note the need for adult planning and structuring, but this should be done with the goal of supporting and extending active child engagement and participation in activities. A further theme stressed in a number of the articles was that it is not necessary to separate out early mathematics development from language and literacy development. Some studies intentionally embedded the presentation of mathematics content within book reading or oral storytelling (Casey et al. 2008; Young-Loveridge 2004). We caution, however, that the one study that examined children's language and literacy development as well as early mathematics knowledge following the introduction of a preschool mathematics curriculum found effects on early mathematics but not on language or literacy development (Starkey et al. 2008).

Variation in Content Covered in Professional Development on Early Mathematics. There was a difference across the published studies as to breadth of the early mathematics topics covered. Some covered a range of topics while others focused on a more limited set viewed as foundational for later development. Those that covered a range of topics referred to the joint statement of the National Association for the Education of Young

[9] The articles summarized in this section report both on the development of the intervention and on its evaluation.

Children (NAEYC) and the National Council of Teachers of Mathematics (NCTM) regarding the important topical areas to cover in work with young children. For example, Starkey et al. (2004) describe the provision of professional development for an intentionally broad curriculum that included enumeration and number sense, arithmetic reasoning, spatial sense, geometric reasoning, pattern sense and unit construction, non-standard measurement, and logical relations. Ginsburg and colleagues, following the NAEYC and NCTM joint statement closely, focused on numbers and operations; geometry, spatial relations and measurement; patterns and logical reasoning; and data analysis (Ginsburg et al. 2006). In contrast, Sophian (2004) focused more narrowly on a concept that can serve as a stumbling block for young children: the use of differing unit sizes in measurement and the implications of this for numerical outcomes. Casey and colleagues (2008) emphasized children's spatial reasoning skills, while the curricula or activities introduced by Arnold, Fisher, Doctoroff and Dobbs (2002) as well as by Young-Loveridge (2004) emphasized numeracy.

The more comprehensive curricula tended to stress the need for the introduction of materials in a manner that permitted deepening and extending children's understanding of topics, building from one topic to the next, and permitting linkages to be made across activities. Clements and Sarama (2008) emphasize the difference between *curricula*, in which separate topics are introduced during different activities, and their *approach*, in which topics are returned to repeatedly across activities to help children progress in their depth of understanding of particular topics and to consolidate earlier learning. They emphasize the importance of weaving together content across activities. Ginsburg and colleagues (2006) express concern about programs that are organized as "collections of activities" that do not systematically introduce, revisit and enrich specific concepts intentionally over time.

Approaches Combining Workshops or Training with On-site Visits. Five of the seven evaluation studies report on professional development implemented through workshops or days of training followed up through on-site visits to address questions, provide further materials, or observe to assure fidelity of implementation and provide feedback. There was, however, substantial variation in how long the workshops or training lasted and how many follow-up sessions were scheduled. These appeared to be related to the breadth of the curriculum and duration of implementation, with the broad curricula involving greater extent of exposure to professional development and implementation in classrooms over longer periods of time.

Thus, in the work of Arnold and colleagues (2002) in preparing teachers to implement a curriculum over a six-week period with a fairly narrow focus on numbers, counting and quantity, an initial training workshop lasted two hours and was followed by brief weekly visits. The two-hour training focused on how to implement a range of activities, choosing from among 85 provided to the teachers, during different parts of the daily schedule.[10] The training also introduced principles for implementation (encouraging and praising the

[10] During the first three weeks of implementation, teachers chose an activity each day for circle time. During the second three weeks of implementation, teachers chose one activity each day for small group time and two for transition or mealtime.

children, keeping it fun, following children's lead, and providing feedback and scaffolding).

At the other end of the spectrum, Starkey, Klein and Wakeley (2004) in implementing what they label a "conceptually broad" math curriculum during the full duration of the prekindergarten year, held a five-day summer workshop for teachers followed by a four-day winter workshop. Teachers received a manual, instruction and practice with particular small-group and computer-based activities. In addition, the workshops provided an overview of children's development as related to each early mathematics topic covered, focused on assessing children's mathematics knowledge, and introduced teachers to the complementary home curriculum to support the focus in class. The on-site component in this instance involved a once-a-month visit to provide training for the implementation of each unit in the curriculum. The on-site component also provided the opportunity to discuss problems, observe the fidelity of implementation, and provide feedback to teachers. Similarly, Clements and Sarama (2008) provided a four-day training on the Building Blocks curriculum, with two hours of refresher training every other month. They also provided monthly on-site coaching focusing on the implementation of the curriculum.

Other Approaches. Of the two studies that did not evaluate programs that combined workshops or training with on-site coaching, one provided training without follow-up coaching (Casey et al. 2008), while one provided the on-site feedback without initial training (Young-Loveridge 2004). Casey and colleagues (2008) describe a brief training for teachers in the intervention condition including videotapes of teachers implementing the activities. Teachers received all the materials needed for implementation of the activities as well as detailed instructions. Although teachers were observed implementing the activities, this was to ensure that the activities were taking place; there is no mention of feedback or coaching. The program implemented by Young-Loveridge relied on specialists to implement the early mathematics activities. Pairs of children engaged in games and book reading with the specialist, each pair for half an hour each day (Young-Loveridge 2004). The specialists were videotaped engaging in the activities and given feedback on how to strengthen their approach.

Need for Focus on Professional Development Provided Both Through Education and Training in Mathematics for Early Educators. While six of the seven studies that reported full evaluations involved workshops or training sessions that were not part of degree programs in higher education, Ginsburg and colleagues (2006) discuss the need for a focus on professional development in early mathematics both within degree-granting higher education programs and as part of preservice or in-service training that is not credit-bearing toward an associate, bachelor or graduate degree in early childhood. In their work to date in designing programs for different groups of early childhood educators, Ginsburg and colleagues introduce material with different depth and comprehensiveness for these two contexts. However irrespective of the level, they contend that professional development in early childhood mathematics needs to include the same components: (1) an understanding of the mathematical ideas that are conveyed through the curriculum (which may need to be introduced or reviewed); (2) a grasp of

children's informal mathematics knowledge; (3) the ability to assess young children's knowledge and understanding in early mathematics; (4) pedagogy that is appropriate for young children; and (5) mastery of the curriculum.

C. 2b. Study Designs. Different research designs were used in the seven evaluation studies.

Experimental Designs. It is important to note the reliance on experimental designs in four of the studies, some of these building in contrasts of multiple curricula or approaches. Arnold, Fisher, Doctoroff & Dobbs (2002) used an experimental design with a preliminary matching step. Eight Head Start classrooms were matched with respect to whether they met for full- or part-day, morning or afternoon. One of each matched pair was randomly assigned to the intervention condition. Child assessments and teacher surveys were completed prior to and after the implementation of the program in both the intervention and control group. The study by Clements and Sarama (2008) involved random assignment to the Building Blocks curriculum, the Preschool Mathematics curriculum, or to a control group in which teachers continued to follow their school or centers ongoing approach to early mathematics instruction. Of 100 teachers of low-income children in Head Start and prekindergarten classrooms, 24 were randomly selected and then these were randomly assigned to one of the three curriculum groups. Of an additional 20 teachers of children in mixed socioeconomic classrooms, 12 additional teachers were randomly selected, and these were again randomly assigned to the Building Blocks, comparison curriculum, or control group. The study by Starkey et al. (2008) was part of the PCER program. Forty teachers in Head Start and public preschool programs were randomly assigned to the treatment group, implementing the Pre-K Mathematics curriculum supplemented with DLM Early Childhood Express Math software, or the control group, pursuing the early mathematics approach already being implemented in their programs. Random assignment occurred within blocks of teachers from Head Start and state-funded prekindergarten in sites in New York and California.

Casey and colleagues (2008) reported on two studies, both involving random assignment of teachers to differing curricular approaches. In Study 1, six kindergarten teachers in a lower middle-class public school, each teaching morning and afternoon classes, were randomly assigned to the approach combining geometry instruction and storytelling in addition to the ongoing curriculum, or pursue the ongoing mathematics curriculum In Study 2, four teachers teaching full-day kindergarten classes in a lower-SES community were randomly assigned to implement the combination of storytelling and geometry instruction, or only the geometry instruction. We note that Casey and colleagues are reluctant to call this an experimental design because randomization occurred at the teacher rather than the child level; however, all of the studies in this set involving random assignment carried out the randomization at the teacher level, sometimes within blocks of program types and sites. There was clearly wide variation across studies in terms of numbers of teachers involved and the generalizability of results.

Quasi-experimental Designs. Three further studies used quasi-experimental designs but with interesting variations to strengthen the design. Sophian (2004), also focusing on

Head Start settings, compared three groups: one received the early mathematics curriculum, one only the pre- and post- testing for the study, but one a literacy curriculum (to hold constant the extent and nature of professional development but vary the content). Three classrooms received each approach; these were matched on teacher credentials, proportion of children with special needs, and attrition statistics at each center. Starkey and colleagues (2004), studying prekindergarten classrooms ranging from low-income to middle-income, used a successive-cohort design in which an initial cohort did not receive the intervention and a subsequent cohort did receive the intervention. The cohort that did receive the intervention involved classrooms with the same teachers as those in the prior year, so classroom context and many teacher characteristics were held constant. Pre-post assessments were carried out in the intervention group, and post-tests only in the comparison group. The study by Young-Loveridge (2004) included two contrast groups in addition to the intervention group. All children were in their first year of school in low-income communities in New Zealand. While 23 children from two schools participated in the in-school intervention (as noted earlier, working with a specialist in pairs for half an hour a day), 83 children were in the contrast group, some from the same two schools (within-school contrast) and some from two further schools (across-school contrast). As no differences were found between the two contrast groups, these were combined in analyses.

Samples. This set of studies focused heavily on children in low-income settings, though some also tested the generalizability of results in more diverse settings. Thus, for example, the studies by Clements and Sarama (2008) and Starkey et al. (2008) were carried out in both Head Start and prekindergarten programs serving low-income communities, though the study by Clements and Sarama (2008) also intentionally included a sample involving greater socioeconomic diversity, with both low- and middle-income families. It should be noted that two of the studies involved kindergarteners (Casey et al. 2008; Young-Loveridge 2004). In each sample, a substantial proportion of the children were of minority backgrounds. For example, in the study by Sophian (2004), conducted in Hawaii, most of the children in the sample were Asian-American and Hawaiian. In the study by Arnold and colleagues (2002), of 112 children in the sample, 45 were Puerto Rican, 44 were African-American, six were Asian and six were biracial. In the study by Starkey and colleagues (2004), while there was substantial representation of minority children, the low-income component of the sample had a higher proportion of children who were African-American and Latino (32 percent and 41 percent respectively) than the middle income component (10 percent and 7 percent). In the study by Young-Loveridge (2004) in New Zealand, 44 percent of the children were Maori and 4 percent Pacific Islander. The studies carried out by Casey and colleagues were conducted in school systems in which most students were of minority racial or ethnic groups.

Inclusion of Key Outcomes. In this set of evaluation studies, child outcome measures were consistently included, but measures of teacher knowledge and teacher skills were not. It is important to note that two of the most recent studies include observational measures of the quality of math stimulation and instruction in the early childhood classroom (Clements and Sarama 2008; Starkey et al. 2008). This may have reflected a lack of observational measures of math stimulation in early childhood settings until quite

recently and measures development in part in response to the goals of these particular studies. For example, the measure of fidelity of curriculum implementation in early mathematics, and the Classroom Observation of Early Math Environment and Teaching (COEMET), were developed as part of the ongoing work by Clements and Sarama. The limited study of teacher knowledge and attitudes is unfortunate, given the discussion by some researchers of limited background and sense of competence by many early childhood educators in this area (see, for example, discussion by Ginsburg et al. 2006). As per earlier sections in this review, we concur with the conclusion of the National Reading Panel (National Institute of Child Health and Human Development 2000) that measures of teacher knowledge, teacher practice, and child outcomes are all important for assessing whether and how professional development approaches are having effects.

In terms of child outcomes, it is noteworthy that while standardized assessments were used in some studies, in others, the researchers felt a need to develop new child assessments to more closely reflect and measure the contents of the intervention. Thus, for example, Sophian (2004) used a checklist reporting on children's skills in specific areas and a newly developed measure to provide more information about the area focused on in the curriculum (knowledge of measurement and combinations of shapes). Starkey and colleagues (2004) used a measure newly developed for the study, the Child Math Assessment, to assess informal math knowledge across a range of topics. Children were videotaped completing 16 tasks and their performance was coded based on the videotapes. An abbreviated version of the Child Math Assessment was also used in the PCER study focusing on early mathematics (Starkey et al. 2008). While the development of new child assessment procedures and measures can be a lasting contribution of these studies, the lack of data taken from nationally normed assessments limits our capacity to relate results from the research using these measures to national samples.

C. 2c. Patterns of Findings. The seven evaluation studies consistently examined effects on child outcomes. However there is a less consistent focus on teacher practice and on teacher knowledge or attitudes.

Findings Regarding Child Outcomes. All seven studies evaluating approaches for professional development in early mathematics curricula report gains on measures of children's math knowledge or ability. The studies are informative as to the range of child outcomes that particular interventions did or did not affect. For example, Arnold et al. (2002) reported significantly greater gain scores for children in the intervention group on mathematics knowledge as well as on teacher report of children's interest in math and children's self-report measures of interest in math. Casey and colleagues (2008) found the approach of combining storytelling with geometry activities to have effects on a closely related outcome measure but not a broader math assessment (that is, evidence of near but not far transfer), with results concentrated in female children. The study by Young-Loveridge (2004) found a substantial effect of the math story and games activities intervention on young children's numeracy, but follow-ups at six and 15 months showed reduction in the effect over time.

As noted above, many of the children in the study samples were from low-income and minority families, and so positive impacts were found for children from disadvantaged backgrounds in multiple studies. In some instances, researchers report greater gains for minority or low-income children. For example, the study by Arnold and colleagues (2002) reports less change for white than for Puerto Rican and African-American children. The study by Starkey et al. (2004) found fall to spring improvements for lower- as well as higher-income children. In the spring, the scores of the lower-income children in the intervention group did not differ significantly from those of middle-income children in the nonintervention group, indicating that the intervention brought lower-income children to the level of more advantaged children not exposed to the intervention.

Findings Regarding Practice Within Early Childhood Settings. The two recent studies examining effects of early mathematics curricula on the classroom environment and teaching practices resulted in mixed findings. On the one hand, the study by Starkey and colleagues (2008), while showing impacts on children at the end of the prekindergarten year on two math assessments, nevertheless showed no evidence of group differences on the Early Childhood Environment Rating Scale-Revised, the Arnett measure of the emotional tone of teacher interactions, or the Teacher Behavior Rating Scale, including the component of the scale focusing on Math Concepts. However, the study by Clements and Sarama (2008) found differences by group on the Classroom Observation of the Early Mathematics Environment and Teaching (COEMET) scale, with the environments of classrooms randomly assigned to use the Building Blocks curriculum as well as the Preschool Math Curriculum showing stronger math environments than the control group classrooms. In addition, scores on the observational measure were higher for Building Blocks classrooms than for Preschool Math Curriculum classrooms. Scores on the COEMET helped to explain children's gain scores on the child assessment.

Findings Regarding Teacher Knowledge, Attitudes and Skills. The one study reporting on the effects of professional development on teacher knowledge, attitudes and skills (Arnold et al. 2002) focused on one of the interventions of briefest duration (a two-hour workshop with brief weekly follow-up visits). This study found that teachers in the intervention group reported significant increases in their liking for and sense of competence in the teaching of math from pre- to post-test and had higher scores at post-test than teachers in the nonintervention group.

Across this small set of studies, a low "dosage" of professional development as well as a greater dosage was reported to be associated with positive effects on child outcomes, and as noted, the brief dosage also resulted in positive changes in teacher attitudes about teaching math. Why might even a brief dosage of professional development with frequent but brief follow-up provide the basis for improved child outcomes? It is not possible to identify one specific source for this pattern with the information given, but a number of possibilities can be offered. As noted above in the section of this review on preparation of early educators for instruction in early language and literacy, a small dosage of professional development may be appropriate if the curriculum or set of activities is limited in complexity or scope. In addition, it is possible that particularly in the domain of early mathematics, meaningful input even in a low dose is a marked

improvement to prior educator knowledge. This may be particularly true if educators have limited background or do not feel a great sense of competence in mathematics. In addition, multiple studies noted that in the absence of the intervention, most programs were providing extremely limited input in math. Thus the control groups against which the intervention groups were being compared were nearly a no-treatment control. Even a limited amount of professional development may provide a basis for group differences given the nature of the control groups.

Each of the evaluation studies described a curriculum that had clear, well-articulated goals and objectives and that was explicitly linked to research. For example, Clements and Sarama (2008) followed a carefully developed sequence of steps for developing and then testing a curricular approach, and the work of Starkey and colleagues (2004) built on the NCTM standards. While more limited in focus, the approach taken by Sophian was developed based on research findings indicating that children had difficulties with the concept of alternative units of measurement. In each of these studies, a specific set of activities had been developed for children to engage in, focusing on the topic(s) covered by the curriculum or integrating topical areas at increasing levels of complexity across activities. Training on the curriculum always involved a manual and practice in implementation of the activities. Substantial effort appeared to focus on assuring that the activities would be engaging to young children.

It is impossible to evaluate the content of the activities and manuals from the research reported. However, a consistent pattern emerges of a carefully planned foundation for professional development in terms of goals, manuals and curricular materials.

C. 2d. Implementation of Professional Development. In this section we turn to issues in the implementation of professional development that were evident across the studies focusing on early mathematics.

Consistent Implementation of Approaches Involving Individualized Support and Feedback in the Workplace. A key element that was consistent across most of the programs evaluated by the studies in this section of the review and that may have contributed to improved mathematics outcomes for children is a design that involved a workshop or days of training with on-site follow-up. The prevalence of follow-up observations of the teachers implementing the activities or curriculum, in almost all instances accompanied by feedback on implementations, raises the possibility that in addition to presenting curricular materials and background information, support and feedback regarding classroom practices improves implementation. These studies also raise the possibility that for sustained implementation of a curriculum, it may be important that the on-site component of professional development occur periodically throughout the period of the program.

Matching Comprehensiveness of Professional Development Approach with the Comprehensiveness of the Curriculum. It is important to note that the interventions involving more comprehensive curricula incorporated professional development with more elements. In particular, these programs more consistently provided teachers with

background such as explanations of the mathematics concepts in the curriculum, grounding in young children's early mathematics development, and approaches to assessment of children's mastery of the concepts in the curricula. This pattern is consistent with the summary above for early educator preparation for instruction in language and literacy, with more comprehensive professional development accompanying more comprehensive curricula. As noted in the earlier section as well, this matches with discussions of professional development needs for teachers in K–12 by Joyce and Showers (2002), who note that those planning professional development should judge the complexity of the instructional approach that teachers are being asked to implement and match the comprehensiveness of the professional development to the complexity of the instructional approach.

Ginsburg and colleagues (2006), however, describe multiple sources of resistance to comprehensive professional development in early mathematics. They note that an unstructured approach toward early childhood teaching may result in resistance to the introduction of the systematic content of an early mathematics curriculum. For other teachers, a didactic approach toward instruction may result in resistance to an approach involving children learning through the structuring of activities and materials rather than direct instruction. They note that early childhood educators may also resist comprehensive professional development in early mathematics when they have limited understanding of or confidence about mathematics concepts.

Potential Importance of Including Supervisors or Directors Along with the Educators Themselves. While not covered systematically across the set of evaluation studies, the intervention approach developed by Ginsburg and colleagues (2006) raise the further issue of the potential importance of including site supervisors or center directors in professional development rather than instructing individual teachers in isolation. Their workshop approach for in-service training evolved to include a summer workshop for the leaders in centers in order to assure their "buy in" and ongoing supervision. One of the early mathematics evaluation studies called attention to the potential importance of including all instructional staff members in Head Start in a professional development intervention (Sophian 2004).

In sum, while it is not yet possible to make causal attributions about particular features of the professional development as underlying positive outcomes in young children's math achievement, features that can be considered potential contributors in this set of studies include: well-articulated and research-based curricular goals; the availability of a manual and set of activities for implementing the curriculum; the match between comprehensiveness of the curriculum and extensiveness of professional development; and an approach to professional development that includes supervisors and provides on-site follow-up to educators.

C. 2e. Sustainability of Effects. Only two of these studies included findings pertaining to whether effects on child outcomes in mathematics were sustained. Young-Loveridge (2004) found that while effects of the pairs of children engaging in math stories and activities with a specialist for half an hour a day had substantial effects on children's

numeracy immediately after the intervention, persisted through 15 months but diminished in size. The PCER study of early mathematics by Starkey and colleagues (2008) found evidence of greater growth on two measures of early mathematical skills by children in the treatment group at the end of the prekindergarten year but found no evidence of effects persisting into kindergarten. It is noteworthy that the focus of these examinations of sustainability is on impacts on children, not on whether professional development for early mathematics resulted in improved or sustained teacher knowledge or skill.

C. 3 Child Social Behavior

C. 3a. Overview of Studies Reviewed.
This section of the review will focus on studies that evaluate approaches to strengthening early childhood professional development in the area of child social behavior.

Table 3. Characteristics of Child Social Behavior Studies Reviewed

Study Number	Citation	Design*					Outcome Areas Examined†		
		Exp	Quasi-Exp	P/P With Comp	P/P Without Comp	Desc	EK	EP	CO
1	Brigman, Lane, Switzer, Lane, & Lawrence (1999)	X							✓
2	Denham & Burton (1996)		X						✓
3	Domitrovich, Cortes, & Greenberg (2007)	X							✓
4	Franyo & Hyson (1999)	X					✓		
5	Girolametto, Weitzman & Greenberg (2004)	X						✓	✓
6	Gowen (1987)				X		✓	✓	
7	Hendrickson, Gardner, Kaiser & Riley (1993)				X			✓	✓
8	Lynch, Geller & Schmidt (2004)	X							✓
9	Raver, Jones, Li-Grinning, Metzger, Champion, & Sardin (2008)	X						✓	
10	Reynolds & Kelley (1997)				X		✓		✓
11	Rhodes & Hennessy (2000)			X				✓	✓

Continues next page

Table 3. Characteristics of Child Social Behavior Studies Reviewed (Continued)

Study Number	Citation	Design*					Outcome Areas Examined†		
		Exp	Quasi-Exp	P/P With Comp	P/P Without Comp	Desc	EK	EP	CO
12	Schottle & Peltier (1996)		X						✓
13	Webster-Stratton, Reid, & Hammond (2001)	X						✓	✓
14	Webster-Stratton, Reid & Hammond (2004)	X						✓	✓
Total studies reviewed : 14		**8**	**2**	**1**	**3**	**0**	**3**	**7**	**11**

(*Exp= Experimental, Quasi-Exp= Quasi-Experimental, P/P With Comp= Pre-Post with comparison group, P/P Without Comp= Pre-Post without comparison group, D= Descriptive; †EK= Educator Knowledge, EP= Educator Practice, CO= Child Outcomes)

Two Foci of Professional Development Approaches in This Area. A key distinction in this body of work is that some approaches focus on strengthening early childhood professionals in working with young children in preschool settings who already show serious problems in their social behavior, such as oppositional defiant behavior (Webster-Stratton, Reid, and Hammond 2004) or social withdrawal (Hendrickson et al. 1993), while other approaches focus on helping all children develop better social skills (Brigman et al. 1999).

A 1999 literature review by Bryant and colleagues (Bryant et al. 1999) points to the potential importance of intervening with young children already showing behavior problems. They summarize evidence of great stability in behavior problems from the preschool period into adolescence. Therefore, practices that can diminish early behavior problems may help to prevent the later emergence of serious behavioral problems that may contribute to juvenile delinquency. Indeed, Bryant and colleagues note that long term follow-up studies of comprehensive early childhood interventions, such as the Abecedarian project, provide evidence of reductions in delinquency.

Early childhood educators themselves place a high priority on learning how to manage behavior positively within the classroom. Disruptive behavior in early childhood classrooms detracts from learning experiences not only for the child exhibiting the negative behavior but also for the class as a whole. More recent work makes an explicit link between young children's social skills and learning in the classroom. For example, Bodrova and Leong (2006) note that improved self-regulation for all children in a classroom leads to greater engagement in activities that foster learning.

Despite the potential importance of strengthening early childhood educators' ability to address problem behaviors and to foster stronger social competence in all children, Bryant and colleagues noted limitations in the research on effective approaches. These included:

- A focus on older children but few studies of interventions for preschool-age children;

- Small samples in the evaluation studies;
- A focus on aggressive and disruptive behavior but not strengthening social behavior in all children;
- Methodological problems in this body of work, including lack of experimental evaluations; focus on children in middle class families rather than diverse samples; limited use of direct observation of child behavior; and a lack of examination of whether effects are sustained.

Of particular importance, Bryant and colleagues noted that only a handful of interventions trained *early childhood educators* on working with children with behavior problems, with a much greater emphasis on working with *parents* on these issues. The present review found promising work in this area that helps to address both the substantive and methodological concerns raised by Bryant and colleagues. As summarized below, this work includes a number of recent studies in which early educators are prepared to strengthen the social development of all children rather than only those with behavioral problems, experimental evaluations of training for teachers to work with children, and inclusion in studies of diverse samples of children.

Studies Focusing on Professional Development Aimed at Improving Children's Social Behavior. Fourteen studies were identified involving early childhood professional development focused on improving children's social behavior. Ten of these focused on strengthening the social skills of all of the children in an early childhood classroom, though sometimes in combination with management of disruptive behavior (Brigman et al. 1999; Denham and Burton 1996; Domitrovich, Cortes, and Greenberg 2007; Franyo and Hyson 1999; Girolametto, Weitzman, and Greenberg 2004; Gowen 1987; Lynch, Geller, and Schmidt 2004; Raver et al. 2008; Rhodes and Hennessy 2000; Webster-Stratton, Reid, and Hammond 2001).

Among those studies focusing on strengthening children's social behavior, there was a range in terms of the specific aspect of social development that the professional development emphasized. These included children's listening and attending skills (Brigman et al. 1999), their engagement with peers (Girolametto, Weitzman, and Greenberg 2004), time spent in play (Gowen 1987), understanding emotions, and interpersonal cognitive problem solving (Denham and Burton 1996; Domitrovich, Cortes, and Greenberg 2007), and general social behavior or competence (Rhodes and Hennessy 2000; Brigman et al. 1999; Lynch, Geller, and Schmidt 2004; Webster-Stratton, Reid, and Hammond 2001). One study focused on teachers' understanding of variations in children's temperament and acceptance of a range in children's behaviors and expression of feelings (Franyo and Hyson 1999). Another focused on teachers' ability to foster an emotionally positive classroom climate (in addition to managing disruptive behavior) (Raver et al. 2008). In some instances, the basis in the research for focusing on a particular aspect of social development was not fully articulated. For example, it is not clear that increasing the sheer frequency of engagement with peers among children not showing social withdrawal yields an outcome with long-term benefits.

Studies Focusing on Professional Development for Working with Children Already Showing Problem Behaviors. Four studies focused on strengthening early educators' approaches for working with children already showing problem behaviors. Three out of the four focused on aggressive behavior (Reynolds and Kelley 1997; Schottle and Peltier 1996; Webster-Stratton, Reid, and Hammond 2004). However one focused on socially withdrawn children (Hendrickson et al. 1993).

The professional development approach in this set of studies often involved a combination of workshops with on-site consultation. For example, Webster-Stratton and colleagues (2004), in implementing and evaluating professional development focusing on working with children with oppositional defiant disorder, provided teachers with four days of training in a clinic setting followed by two meetings with staff therapists at the school to develop an individual behavior plan for the child. The four days of training emphasized effective management of misbehavior in the classroom, developing positive relationships with the students with oppositional defiant disorder, and fostering social skills in everyday school settings. The study by Girolametto and colleagues (2004), which describes an approach to helping teachers extending children's play through nondirective verbal supports, involved three group sessions of two and a half hours each complemented with three sessions in the day care center involving videotaping caregiver-child interaction in the classroom followed by the discussion and the provision of individual feedback. There was variation in the intensity and structure of on-site consultation. For example, Raver and colleagues (2008) hired mental health consultants to coach teachers one morning a week, providing feedback and stress reduction, and providing direct one-on-one services to children. In contrast, Gowen (1987) provided two trainers for informal consultation as needed. Exceptions to the pattern of workshops with some type of follow-up in the early educators' workplace included reliance on the workshop format without follow-up observation or consultation (e.g., Franyo and Hyson 1999), and participation in 120 hours of professional development of which 90 hours involved in-class instruction and 30 hours involved teachers observing in other classrooms (Rhodes and Hennessy 2000).

C. 3b. Study Designs and Methodology. The professional development approaches in this set of studies were evaluated using a range of evaluation designs. More recent studies tended to be more likely to use experimental designs.

Experimental Evaluations. Progress beyond the review by Bryant and colleagues is clearly indicated by the fact that eight of the studies involved experimental evaluations (Brigman et al. 1999; Franyo and Hyson 1999; Girolametto, Weitzman, and Greenberg 2004; Webster-Stratton, Reid, and Hammond 2004; Domitrovich, Cortes, and Greenberg 2007; Lynch, Geller, and Schmidt 2004; Raver et al. 2008; Webster-Stratton, Reid, and Hammond 2001). There were delayed post-tests in each of these in order to assess maintenance of outcomes.

Quasi-Experimental and Pre-Test Post-Test Designs. Three studies involved non-experimental evaluations with pre- and post-tests for both a program and comparison group (Rhodes and Hennessy 2000; Schottle and Peltier 1996; Denham and Burton

1996). One study involved the articulation of target levels for the desired teacher behaviors, and evaluation of whether the targets were achieved (Gowen 1987). Finally, two studies involved studying behavior change over time in small samples of teachers and students as the teachers underwent training. In the study by Hendrickson et al., (1993), this sometimes involved multiple baselines (tracking child behavior during a withdrawal phase).

Samples. A number of these programs of professional development focused on settings with low-income children (Gowen 1987; Schottle and Peltier 1996; Brigman et al. 1999; Domitrovich, Cortes, and Greenberg 2007; Lynch, Geller, and Schmidt 2004; Raver et al. 2008; Webster-Stratton, Reid, and Hammond 2001), while others involved a wide range in terms of socioeconomic status (Franyo and Hyson 1999; Reynolds and Kelley 1997; Rhodes and Hennessy 2000; Webster-Stratton, Reid, and Hammond 2004). The study by Hendrickson and colleagues (1993) focused on socially withdrawn children who also had disabilities. Although many of the studies focused on children from ages 3 to 5 years old, there was a range in targeted age groups. It is important to note that the study by Schottle and Peltier (1996) focused on slightly older children, participating in kindergarten through third grade, and Gowan (1987) included classrooms with children whose ages ranged from 7–62 months.

Outcomes Examined. It is not surprising, given the focus of these programs of professional development on improving child social behavior, that nearly all studies included measures of child behavior. These varied, however, according to the particular aspect of social behavior the program emphasized (for example, attending, extent of peer interaction, engagement in play, amount of aggressive behavior, social competence, overall social behavior). Teacher practice was more often a focus of these evaluation studies than teacher knowledge or attitudes, with the emphasis again varying by program focus (and including verbal supports for peer interaction, nondirective verbal interactions supporting children's play, positive relationships with children, detachment in interactions with children, and teacher management of child misbehavior). Teacher attitudes and knowledge were the focus of the study in which teachers were trained with the intent of extending their knowledge about temperament and attitudes of acceptance of a range of child behaviors (Franyo and Hyson 1999), and in which the training focused on the importance of children's play and of nondirective verbal facilitation of play (Gowen 1987).

Methodological Issues. While it is clear that recent interventions and evaluations have made important progress in terms of focus on all children in addition to those showing problem behaviors, greater reliance on experimental evaluation, and inclusion of children from diverse backgrounds, some methodological issues remain. A concern raised by Bryant and colleagues was small sample sizes. Thus it is encouraging that a number of recent studies involve larger samples (Franyo and Hyson 1999; Webster-Stratton, Reid, and Hammond 2004; e.g., Brigman et al. 1999; Domitrovich, Cortes, and Greenberg 2007; Lynch, Geller, and Schmidt 2004). However, even though the sample size of children in a number of the reviewed studies may be larger than those in the past, they are still relatively small when the nested nature of the data (children within classrooms

within centers within programs) is taken into account. The use of multilevel modeling (e.g. hierarchical linear modeling) has been suggested when behavior of individuals within organizations are studied (Davidson et al. 2002). However, none of the studies reviewed here used a nested design.

Other remaining methodological issues in this set of studies include reliance on a single observer who was not blind as to experimental and control group (Rhodes and Hennessy 2000), reliance on teacher ratings as the sole source of data on children's behavior (Lynch, Geller, and Schmidt 2004), non-equivalent experimental and control groups (Webster-Stratton, Reid, and Hammond 2001), a need for further clarification of the program of professional development (Hendrickson et al. 1993), focus only on teacher attitudes and knowledge without complementary measures of teacher practice or child outcomes (Franyo and Hyson 1999), and unexpected patterns of development reported for children in a control group (lack of progress from fall to spring in complexity of play and peer interactions) (Rhodes and Hennessy 2000). In some instances there was limited sample description. For example, Girolametto and colleagues (2004) provide no information on the socioeconomic status of families participating in their study. One of the most rigorous evaluations, the study by Webster-Stratton and colleagues (2004) had a limitation for current purposes that was not rooted in problems with design or measurement (which were quite rigorous and well described). This study aimed to evaluate whether training teachers in working effectively with children with serious behavior problems would augment training of parents and children. Among five groups to which families were randomly assigned, none involved teacher training alone. This study can address the question of whether the groups that had teacher training in addition to other forms of intervention had better outcomes than the other forms of intervention alone but not whether teacher training in and of itself is effective. A strength of some more recent studies is the ethnic diversity of children included (Domitrovich, Cortes, and Greenberg 2007; Lynch, Geller, and Schmidt 2004; Webster-Stratton, Reid, and Hammond 2001).

*C. 3c. Patterns of Findings***.** In this section we describe findings first in studies focusing on strengthening professional development of early educators to work with children showing behavior problems, and then to findings from studies focusing on preparation to strengthen social skills in all of the young children in a classroom or group.

Findings from Studies Focusing on Children Already Showing Behavior Problems. There was evidence of positive outcomes for each of the professional development approaches that involved increasing teacher effectiveness in working with children with behavior problems (either disruptive or withdrawn). These programs all had the common element of a clearly articulated set of specific practices for reducing behavior problems and enhancing positive peer interaction. All of these programs also included an on-site component in which teachers worked with consultants to develop plans for individual children and received feedback on their practices. The on-site work was explicitly aimed at helping to assure fidelity of implementation in a number of programs; for example, on-site videotaping of the coaching was used to verify fidelity of implementation in the study by Hendrickson and colleagues (1993). There were also instances in which goals were set

jointly by the teacher and coach or expert during the on-site work (Schottle and Peltier 1996).

Findings From Studies Focusing on Improving All Children's Social Skills and Behavior. Most of the studies that focused on improving children's social skills and behavior found some positive impacts. For example, Domitrovich and colleagues (2007) found that intervention children, compared with those in the control group, had a larger emotion receptive vocabulary, were more accurate in identifying feelings, and showed less anger attribution bias (effect sizes ranged from d = .28 - .40). Franyo and Hyson (1999) report an increase in early educator knowledge following the workshop on child temperament. However, there was no evidence of a change in teacher attitude of acceptance of the range of child behaviors. The experimental evaluation of the Ready to Learn curriculum (Brigman et al. 1999), for which training involved two full-day workshops with three half-day follow-up workshops, resulted in better scores on observed attending behavior and teacher report of child social behavior. The 120 hours of training provided in the study by Rhodes and Hennessy (2000) was reported to result in increased observed positive relations of teachers with children, diminished teacher detachment, and increased complexity of child social play and play with objects. However, as noted, there are concerns in this study with respect to observations being carried out by observers not blind as to group and because children in the control group did not make progress as one might expect during the course of a school year.

The hypothesis that emerges from the evaluations of professional development with the aim of improving broader social behavior is that with broader goals comes the need for the provision of more background on children's development and thus more extensive course work or training. However there is still an implication in the work that specificity of goals in terms of desired teacher behavior, and on-site work to provide feedback and assure fidelity, contribute to positive outcomes.

C. 3d. Implementation of Professional Development. We have noted that a number of the professional development approaches in this area involved combining training with individualized feedback and support in the workplace. Several additional implementation issues emerge in this set of studies, some for the studies focusing on early educator approaches with children who already show behavior problems, and some for the studies focusing on early educator approaches to strengthening all children's social skills.

Variation in emphasis on the provision of background knowledge. There was variation across programs focusing on strengthening early educators' work with children showing behavior problems in terms of emphasis on background knowledge. Some programs placed much greater emphasis on providing background and context regarding children's behavioral development and effective behavior management (Webster-Stratton and Reid 2004) while others focused more narrowly on the development of individual plans for children and provision of individualized on-site work with early educators without the provision of background knowledge and context (Schottle and Peltier 1996; Reynolds and Kelley 1997). Because measures and follow-up periods vary across studies, it is impossible to conclude whether the provision of more in-depth information to teachers

resulted in larger or more sustained changes in teacher practice or the ability to approach a wider range of specific behavior problems effectively. This is an important issue for further focus.

Dosage. In the studies focusing on strengthening early educators' professional development regarding the social skills of all children, the programs involving greater intensity or duration were reported to have positive effects for teachers and children. These also tended, however, to involve the implementation of more specific curricula or classroom approaches, so it is difficult to disentangle specificity of approach from dosage.

Level of Expertise of Provider of Professional Development. The level of expertise of the provider of professional development varied across these studies. For example, a skilled clinician provided the professional development in the work of both Raver and colleagues (2008) and Webster-Stratton and colleagues (2004), and a behavior management consultant provided the on-site training and coaching in the work of Schottle and Peltier (1996). However, the background of the provider of professional development did not appear to be as extensive in other approaches (e.g., Reynolds and Kelley 1997). In some cases, coaches were program administrators or other supervisory staff members who were selected to participate in the intervention (e.g. Domitrovich, Cortes, and Greenberg 2007; Lynch, Geller, and Schmidt 2004). It is difficult to isolate the importance of the expertise of the provider of professional development given other differences across these studies, for example in outcome measures used and study design.

C. 3e. Sustainability of Effects. Several of the studies in this set included delayed post-tests to examine sustainability of effects. However the duration of the delay varied as did the outcome examined. At one extreme, Franyo and Hyson (1999) found sustained changes in knowledge about child temperament four weeks after a workshop providing training on this topic. Perhaps more impressive is evidence of sustained improvement in the behavior of children with conduct disorders into a new school year in the set of studies reported by Webster-Stratton and colleagues (2004; 2001). Further work looking explicitly at sustainability would contribute to the rigor of this body of work.

V: Approaches to Strengthening the Overall Quality of Early Care and Education Settings

In this section of the review we focus on the research on approaches to professional development that aim to improve the overall quality of early care and education settings. Two approaches are distinguished: those that provide professional development on comprehensive curricula, integrating multiple developmental domains rather than focusing on specific domains, and those that use broad measures of early care and education quality to guide improvement efforts.

D. 1. Comprehensive Curricula

D. 1a. Overview of Studies Reviewed. The studies reviewed in this section examine the effectiveness of comprehensive curricula intended to improve teachers' instructional practices in center-based programs as well as children's developmental outcomes across multiple domains.

Table 4. Characteristics of Comprehensive Curricula Studies Reviewed

Study Number	Citation	Design*					Outcome Areas Examined†		
		Exp	Quasi-Exp	P/P With Comp	P/P Without Comp	Desc	EK	EP	CO
1	Barnett, Jung, Yarosz, Thomas, Hornbeck, Stechuk, & Burns (2008)	X						✓	✓
2	Bierman, Nix, Greenberg, Blair, & Domitrovich (2008)	X							✓
3	Chambers & Slavin (2008)	X						✓	✓
4	Diamond, Barnett, Thomas, & Munro (2007)	X							✓
5	Farran & Lipsey (2008)	X						✓	✓
6	Lambert & Abbott-Shim (2008)	X						✓	✓
7	Powell & File (2008)	X						✓	✓
8	Priest & Zoellick (2008)	X						✓	✓
9	Starkey, Klein, Clements, & Sarama (2008)	X						✓	✓
10	Thornburg, Mayfield, Morrison, & Scott (2008)	X						✓	✓
Total studies: 10 reviewed		**10**	**0**	**0**	**0**	**0**	**0**	**8**	**10**

(*Exp= Experimental, Quasi-Exp= Quasi-Experimental, P/P With Comp= Pre-Post with comparison group, P/P Without Comp= Pre-Post without comparison group, D= Descriptive; †EK= Educator Knowledge, EP= Educator Practice, CO= Child Outcomes)

Seven of the 10 studies reviewed in this category were part of the PCER initiative, designed to conduct experimental evaluations of preschool curricula (U.S. Department of Education 2008). The seven PCER studies reviewed here were intended to promote children's development across domains in an integrated fashion (as opposed to curricula focusing primarily on language and literacy or early mathematics, as described above) though the individual curricula assessed were based on different instructional philosophies.

The remaining three studies evaluated curricular strategies for promoting children's executive function (EF). Often considered to be a cognitive skill, EF (and its role in supporting the development of self regulation) is now recognized as a central feature of children's development that relates to their abilities to control their behavior and emotions, inhibit impulses, and direct their attention toward important tasks. These tasks are important not only for cognition but also for language, social interactions and even motor development. The first strategy is the Tools of the Mind curriculum (Leong and Bodrova 1995), based on the theories of Vygotsky and Luria, which promotes the development of self regulation through supporting activities like extended dramatic play and private speech. Two of the ten studies focused on the Tools of the Mind Curriculum (Diamond et al. 2007; Barnett et al. 2008). A second strategy was tested in the Head Start REDI intervention (Bierman et al. under review). In this approach, a comprehensive curriculum focused on aspects of language development as well as the development of social skills was implemented and the effects on EF as well as other outcomes were tested.

D. 1b. Study Designs and Methodology. All of the studies included in this section were experimental. As part of a group of funded studies with a common framework, the PCER studies (7 of which are reviewed in this section) were required to incorporate an experimental design in their evaluation (U.S. Department of Education 2008). In these studies, classrooms were randomly assigned to implement the intervention curriculum or a control curriculum. Many of the PCER studies were conducted in public pre-kindergarten classrooms or in Head Start classrooms, so the samples of children and early childhood educators included in the studies were quite diverse.

The PCER studies and one of the reports on the Tools of the Mind curriculum (Barnett et al. 2008) included measures to examine changes in educator practices and skills (through observation of the global quality of the classroom and instructional practices) as well as changes in children's outcomes.

The general model of professional development used throughout the studies involved an initial training for classroom teachers (varying from one to four days) with follow-up support or training provided through site visits and consultations from experts in the curricula. In some cases (Barnett et al. 2008; Chambers and Slavin 2008; Powell and File 2008), the follow-up included additional training sessions (in addition to the weekly or periodic mentoring or consultation being offered). Note that the follow-up consultation or additional training was not available for all of the curricula.

D. 1c. Patterns of Findings. This body of studies is informative about the potential of curricula in combination with professional development approaches to impact educator practices or children's developmental outcomes. But without systematic variation in the professional development approaches employed to prepare early educators to implement the curricula, this set of studies does not shed light separately on which professional development strategies work best for promoting positive outcomes.

Findings Regarding Educator Practice. Eight of the 10 studies examined changes in educator practices or in overall quality of the classroom environment. The effects noted on educator practices were not consistent across the studies. Barnett and colleagues (2008) reported large effects of the Tools of the Mind curriculum on all of the measures used to assess instructional or classroom practices. The Tools of the Mind curriculum improved total scores on the Early Childhood Environment Rating Scale–Revised (ECERS-R) (Harms, Clifford, and Cryer 1998), the Supports for Early Literacy Assessment (SELA) (Smith et al. 2001) and the Preschool Classroom Implementation Scale (PCI) (Frede and Miller 1990). Tools of the Mind classrooms also scored higher than controls on one subscale (productivity) of the Classroom Assessment and Scoring System (CLASS) (Pianta et al. 2005). Similarly, Lambert and Abbott-Shim (2008) reported effects of Creative Curriculum on all aspects of classroom practices studied, including overall quality, teacher-child relationships, early literacy instruction, and early language instruction.

Three of the studies found mixed effects on educator practices, with positive impacts on specific language and literacy instructional practices, but not on overall classroom quality. Chambers and Slavin (2008) found positive effects on reading and early literacy instruction but no effects on overall classroom quality. Likewise, Priest and Zoellick (2008) found effects of a language supplement to Creative Curriculum (Ladders to Literacy) on early literacy instruction. Farran and Lipsey (2008) found effects of one curriculum (Bright Beginnings) on early literacy and phonological awareness instruction but no effects on classroom practices of the other curriculum studied (Creative Curriculum). Finally, three of the PCER studies (Powell and File 2008; Starkey et al. 2008; Thornburg et al. 2008) found no effects on educator practices.

Findings Regarding Child Outcomes. Across the 10 studies, only isolated and mixed effects on child outcomes were reported. Barnett et al. (2008) reported significant effects of the Tools of the Mind curriculum on children's social behavior as reported by teachers on the Social Skills Rating System (SSRS) (Gresham and Elliott 1990). Diamond and colleagues (2007) also reported positive effects of the Tools of the Mind curriculum on children's inhibitory control. In the study examining the Project Approach (Powell and File 2008), children's behavior was negatively impacted by the curriculum (more behavior problems, weaker social skills and fewer learning behaviors) when compared to the control group. Starkey and colleagues (2008) and Thornburg and colleagues (2008) both reported negative effects on one math skill (shape composition) but no other positive or negative effects across other developmental domains.

D. 1d. Implementation of Professional Development. Looking across the 10 studies, little can be gleaned about effective professional development related to the implementation of comprehensive or integrated curricula. The only intervention approach for which positive effects were reported both on classroom measures and child outcomes was Tools of the Mind. It is possible that the other comprehensive curricula placed too many expectations at once on early educators, or did not match the extent and comprehensiveness of professional development with the complexity of the curricula. However, as noted above, the lack of systematic evaluations of variation in professional development approaches and dosages makes it impossible to isolate either the nature of the curricula or the specific approach to professional development as underlying the results. A further possibility is that the relative lack of effects overall on educator practices and child outcomes is related to initial knowledge or skills of the early educators. It may be that professional development for comprehensive curricula requires a higher initial level of educator knowledge and skill. However, the majority of the studies reported that the educators in the sample had more than five years of experience (in some cases, the average was closer to 10 or 12).

This set of studies is more informative about what needs to be studied systematically in the future than about how the present set of results relate to the professional development that was implemented. Future studies focusing on comprehensive curricula should systematically vary the extent and approach to professional development, especially with the goal of identifying whether a more complex set of curriculum elements requires more extensive professional development overall, or a greater dosage of particular elements (such as initial presentation of underlying concepts, modeling and practice, or on-site coaching). Future work should also examine early educator level of previous education, training and knowledge as moderators of the effectiveness of professional development on comprehensive curricula. Finally, it may be useful to evaluate the effectiveness of professional development for comprehensive curricula that, while broad, nevertheless vary in terms of the number of different curriculum elements and integration across elements that early educators are being asked to master.

D. 1e. Sustainability of Effects. The sustainability of effects was not addressed in this set of studies.

D. 2 General Approaches in Professional Development

D. 2a. Overview of Studies Reviewed. The studies reviewed in this section are much more diverse in scope, purpose, and content than studies included in other sections. Unlike the literature describing the effectiveness of various curricular approaches, in which the professional development of the early childhood educator is often not treated as a separate focus of the study, the literature in this category is part of a small body of studies focusing explicitly on the processes and principles of professional development.

Table 5. Characteristics of General Approaches Studies Reviewed

Study Number	Citation	Design*					Outcome Areas Examined†		
		Exp	Quasi-Exp	P/P With Comp	P/P Without Comp	Desc	EK	EP	CO
1	Arnett (1989)		X					✓	
2	Campbell & Milbourne (2005)			X				✓	
3	Cassidy, Buell, Pugh-Hoese, & Russell (1995)			X			✓	✓	
4	Fantuzzo, Childs, Hampton, Ginsburg-Block, Coolahan & Debnam (1997)	X						✓	
5	Fantuzzo, Childs, Stevenson, Coolahan, Ginsburg, Gay, Debnam, & Watson (1996)	X						✓	
6	Fiene (2002)	X					✓	✓	
7	Kontos, Howes, & Galinsky (1996)			X			✓	✓	
8	Palsha & Wesley (1998)				X			✓	
9	Pianta, Mashburn, Downer, Hamre, & Justice (2008)	X						✓	
10	Wesley (1994)				X			✓	
11	Whitaker et al. (2007)		X						
Total studies reviewed: 11		**3**	**2**	**3**	**2**	**0**	**3**	**9**	**0**

(*Exp= Experimental, Quasi-Exp= Quasi-Experimental, P/P With Comp= Pre-Post with comparison group, P/P Without Comp= Pre-Post without comparison group, D= Descriptive; †EK= Educator Knowledge, EP= Educator Practice, CO= Child Outcomes)

While some of the articles in this section presented results for small empirical studies, others discuss best practices or report on the results of small studies that did not use statistical analyses to describe results. Only the studies presenting empirical results are summarized in table format. The findings described below should be interpreted as first steps in establishing a solid body of research on processes and principles. However, a majority of the processes and principles described in this work underscore themes that emerged from the sections on professional development within content areas or for the comprehensive curricula.

The focus of the professional development targeted by most of the studies in this set was overall quality of the environment and interactions with children (Cassidy et al. 1995; Fiene 2002; Kontos, Howes, and Galinsky 1996; Palsha and Wesley 1998; Wesley and Buysse 2004; Arnett 1989; Pianta et al. 2008). One set of studies addressed the issue of parent involvement and interactions between parents, teachers, and children in programs, which was unique across all of the studies included in this review (Fantuzzo 1996; Fantuzzo et al. 1997), with the exception of the work discussed above in which both parents and teachers focused on helping children with oppositional defiant behavior problems (Webster-Stratton, Reid, and Hammond 2004). The approaches included

workshop training, community college course work, on-site consultation or mentoring, Web-based professional development that included video exemplars of classroom practices as well as individualized Web-based consultation, and combinations of workshops and on-site support.

In all, 11 empirical articles are included in the table. In addition, articles and books were reviewed for information on best practices (but are not included in the table). Linkages across pairs of articles are evident for two sets of articles: one set is Wesley (1994) and Palsha & Wesley (1998); the other set is Fantuzzo and colleagues (1996). In these sets, the authors have published a follow-up article that builds on the approach and results detailed in an original article. The articles in these sets will be discussed separately since the samples and methods differed slightly across the studies.

D. 2b. Study Designs. This area on processes and principles of professional development contained a mix of studies using experimental designs and pre-post designs with and without comparison groups. In all cases, the samples were small and limited the degree to which findings could be generalized to other populations of interest. Yet the studies did include groups (of both educators and children) that are considered important targets of professional development and of improved practice. The populations targeted in these studies included infants and toddlers (Campbell and Milbourne 2005; Fiene 2002; Pianta et al. 2008), children with special needs (Wesley and Buysse 2004; Palsha and Wesley 1998), and children from low-income families (Campbell and Milbourne 2005; Fantuzzo 1996; Fantuzzo et al. 1997). A study examining the effectiveness of scholarships for course work in a community college targeted child care providers who had not previously taken college-level courses (Cassidy et al. 1995). One study was also aimed at improving practice among family child care providers, a group that has not been discussed extensively in the literature on professional development for early childhood educators (Kontos, Howes, and Galinsky 1996), though the recent study reviewed in the *language and literacy* section above by Neuman and Cunningham (2009) does include a focus on educators in this setting.

None of the studies reviewed in this section presented findings on the implications of professional development for child outcomes, though it should be noted that the My Teaching Partner intervention (Pianta et al. 2008) will examine child outcomes in future publications. Additionally, the forthcoming Quality Interventions for Early Care and Education (QUINCE) Evaluation was designed to examine on-site consultation and corresponding effects on the quality of the environment and children's outcomes. The most frequently analyzed outcome was the global quality of the environment, usually assessed with an environmental rating scale such as the Early Childhood Environment Rating Scale, for which a revised edition also exists and was sometimes used in this set of studies, (ECERS) (Harms, Clifford, and Cryer 1980, 1998), the Infant-Toddler Environment Rating Scale (ITERS) (Harms, Cryer, and Clifford 1990), for which a revised edition also exists and was sometimes used, (Harms, Cryer, and Clifford 2003), or the Family Day Care Rating Scale (FDCRS, Harms and Clifford 1989).[11] These scales are used to assess multiple dimensions of the environment (classrooms or homes) in

[11] A revised version of this measure also now exists but was not used in this set of studies.

which child care is provided. The scales are tailored to the specific environment they assess, but general features assessed across the three scales include: health and safety provisions, interactions, activities, language, space and furnishings, program structure, and adult needs. Another measure of quality used in a number of the studies reviewed here is the Caregiver Interaction Scale (CIS) (Arnett 1989), which rates the quality of the adult-child interactions after a period of observation. Qualities of adult-child and adult-adult interactions also were assessed using interval coding (every 15 seconds) of a 10-minute sample of classroom activity. Few studies in this set examined changes in caregiver knowledge as a result of professional development.

The goals and objectives described in this set of studies varied in their specificity but related in general to improvement of the overall environment and interactions children experienced. The approaches to quality improvement and professional development included coursework, training plus on-site consultation, and on-site consultation, Web-mediated consultation or mentoring (without training). The research base underlying these approaches is very thin. The correlational studies described above linking higher levels of education and training to higher levels of quality provide the primary rationale for these approaches to professional development. In addition, most of the studies take as their starting point the assumption that classroom quality and interactions with children are not likely to improve if workshop attendance is the only professional development that early childhood educators complete. Prior to the publication of the studies reviewed here, there were few studies in early childhood education documenting the importance of using on-site consultants or mentors alone or in connection with a training course. Thus, many of the studies were launched with the expectation that strategies such as on-site consultation and mentoring would be more effective than workshops, but there was little empirical evidence on which they could build their approach.

When workshop curricula were used in this set of studies, an attempt was made to provide experiential, hands-on learning opportunities for participants (Campbell and Milbourne 2005; Fantuzzo 1996; Fantuzzo et al. 1997). Kontos, Howes, and Galinsky (1996) do not describe a focus on experiential learning but note that the Family-to-Family training projects that were evaluated were allowed to adapt curriculum materials and make the training more advanced than it had previously been (usually one-time workshops or conferences compared to 15 to 25 hours of class time in the Family-to-Family training).

Another activity used in some of the studies was the completion of a program self-assessment that provided the basis for a quality improvement action plan (Campbell and Milbourne 2005; Palsha and Wesley 1998; Wesley and Buysse 2004). Wesley (1994) notes that the inclusion of a self-assessment was important for three reasons. First, it conveyed the message to the staff participating in the consultation that their input about their own program and practice was vital to the success of the process. Second, staff were taught to use an assessment tool (in this case, the environmental rating scales) that could guide their own observations of the program and help them rate the quality according to standard benchmarks, a skill that could be used after the consultation was over. Thus, program staff were actively involved in setting goals and objectives for

professional development. Third, self assessment allowed the staff to see what they were doing compared to what was recommended (on the rating scales). Reflecting on these differences can help motivate change.

D. 2c. Patterns of Findings. Which features of professional development appeared to be most successful at improving quality of the environments and interactions? The discussion of results is organized by the primary strategy of professional development that was used. A discussion of the lessons learned from the empirical studies and the literature on best practices in professional development will follow the presentation of results. The results summarized here complement and extend the discussion above focusing on early educator human and social capital.

Completion of Community College Course Work. One study examined whether participation in a year of community college course work would improve teachers' beliefs and classroom quality compared to a matched group of teachers from the same programs (Cassidy et al. 1995). Gains on both the measure of global quality (ECERS and ITERS) and on a measure of teacher's beliefs about classroom practice were noted for the group of teachers receiving a scholarship to complete the community college course work. The authors offer some explanations for the factors that must be in place to support these gains. First, they note that the teachers in the scholarship group may have the additional support of coworkers and administrators in their program that helped foster the quality improvements. In addition, the authors point out that the course work taken by the teachers was focused predominantly on child-related topics and methods, a factor they view as critical to changing beliefs and classroom practices.

A second study examined the value of course work using a quasi-experimental design (Arnett 1989). Educators in Bermuda took a four-course program studying communication and child development in the first year and child care and preschool activities in the second year. Educators who had completed half or more of the course work were observed to be more positive than those who had not yet completed the course work. They also rated themselves as less authoritarian. The authors view this as evidence that the course work can shape both attitudes and behavior with children.

Training plus On-site Support through Consultation or Mentoring. The studies that examined workshop training with on-site support through consultation or mentors demonstrated mixed success in improving quality. As noted earlier in this review, different studies are inconsistent in their use of the terms "mentors" and "consultants." In each instance, the relationship involved working with the early educator at their workplace. There is a clear need for efforts to clarify the terminology regarding on-site work with educators. Here we use the terms chosen by the researchers.

In the Family-to-Family training, which included workshops and home visits for family child care providers, modest improvements in global quality were reported for two of the three training sites (Kontos, Howes, and Galinsky 1996). The quality of interactions with children did not improve. When the authors imposed a stricter criterion of detecting "observable" changes on the FDCRS of one point or more, only 19 percent of the

providers made observable changes. Nearly three-quarters made no observable changes, and 8 percent of providers lost ground on quality. The authors conclude that the training may not have been rigorous enough to result in meaningful changes. They note that while the training included home visits (viewed as an element of successful training), "nonetheless, the emphasis is on the classroom component over the more individualized, expensive, and time-consuming coaching that can occur during home visits" (Kontos, Howes, and Galinsky 1996, p. 443).

A second study examining training plus on-site consultation also showed modest to no effects. Global quality and caregiver-child interactions were compared before and after a 15-hour training course for a group that received three hours of on-site consultation compared to a group that received no consultation (Campbell and Milbourne 2005). The teachers completing the training were infant-toddler caregivers working in programs that provided care for children from low-income families. While they were taking a course on issues related to infant-toddler care, they received brief consultation sessions (3 sessions, one hour each). In these sessions, the teachers completed a self-assessment then worked with the consultant to create and implement an action plan. No significant gains were found on the ITERS or the measure of caregiver-child interactions. One positive finding noted is that more caregivers in the consultation group (21 percent) made observable changes on the ITERS than caregivers in the non-consultation group (8 percent), though this difference did not achieve statistical significance. The authors view this finding as promising given the short duration of the training course and consultation (three months for a total of 18 hours). However, the overall meager results of the study point to the need to examine more intensive workshop and consultation processes that have a greater chance of actually changing knowledge and practices.

A study with similar results also focused on improving the environment and interactions in infant-toddler classrooms (Fiene 2002). This experimental study analyzed the effects of "intensive mentoring" during four months from a seasoned early childhood professional compared to the effects of having workshop training available. The mentoring used a problem-solving approach in which mentor and mentee formed a trusting relationship, and then the mentor gave constructive criticisms. However, few details about the mentoring program were described in the study. No impacts on global quality or caregiver interaction were found. To further understand these results, it would be useful to know more about the qualities of the relationship between the mentor and staff. As described below, a collaborative approach to on-site quality improvement may be more effective than an expert-novice relationship in which the mentor takes on the role of the expert who is there to impart information to the staff.

On-site or Web-Mediated Consultation without Workshops or Training. In contrast to the Fiene (2002) study, Wesley (1994) and Palsha and Wesley (1998) found that on-site consultation with the goal of improving the quality of the environment can be successful. These studies are compromised by their lack of comparison groups and small sample sizes. Nevertheless, the consultation model that is tested shows promise in increasing global quality in center-based infant-toddler and preschool classrooms (no significant quality changes were found for the small sample of family child care programs included

in the 1998 study) and sustaining increases after the consultation ends. The model described in the 1994 and 1998 studies uses the environmental rating scales as the basis for the consultation relationship. The model was initially developed to help promote quality in classrooms that include children with special needs, though the observation was made that improvement of global quality affects all of the children in the classroom, not just the child with special needs. The steps of the model are articulated, and consultants receive a two-day training to learn the components and strategies of the model.[12] After a period of relationship-building, consultees are taught how to use the rating scales to assess the quality of their own programs. Then, together with the consultant (who has also assessed the quality), they discuss the findings and create an action plan for quality improvement. This focus on collaborative assessment and change empowers the consultees to think through problems and come up with solutions independently (Palsha and Wesley 1998).

Another key feature discussed in Wesley (1994) and Palsha and Wesley (1998) that should be noted is the inclusion of all staff in a classroom (and center administrators, if possible) in the consultation process to increase the shared knowledge base and prevent a reversion to previous practice. This inclusion also helps increase the buy-in of staff to the change process and helps ensure that results are sustained over time.

Pianta and colleagues (2008) describe the results of a different approach to consultation—embedded within a larger study of professional development—that directly targets teachers' interactions with children. This study of My Teaching Partner (MTP) used an experimental design (with teachers randomized at the level of school district) to examine the effectiveness of different professional development resources (including online video exemplars and individualized consultation) on teachers' interactions with children. In one condition, teachers had on-demand access to only the online video exemplars. In the second condition, teachers had access to the exemplars as well as MTP consultation support. In this condition, teachers submitted videos every two weeks of themselves engaged in an activity with their students. The MTP consultant reviewed the video and provided direct and specific feedback to the teacher. The consultants posed questions and teachers responded to the questions using the MTP Web site. Teachers also met with the MTP consultants in an online chat to further discuss the feedback and additional questions. Videos from the Web-only teachers and the consultancy teachers were coded using the Classroom Assessment Scoring System (Pianta, La Paro, and Hamre 2008), and scores were analyzed. Teachers in the consultancy condition had significantly higher rates of growth than teachers in the Web-only condition on three of the seven dimensions examined (Teacher Sensitivity, Instructional Learning Formats, and Language Modeling) and showed more positive growth on all of the dimensions.

Collaborative Training of Parents and Teachers. One pair of studies (Fantuzzo 1996; Fantuzzo et al. 1997) focused on parent involvement in Head Start programs. The model used a collaborative training approach through which parents and teachers were trained together, viewed videotapes of exemplary practices provided by other teams of staff and

[12] Because the consultant rather than the early educator receives this training, we do not include this approach in the category of consultation plus training.

parents, and reflected on their own performance using videotapes of their own classrooms. Compared to parent-staff teams that attended a more traditional set of workshops, the collaboratively trained parents and teachers reported higher levels of satisfaction and involvement in the training. Collaboratively trained parents reported more affirmation and support by the teacher but their perceived role in the classroom did not differ from workshop-trained parents. Similarly, they did not engage in more positive interactions with children than workshop-trained parents. In a revision of the model and a second experimental evaluation, Fantuzzo and colleagues (1997) added two components to the model—parent exemplars in the training curriculum and opportunities to view both teacher and parent exemplars in the classroom environment—to expand on the role of parents in the classroom. The components were successful in promoting more verbal exchanges and responses to child initiations among parents in the classroom. Teachers in the collaboratively trained group showed the highest levels of positive instruction and praise.

D. 2d. Implementation of Professional Development. This section focuses on what can be learned about the implementation of professional development approaches in this set of studies focusing broadly on improving overall quality.

Provision of Incentives. Though most articles did not address the issue of incentives for professional development, one strategy that was effective for improving practice was the provision of a scholarship for taking community college course work and a bonus or salary increase after completion of a degree (Cassidy et al. 1995). In other studies, modest financial support was provided to purchase materials or classroom resources (Campbell and Milbourne 2005; Palsha and Wesley 1998), but the evidence on quality improvements in these studies is mixed. It is difficult to isolate the effectiveness of incentives from the other features of professional development that were evaluated (e.g., on-site consultation).

Dosage. Another feature that varied across the studies reviewed was the intensity and duration of the intervention. A common theme running through the literature on best practices is that professional development must be "intensive and continuous" (National Research Council 2001, p. 276). The section of the National Research Council Report *How People Learn* on teacher preparation is also clear on this issue: "Teachers need opportunities to be involved in sustained learning, through teaching that models the methods that they are being urged to adopt….[T]ime must be scheduled for teachers to engage in ongoing opportunities to learn" (Donovan, Bransford, and Pellegrino 1999, p. 27).

Yet guidelines for intensity and duration are difficult to find in the literature. Indeed, the appropriate levels of intensity and duration appear to depend on the goals of the professional development. To change and sustain the quality of environments, the literature suggests that on-site consultation may not be effective at low levels of intensity, even when combined with training (Campbell and Milbourne 2005; Fiene 2002) but may be more successful at higher levels of intensity (longer and more frequent on-site visits over a longer period of time) (Palsha and Wesley 1998).

Direct Focus on Practice. The bulk of studies and best practices reviewed highlighted the importance of at least a portion of the professional development occurring on site (or via the Web) with opportunities for applying knowledge directly. Active learning, in combination with observation and individualized feedback, are critical components in adult learning (Epstein 1993; National Research Council 2001; Birman et al. 2000).

It is noteworthy that research and best practice statements on adult learning and K–12 teacher preparation concur with the emphasis on individualization, sufficient intensity, and the need for opportunities for observation and practice that we have identified in the early childhood literature reviewed. For example, the National Research Council report on principles of adult and child learning and their implications for practice *How People Learn* (Donovan, Bransford, and Pellegrino 1999) notes that teacher preparation often violates what is understood about adult learning. In particular, this report concludes that teacher education often:

- fails to use as a starting point the areas in which the teacher identifies a need for help;
- introduces a new technique without sufficient explanation especially of how and why it might be valuable to implement;
- does not involve opportunities for practice with feedback within the classroom;
- fails to provide teachers with the skills to assess for themselves how well new practices are being implemented;
- is provided to the teacher without providing opportunities for ongoing contact and support as he or she seeks to implement new practices.

The work of Joyce and Showers (2002) also underscores that teacher preparation includes multiple components and requires both sustained engagement and opportunity for observation and practice. Their research on K–12 teacher preparation suggests that four components are needed in order to bring about sustained change in practice: (1) building knowledge by exploring theory to understand the new concepts underlying a new skill; (2) observing the new skill being modeled in a setting similar to the educator's workplace; (3) opportunities to practice the new skill, with the amount of practice required varying by the complexity of the new skill (and between 8–12 weeks of practice and 25 trials estimated as necessary for a skill of medium complexity); and (4) ongoing support through working with peers on the development of lessons and curricular materials.

Sheridan and colleagues (2009) emphasize that there is a need to shift the focus in the research on early childhood professional development from specification of formats (such as education or training) to a direct focus on processes. We need direct examinations of the relative importance of such strategies built into professional development of observation of positive practices, provision of feedback on practice, and discussion and planning with others regarding practice. Zaslow (under review) also notes that we need a common vocabulary for describing the processes that are of importance in professional development and requirements for more detailed descriptions of these in evaluation

reports. It is only through common definitions and terminology and systematic reporting of underlying processes that we will be able to aggregate findings across studies.

Professional Development for Multiple Staff Members Together. Finally, the literature suggests that engaging larger "systems" for professional development, for example all of the teachers in a classroom rather than one teacher, is important for improving and sustaining new practices (Palsha and Wesley 1998; Birman et al. 2000): "Greater change is possible when individuals in a social organization (1) are prepared together in order to develop a shared knowledge base, (2) are involved in assessing their own needs, (3) receive ongoing staff development over an extended period of time, and (4) have opportunities to apply their new knowledge and skills in the work setting" (Palsha and Wesley 1998, p. 76). Two recent publications (Vu, Jeon, and Howes 2008; Fulgini et al. 2009) present findings indicating that the context of the early childhood setting may be important to the implementation of professional development approaches and to their effectiveness. These studies provide evidence that different types of early childhood settings differ in terms of degree of isolation of the early educator and ongoing supervision and support by administrators. Findings suggest that response to professional development differs in settings with greater and less ongoing supervision and monitoring.

The work in early childhood professional development also points to the importance of support from program administrators. This is in accord with research on adult learning and K–12 teacher preparation. For example, Donovan and colleagues (1999) conclude that program administrators need professional development to help assure that teacher preparation is supported and sustained. Administrative involvement is also noted as an important component of systems change in schools (Fullan 2007) and of the development of *professional learning communities* in K–12 settings (DuFour, Eaker, and DuFour 2008).

Aligning Professional Development with Standards. Increasingly, the systems that early childhood professional development must be aligned with go beyond the school, center or program to include state early learning standards for what young children are expected to know and be able to do. Strickland and Riley-Ayers (2006) note that such standards can provide a common vision for the skills that early childhood professionals in a range of different programs should be prepared to support in their professional development. This can help to unify the professional development across types of early care and education. Yet Strickland and Riley-Ayers note that it is important to guard against unintended consequences of such standards, for example assessments of programs or of children's development that focus on whether children have mastery of specific words or numbers rather than on whether early educators are focusing on the underlying processes of building comprehension or concepts related to literacy or numeracy.

Need for Intentionally Differentiated Approaches to On-site or Individualized Professional Development. As noted, the research reviewed in this section indicates that early childhood professional development is evolving to include a focus on on-site or individualized strategies. An important next step in the evolution of research and practice will be the evaluation of intentionally differentiated approaches to on-site work. Research

is needed focusing on such key dimensions as whether there are preexisting goals for the on-site work or whether goals are set by the early educator participating in the professional development, the nature of the on-site working relationship, whether feedback is provided, and how long the on-site work continues. Differentiation is also needed in the terminology (coaching, mentoring, provision of technical assistance) used to describe on-site work. Evidence on which individualized approaches are effective, when, and with whom, will help plan for the efficient use of resources to advance early childhood practice and improve child outcomes. When measures of quality are used to guide improvements in overall quality, the specific measure should be selected with attention to its content and how this aligns with the specific goals of professional development (Zaslow et al. April, 2009, under review) For example, some broad measures of quality, while including multiple constructs, have a stronger emphasis on particular constructs such as health or instructional quality.

D. 2e. Sustainability of Effects. Few studies address the sustainability of effects in professional development approaches aimed broadly at improving overall quality. One new study (QUINCE Research Team 2009) has reported preliminary findings on sustainability of effects of the Partners for Inclusion approach to professional development developed by Wesley and colleagues (Palsha and Wesley 1998; Wesley 1994) as part of the Quality Interventions for Early Care and Education (QUINCE) Evaluation. This random assignment evaluation involved observation in the classroom environment both at the time the intervention concluded and six months later. Improvements that occurred from baseline to the conclusion of the intervention were generally sustained through the delayed post-test observation.

VI: Conclusions

Though it may be early to draw definitive conclusions, the literature on early childhood professional development does point to an initial set of strategies that can serve as a starting point toward the identification of effective practices in the preparation of early educators. These initial conclusions are in accord with the conclusions of the Committee on Early Childhood Pedagogy (National Research Council 2001) and the findings from other evaluations of professional development programs (Epstein 1993; Garet et al. 1999). Acknowledging that these are initial conclusions, the evidence to date suggests that professional development for early childhood educators may be more effective when:

- *There are specific and articulated objectives for professional development.* A meta-analysis of studies in which there was "specialized caregiver training with a focus on interaction skills with children" found a statistically significant effect of specialized training on caregiver competence overall, with a medium effect size (*d=.45)* (Fukkink and Lont 2007, p. 297). When the content of the training was more specific, rather than open in content, effects on early educator practice were larger (Fukkink and Lont 2007). Use of an observational measure of quality can help to provide specific and articulated goals for quality improvement (QUINCE Research Team 2009). The content of the measure of quality chosen to guide efforts needs to be aligned with the areas of practice in which improvement is sought and the child outcomes considered of importance (Zaslow et al. April, 2009, under review). Consensus documents that summarize research about what is appropriate and important for young children to know in the areas of language and literacy and early mathematics provide a strong research basis for developing appropriate curricula and approaches for preparing early educators to implement the curricula (National Reading Panel 2000; Snow, Burns, and Griffin 1998; National Early Literacy Panel 2008; Clements and Sarama 2008; Ginsburg et al. 2006; Starkey, Klein, and Wakeley 2004)

- *Practice is an explicit focus of the professional development, and attention is given to linking the focus on early educator knowledge and practice.* This review provides summaries of multiple studies in which the professional development focused not only on strengthening early educator knowledge but also directly and explicitly on strengthening practice. This emphasis is in keeping with the principles of adult learning summarized by the National Research Council (2001). Such approaches often involved combining course work or training with individualized modeling and feedback on interactions with children in the early educator's classroom or home-based care setting; in some instances, the focus involved individualized professional development without course work (and may have been provided through the Internet rather than on-site) (Pianta et al. 2008) or practice in applying new techniques incorporated directly into course work or training without on-site application (Assel et al. 2007; Campbell and Milbourne 2005; Clements and Sarama 2008; Dickinson and Brady 2006; Dickinson and Caswell 2007; Fantuzzo

1996; Fantuzzo et al. 1997; Gettinger and Stoiber 2007; Landry 2002; Neuman and Cunningham 2009; Palsha and Wesley 1998; Raver et al. 2008). While we caution that not all evaluation studies involving individualized professional development showed positive effects on practice or child outcomes, there is promising evidence for these approaches. We are at a point at which it is important to go beyond broad descriptions of such approaches to identifying the specific processes underlying positive effects and distinguishing between practice-focused on-site individualized approaches that are and are not effective (Zaslow 2009; Sheridan et al. 2009). More thought is being given to the issue of whether the presentation of information through course work or training alone is effective in changing early educator practice and child outcomes (Burchinal, Hyson, and Zaslow 2008; Early et al. 2007), or whether professional development aimed at strengthening knowledge needs to be more closely tied to practice, for example through interspersing training on instructional approaches with opportunities to apply them shortly afterward in the early childhood setting (see for example, the discussion of timing of training and practice opportunities and intentional interspersing of group training and opportunities for application in Dickinson and Brady 2006).

- *There is collective participation of teachers from the same classrooms or schools in professional development*. Joint participation can help to support a professional culture and ensure the sustainability of new techniques and skills. Professional development that includes administrators helps to assure that early educators do not receive contradictory messages about what practices to implement or emphasize. Likewise, including teachers of different age groups or grades can foster continuity in the children's experiences as they move through classrooms in the future (Baker and Smith 1999; Assel et al. 2007; Burchinal, Hyson, and Zaslow 2008; Donovan, Bransford, and Pellegrino 1999; Birman et al. 2000; Bierman et al. 2008).

- *The intensity and duration of the professional development is matched to the content being conveyed*. The appropriateness of the length of time spent in professional development activities depends on the goals of the activities themselves. For instance, a one-time seminar might be appropriate for imparting skills for one strategy to support literacy development (e.g., interactive book reading) but would not be appropriate or adequate if the goal is to convey theory and practice to improve multiple aspects of literacy development (e.g., oral language development, phonological awareness, alphabetic principle, awareness of print) through the use of multiple strategies. That being said, it appears that a one-time workshop is not as effective in training educators in new skills, even if they are narrowly targeted, as are more lengthy or extensive professional development models (Whitehurst, Arnold et al. 1994; Donovan, Bransford, and Pellegrino 1999; Raikes et al. 2006).

- *Educators are prepared to conduct child assessments and interpret their results as a tool for ongoing monitoring of the effects of professional development*. Assessments can help early childhood educators view their knowledge and skills as contributing to improvement in children's outcomes and can serve as a source of feedback for where to target instruction overall and for individual children (Foorman and Moats 2004; Garet et al. 2008; Gettinger and Stoiber 2007; O'Connor et al. 2005).

- *It is appropriate for the organizational context and aligned with standards for practice* including guidance provided by expert research panels and professional organizations as well as national and state standards. There is evidence that the effectiveness of professional development approaches will differ according to such features of organizational context as the extent to which are articulated standards for practice with ongoing monitoring and supervision (Vu, Jeon, and Howes 2008; Fulgini et al. 2009). Increasingly, approaches to professional development also need to take into account state standards regarding pedagogy (for example in early language and literacy, Roskos et al., 2006; and early learning guidelines, Strickland and Riley-Ayers, 2006).

Throughout this review, a number of gaps were identified in the research on early childhood professional development that will need to be addressed to extend and deepen the knowledge base in this area.

- *There is a need for careful examination of the features and overall quality of higher education programs involving professional development for early childhood educators.* Coordinated secondary analyses carried out with the data from seven major studies of early care and education provide little indication of stronger observed classroom quality or larger gain scores on children's academic achievement when early educators had completed a higher education degree, according to the highest education level among those with an early childhood major, or according to whether those with a bachelor's degree had an early childhood major (Early et al. 2007). The quality of the educators' degree-granting higher education programs could not be examined in these analyses, and may be an important underlying factor (Hyson, Tomlinson, and Morris 2008; Burchinal, Hyson, and Zaslow 2008). We are only beginning to see evaluations of planned variations in higher education approaches for early childhood educators. We need to ask if higher education programs that incorporate specific course content and approaches are associated with stronger outcomes.

- *The literature base needs to be expanded to include more process-focused research that can inform effective professional development.* The literature on early childhood professional development tends to focus on the *content* of professional development rather than the *processes* and *strategies* that can be used most effectively. Several articles discuss this problem of a focus on the content rather than the process of professional development. Pang and Kamil

(2006), for example, in their update and extension of the review by the National Reading Panel, note that much of the research on the teaching of reading in the K–12 grades focuses on noninstructional issues, making it difficult to discern the link between professional development and student achievement. Taylor and Pearson (2004) note, "Further research is needed to learn more about how to help schools and teachers succeed at the complex task of translating research-based knowledge into practice [to help all children reach high levels of reading achievement]." Anders, Hoffman, and Duffy (2000) found, "Relatively few researchers have asked questions about the processes that teachers go through as they learn and continue to learn to teach reading" (p. 719). Indeed, they found in their review of the 19,457 studies of reading published between 1965 and 1996, only 140 focused on teacher preservice (education before beginning teaching) or in-service training (ongoing professional development for teachers) on reading. However, after reviewing these 140 studies, the authors conclude that this research on preservice and in-service teacher education "neither explains how teachers of reading are created, how they teach, nor how they change" (p. 732).

- *Evaluations are needed of professional development approaches aimed at increasing the cultural and linguistic competence of early educators*. The literature does not adequately address the issue of cultural and linguistic competence for early childhood educators. This review did not reveal any peer-reviewed articles that examined or evaluated professional development strategies to improve cultural and linguistic competence despite the growing diversity of the early childhood population. Early childhood educators are calling for improvements in their preparation on these topics and are looking for strategies to improve their abilities to address the needs of diverse children and families (Daniel and Friedman 2005). Strategies to improve teacher preparation in cultural and linguistic competence cited by Daniel and Friedman (2005) include increasing faculty knowledge and willingness to adapt and respond to the diversity in early childhood education, requiring practicum and internships in diverse settings, integrating issues of diversity into course content, and requiring English as a second language (ESL) courses for teachers.

- *Further focus is needed on the language and literacy skills that early educators bring to their work, and possible approaches to strengthening these.* Although low literacy is not universal among early care and education providers, and may vary by the requirements for those working in different types of early care and education settings (such as child care, Head Start and prekindergarten), the 1992 National Adult Literacy Survey found that between 44 percent and 57 percent of child care workers perform at the lowest levels of proficiency on standardized literacy assessments (Kaestle et al. 2001). A more recent study of child care providers in Alameda County, Calif., indicated that almost one-third (31 percent) of the providers in that county had "limited proficiency" in English, based on their scores on the Test of Applied Literacy

Skills (TALS) (Phillips et al. 2003). Research is needed focusing on the potential of professional development to strengthen the spoken language and literacy skills of early childhood educators. For children who are dual language learners, consideration should be given to the language and literacy skills of educators in both the child's home language and English.

- *There is a need to expand understanding of the strategies that are most effective for educators working in the full range of settings in which children, especially low-income children are cared for, and for children in the full age range from birth through school entry*. The literature is heavily focused toward professional development for educators working in center-based settings including Head Start and prekindergarten programs. Yet, this group of educators constitutes only 24 percent of the workforce. The majority of paid educators in early childhood care and education work in licensed (28 percent) and unregulated (48 percent) home-based settings (Burton et al. 2002). Likewise, the literature emphasizes professional development for educators working with preschool-age children. There is limited research focusing specifically on professional development for those working with infants and toddlers.

- *Further research is needed on how best to target professional development approaches, both in terms of timing (whether the professional development is offered preservice or in-service) and in terms of the settings the early educators work in (prekindergarten within public schools, prekindergarten in community-based settings, Head Start, center-based child care, and home-based child care).* Different professional development approaches may be more effective when included as part of early educators' preservice preparation or alternatively once they are already working in early childhood settings. Yet studies do not consistently report on which time period they focus on, and we lack studies focusing on the effects of the same professional development when offered as part of pre- or in-service preparation. In order to target professional development efforts, we also need information on whether specific approaches are effective for early educators working across the full range of early childhood settings, or if specific approaches are effective especially for early educators working in particular settings.

- *Continuing to increase the rigor with which studies of early childhood professional development and their data analyses are conducted should be a priority.* The methods and analytical strategies used in evaluations of professional development need more rigor. Though the number of experimental evaluations focusing on early childhood professional development is growing, there is a need for the use of this research design whenever appropriate. Effect sizes are rarely reported in the literature, and provisions are not made to account for the "nested" nature of studies that include children within classrooms within programs. Studies do not

consistently report on all three outcomes that research has identified to be important: educator knowledge, educator practice, and educator outcome.

- *We need to work toward a differentiated and consistently used vocabulary to describe on-site work as part of early childhood professional development.* Further, we need evaluation studies that help to distinguish which specific on-site approaches are effective in which contexts. While on-site work has become a clear focus of the research on early childhood professional development, we are lacking agreement on terminology. Further, it is clear that not all on-site approaches have been effective.

- *Research is needed aimed at helping to determine effective approaches to improving practice across the multiple domains of early childhood development simultaneously*. A final gap to note in the literature is the lack of focus on integrating content across topical areas. For example, how should early childhood educators blend early literacy, math and social behavior strategies to achieve the best results for children? What professional development strategies are most effective at helping teachers balance the content to create learning environments that promote development across domains? This is a challenge for the next generation of studies on professional development for early childhood educators.

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Appendix A

Table A-1a. Language and Literacy Studies: Methodology

Study	Research Questions	Research Design	Sample	General Comments
Adger, Hoyle, and Dickinson (2004)	Does an analysis of discourse among participants in the Literacy Environment Enrichment Program (LEEP) professional development training program provide insight into the processes by which teachers develop new understandings about literacy, begin to question their own practice, and come to regard their classrooms as amenable to modification?	Nine LEEP training sessions were videotaped during 2000-2001. The participants sat facing each other on three side of a large table configuration, with the instructor on the fourth side. Videotapes captured the Professional Conversation, the lecture/discussion period, and the conversation that closed each session. There were three different instructors over the course of the 10 sessions. See Dickinson and Brandy (2006), Example 2, for more information on LEEP intervention.	There were 11 staff members from four preschool programs (three Head Start and one public school program) that participated. The group included seven teachers and four supervisors. Three had associate degrees and four had masters' degrees. Mean number of months' experience in early childhood programs was 128. Mean number of months in current position was 41. Mean number of months in teaching 3- to 4-year-olds was 106.	The authors note several purposes of discourse processes methodology: 1) It helps describe course content. 2) It locates evidence of research-based knowledge being linked with practical knowledge. 3) It may help evaluate the quality of in-service training sessions. 4) It helps to locate evidence of teacher communities of practice, a concept not always supported with data. 5) A detailed analysis of teachers' talk in a professional development setting may reveal the emergent effects of the course on teachers' learning. Engaging in such conversations may enhance professional interaction as well as changes in classroom practices (although this further link needs to be supported by further research). Although authors claim that these discussions among teachers integrated practical knowledge with research-based knowledge, we did not see evidence in any of the examples presented in the article of this integration; In all transcriptions, teachers built onto each others' practical experiences to generate a common set of propositions about the importance of re-reading books to children.
Assel, Landry, Swank, and Gunnewig (2007)	Do two preschool curricula (Let's Begin with the Letter People and Doors to Discovery) result in greater gains in child language and literacy outcome measures when compared to children in control classrooms? Are there differences, based on curriculum, in the impact on child outcomes? Does curriculum effectiveness differ by site (Head Start classroom vs. public school)? Do children in mentored classrooms (intervention + mentoring) show greater gains than children in non-mentored classrooms?	Researchers randomly assigned school sites to one of three conditions: Let's Begin with the Letter People, Doors to Discovery, or Control. Then the school sites receiving one of the two curricula were randomly assigned to receive mentoring v. no mentoring.	The sample included 603 pre-k children enrolled in full-day Title 1 (n=26), universal pre-k (n=19), and Head Start classrooms (n=31). There were differences based on site in ethnic backgrounds of children. The majority of teachers from all sites were female, however ethnicity varied by site. Teacher education also varied by site, with teachers in the public school setting having more education and certifications that Head Start teachers.	This study was one of the PCER studies, however, this manuscript did not include the national evaluation components, but only the local or "complementary" research questions. Despite the large number of ELL children in the study, the researchers did not assess differences in these children's outcomes versus non-ELL children. The authors do note that this could not be done due to the varying number of ELL children across sites.

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Table A-1a. Language and Literacy Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Baker and Smith (1999)	Can changes in two kindergarten programs to improve literacy instruction be linked to improved child outcomes? Can these effects be sustained a year after implementation?	Researchers worked with two schools within the same Northwest school district. Although they implemented two different programs in the two schools, the researchers used similar PD components across the two sites (see column on Mode of Delivery). Data were gathered in a Baseline year, Implementation year, and Sustainability year. Child outcomes were compared pre-post and against the performance of comparison groups.	Two schools. Glendale and Lincoln are two elementary schools within a Northwest school district. Of the 16 schools in the district, these two have the highest percentage of students on free or reduced-price lunches, and the highest student mobility rates. Both had identified early reading as an area targeted for improvement. The kindergarten teachers within these two schools were the main targets of the intervention, although other teachers (Title I and English Language Development teachers) were also included, since the child targets of the intervention were children at risk for reading/learning difficulties.	This is an excellent example of a study that focused specifically on the implementation of PD to improve literacy instruction and literacy development in young children. The study pays particular attention to fidelity of implementation, and sustainability of PD one year after implementation. However, it is a case study of PD in two particular schools. The authors note that it would not be feasible to implement their intervention on a large-scale basis, due to the need to attend to the needs and proclivities of individual schools and teachers. However, their framework for approaching professional development can, potentially, have widespread use.
Byrne and Fielding-Barnsley (1995)	What are the effects of the phonemic awareness program, Sound Foundations, when administered by preschool staff working from the manual? That is, will the program have as good outcomes for children when administered under "real life" conditions, in a full-group setting rather than in small groups?	This supplementary group was compared to the original experimental and control groups in terms of children's outcomes. Comparisons of pre-test and post-test performance on phoneme identification were used.	The PD sample was three preschool teachers in Australia. However, no information was provided about them or their schools. The results of the intervention were based on child outcomes, and details were provided about the children. The sample was 93 preschoolers in three separate preschools in Australia. There were 48 boys and 45 girls. The mean age at pretest was 53.9 months, which was slightly younger than the mean age for the original experimental and control groups at pretest (55.6 and 54.9 months, respectively).	The authors note that there is a confound in the amount of time that elapsed between pre- and post-test for this supplemental sample (5.5 to 7 months) and the original experimental and control group samples in the preschool phase of the main study (5 months). However, they note that the magnitude of effects suggests that this minor variation in pre- and post-test intervals is not explaining the variance. Nevertheless, interpretations and conclusions from the results of the study need to be tempered, because the researchers did not control for differences in teacher/researcher characteristics, time on task, group size, amount of attention to individual children, amount of feedback given to children, etc. In sum, there were differences in the intensity of training that the teachers received compared to the researchers who administered the program to the original "experimental" sample, and consequently differences in the dosage of intervention that the children received across conditions.
Dickinson and Brady (2006), Example 1: Teacher-Researcher Pilot Project	Will encouraging teachers to be researchers in their own classrooms improve teacher-child verbal interactions?	In a Head Start center, several teachers were paid to participate in a teacher-researcher professional development project. Participating teachers and researchers held regular meetings to discuss observations of teacher conversations with children. Teachers were encouraged to keep a log of language interactions with children and to bring comments and questions to the meetings. The researchers discussed observations with teachers and provided readings on children's language development.	Three teaching teams, including a lead teacher and an assistant teacher, from a Head Start center participated.	This project was a pilot project that provided the foundation for Dickinson and colleagues' LEEP projects.

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Table A-1a. Language and Literacy Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Dickinson and Brady (2006), Example 2: Literacy Environment Enrichment Program (LEEP)	Will an intensive training program, with components of knowledge acquisition, reflection, and application, improve teachers' language and literacy classroom environments?	A four-credit training program on children's language and literacy development and applications to child care environments was offered in 12 New England colleges and universities. The training program consisted of two three-day sessions which included discussions, demonstrations and lectures, and hands-on activities. During the 3 months between the sessions, participants applied course content in "carefully sequenced" assignments.	72 preschool teachers participated in the LEEP evaluation. 39 received LEEP training, and 33 were members of the control group. A total of 522 children were included in the evaluation. The attrition rate for the LEEP teachers was 10 percent.	This is the original LEEP program, which was developed after the Pilot Project.
Dickinson and Brady (2006), Example 3: Technology-Enhanced Literacy Environment Enrichment Program (T-LEEP)	How effective is a training session combining face-to-face meetings with distance learning technologies in affecting teachers' language and literacy classroom practices?	A training program on children's language and literacy development and applications to child care environments was offered using distance education. 28 teachers participated in the training, and the comparison group contained 37 teachers.	65 preschool teachers were part of the evaluation, 28 of these participated in T-LEEP training. A total of 455 children were in evaluation classrooms in North Carolina and New England. The attrition rate for the T-LEEP participation teachers was 45 percent.	This is the second version of the LEEP program.
Dickinson and Brady (2006), Example 4: Striving to Achieve Reading Success (STARS-LEEP)	Does a modified version of the LEEP program, with fewer sessions, and more time between each session, help facilitate teachers' support for children's language and literacy development?	Preschool teachers in Connecticut have been participating in the STARS-LEEP program. Focus groups with participants are used to gauge teachers' responses to the program. Additionally, post-intervention formal observations were conducted by an outside evaluation firm.	The sample size is not noted. The attrition rate for the STARS teachers was 13.5 percent.	This is the third version of the LEEP program.

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Table A-1a. Language and Literacy Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Dickinson and Brady (2006), Example 5: Program-Delivered Literacy In-Service Training (PD-LIT)	Will a training model in which all staff in a child care center participate and the training is given by a member of the organization, effectively improve classroom language and literacy practices?	In participating centers, a member of center staff is trained on using the training materials (overhead transparencies, videotapes) which focus on children's language and literacy development. Then, this person trains all other staff members in a child care center during internal meetings. The type of evaluation is unclear.	The sample is not noted.	Method is unclear. It sounds as if this program may still be underway and under evaluation.
Dickinson and Caswell (2007)	Do teachers who participate in Literacy Environment Enrichment Program (LEEP) have classrooms that receive higher scores for support for language and literacy after taking the course? Does participation in LEEP add significant explanatory power to the prediction of practices related to language and literacy in the spring, compared to comparison group teachers?	Teachers and supervisors in the intervention group participated in a 45-hour LEEP course, delivered in two three-day sessions. Teacher and classroom data were collected in LEEP and comparison classrooms prior to and after the completion of the LEEP course. The fall data collection also included the completion of a teacher questionnaire.	Intervention and comparison teachers were recruited from Head Start programs across New England over a two-year period. Participating teachers all had at least two college level ECE courses. The sample included a total of 30 intervention (16 - year 1, 14 - year 2) and 40 comparison teachers (12 - year 1, 28-year 2). The majority of teachers were white and on average, had 9 years of teaching experience. No information was provided about the supervisors.	Although fidelity of implementation was not measured, the authors note that in order to receive credits, the teachers had to attend the LEEP sessions (doesn't say how many). Not a lot of information was given about supervisors. No child outcomes were assessed.
Foorman and Moats (2004)	What are the relationships among teacher knowledge, teacher effectiveness, and student outcomes in light of the professional development given?	Professional development activities were administered to participating K-4th grade teachers in the District of Columbia. It is unclear how participants were selected.	The sample for the data collection appears to be limited to 42 3rd- and 4th-grade participating teachers.	

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Table A-1a. Language and Literacy Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Fountain, Cosgrove, and Wood (2008)	Does implementation of Early Literacy and Learning Model (ELLM) produce gains in child and classroom outcomes compared to a control curriculum?	This study was part of the PCER report on the Effects of Preschool Curriculum Programs on School Readiness. The Florida-UNF research team recruited 28 preschool classrooms from three counties with low-performing schools in the state of Florida. These classrooms included Head Start, subsidized, faith-based, and early intervention pre-kindergarten classrooms. They were then randomly assigned to treatment (ELLM implementation) or control conditions.	Head Start, subsidized, faith-based, and early intervention classrooms were recruited. Data were collected on 243 children and 204 parents. Children were 4.6 years old at the time of baseline data collection and were primarily African-American (71 percent), with smaller percentages of White (14 percent) and Hispanic (8 percent) children. All 28 participating teachers were female, with 64 percent identifying themselves as African American and 21 percent white. The average level of experience in teaching was 11 years and 26 percent had a Bachelor's degree.	Unlike many of the studies encompassed in the PCER report, ELLM implementation was found to positively affect a child outcome--language development at the end of the kindergarten year. However, the implementation did not result in improved classroom outcomes.
Gettinger and Stoiber (2007)	Does the Exemplary Model of Early Reading Growth and Excellence (EMERGE) program produce significantly higher performance on measures of children's early language and literacy than a control curriculum.	An initial evaluation of the EMERGE program was conducted after one year of implementation in 15 classrooms. Evaluators compared children's performances on outcome measures with those in control classrooms. Control classrooms were randomly selected to participate. Children were assessed at the beginning (September) and end (May) of the year.	A total of 188 children (30 teachers) were served using the EMERGE model within the context of center-based early education programs in Milwaukee, WI; 154 children (20 teachers) from SDC Head Start classrooms were in the control group. Children ranged in age from 3-5 years. In both groups, approximately 90 percent of children were from families living in poverty according to the federal poverty threshold. The majority of children and teachers in each group were African-American.	This is a mostly descriptive article that describes the design and evaluation of EMERGE, as well as preliminary findings from an evaluation of the EMERGE program. This is one of the Early Reading First studies. Although there is an extensive description of the PD component of the EMERGE program, and the authors report that improving teacher knowledge and practice as the goals of the PD, this article does not report any measures or outcomes associated with teacher knowledge or practice. Although the control group was randomly assigned, it is unclear whether there was random assignment to the intervention group. It appears that this study will continue for two more years.

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Table A-1a. Language and Literacy Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Jackson, Larzelere, St. Clair, Corr, Fichter, and Egertson (2006)	Is there an impact of early childhood educators' (ECEs) participation in HeadsUp! Reading (HUR; National Head Start Association, 2000) on preschool children's language and literacy skills? Is there an impact of participation on classroom practices? Is there a relationship between classroom practices and children's literacy skills, regardless of the intervention group?	Teachers participated in a 15-week HUR course to promote early literacy practices for children birth - 5. The training included 44 hours of live, research-based professional development. A smaller group of HUR participants volunteered to participate in the mentoring component of the study. Trained mentors worked with teachers to develop and individual plan for meeting the teachers' goals. Mentors met with participants four to six times for two to four hours per session over a two-month period. Pre- and post-training child assessments and ECE classroom observations were conducted.	The sample included 14 ECEs with HUR-only, 8 ECEs with HUR+ mentoring, and 17 ECE controls. The majority of intervention and control teachers had some college. A total of 143 children had both pre- and post-test scores on at least one literacy measure. Children were between 2.8 - 6.5 years old, and Spanish was spoken at home by 25.2percent of children. The sample was ethnically diverse and included 35 percent Caucasian children, 22 percent African-American, 22 percent Hispanic, 3 percent Multiracial, 4 percent Asian, and 14 percent Native American. Participating settings included: Head Start centers, child care centers, federal Even Start Family Literacy programs and state-funded prekindergarten programs.	There was a large range in the number of participating children per classroom (2-13). The authors report that post-training child assessments were completed after the 15-week HUR broadcasts and all ECE participants were provided an opportunity for mentoring (HUR+ mentoring). However, it is unclear when the mentoring occurred (e.g., during the 15 week HUR training or afterwards?) and when the child assessments occurred for children in the HUR+ mentoring group. There was no assessment of fidelity of implementation (e.g., how many training sessions did teachers participate in?). There was a large drop-out rate for both intervention ECEs and controls (29 percent), and large portion of children who did not have pre- and post-test scores, and were therefore not included in analyses (38 percent).
Justice, Mashburn, Hamre, and Pianta (2008)	What is the quality of langauge and literacy instruction in 135 publicly funded preschool classrooms serving at-risk children? What are the predictors of high-quality language and literacy instruction (e.g., teacher characteristics, classroom characteristics, and lesson characteristics)? Is procedural fidelity associated with quality instruction?	Teachers participated in one 2-day professional development workshop. Teachers implemented the My Teaching Partner-Language & Literacy Curriculum over the course of 36 weeks. To monitor fidelity, teachers were asked to video themselves teaching a language and literacy lesson once a month and to submit videotapes to the research site. Videos were assess for procedural fidelity and quality of language and literacy instruction.	Participants were 135 teachers who volunteered to participatie in a professional development study of state-funded preschools in a mid-Atlantic state. All of the teachers had a Bachelor's degree, and 36 percent had an advanced degree. Teachers were in state-funded classrooms designed to serve 4-year-old children exhibiting social and/or emotional risks. Forty-six percent of children were African-American, 29 percent were Caucasian, and 12 percent were Hispanic. One out of five children spoke a language other than English in their home. The average family income was $26,500.	All teachers had a bachelors' degree or higher making it difficult to generalize findings. Teachers volunteered to participate in the study and there was no information available for teachers who did not participate. This study was part of a larger study that involved receiving professional development over the course of the year focused on high-quality implementation of a language and literacy curriculum. The authors suggest that this study represents business-as-usual practices when teachers utilize a scientifically based curriculum without receiving explicit instruction in its quality implementation. As part of the larger study, some teachers were randomly selected to receive professional development designed to enhance the quality of language and literacy instruction.

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Table A-1a. Language and Literacy Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Justice, Pence, and Wiggins (2008)	Does implementation of Language-Focused Curriculum (LFC) produce gains in child and classroom outcomes compared to a control curriculum?	This study was part of the PCER report on the Effects of Preschool Curriculum Programs on School Readiness. A combination of Head Start and public pre-kindergarten classrooms were recruited from a convenience sample and randomly assigned to a treatment or control condition. The treatment group received training in implementing LFC. The control group reported using High/Scope curriculum materials, but the extent of this implementation was not assessed.	The Virginia research team recruited Head Start and public pre-kindergarten classrooms. All were full-day programs and teachers received an incentive for participating. Data were collected on 195 children (97 treatment, 98 control). Children were 4.6 years old at the time of baseline data collection. Seventy-one percent were white and 21 percent were African-American. All 14 participating teachers were female and White. They had an average of 11 years of teaching experience and the majority had a Bachelor's degree (71 percent).	During the baseline data collection, one observer completed the observational ratings in 8 of the 12 classrooms at a research site. It was later determined that the ECERS-R and Arnett ratings from these classrooms were inflated, and due to data integrity concerns, this data was excluded.
Landry (2002)	What is the effect of an interactive research-based training program regarding children's language and literacy development on teacher practice and child outcomes?	Teachers participated in a four-day workshop on children's language and literacy development and classroom activities for encouraging it. Weekly follow-up visits from researchers assessed teacher practice and gave teachers feedback regarding their language and literacy activities. Children were assessed at the beginning and end of the school year. It is somewhat unclear how teachers were assigned to intervention and control condition.	3,500 children participated in the evaluation.	The project sounds to be still in progress.
Landry, Assel, Gunnewig, and Swank (2008)	Does implementation of Doors to Discovery and Let's Begin with the Letter People produce gains in child and classroom outcomes compared to a control curriculum?	This study was part of the PCER report on the Effects of Preschool Curriculum Programs on School Readiness. The Texas researchers randomly assigned 76 classrooms to either receive Doors to Discovery training, Let's Begin with the Letter People training, or serve as a control using a three (Type of Curriculum - Doors to Discovery, Let's Begin with the Letter People, or Control) x two (mentoring vs. non mentoring) design with classrooms from three settings--Head Start, Title 1 pre-kindergarten, and non Title 1 pre-kindergarten. 45 classrooms were then randomly selected for inclusion in the study for the PCER initiative, and half were randomly selected to receive mentoring along with their implementation of the treatment curriculum.	The Texas research team recruited Head Start and public prekindergarten programs for participation in the study. Data were collected on 293 children and 237 parents. Children were 4.6 years old at the time of baseline data collection and were ethnically diverse: 43 percent Hispanic, 30 percent white, and 13 percent African-American. Most participating teachers were female, and most were white (55 percent) or African-American (32 percent). They had an average of 14 years of experience in teaching and 66 percent had a bachelor's degree.	Research proved that implementing Doors to Discovery and Let's Begin with the Letter People did not significantly improve child outcomes compared to a control group. The classroom outcomes that significantly improved after implementing the curricula were language instruction, literacy instruction, and classroom quality.

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Table A-1a. Language and Literacy Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Landry, Swank, Smith, Assel, and Gunnewig (2006)	Do children of teachers who received the professional development model show greater gains in cognitive development than control children? Does more teacher training (one v. two years) lead to greater cognitive gains for children?	A quasi-experimental design, teachers were assigned to be in either the intervention or control group in Year 1. All teachers in the Year 1 control group were then in the intervention group in Year 2. Coordinators at each site managed all grant-related activities, including data collection, monitoring assessments and in-classroom mentoring, ongoing teacher training, and selecting and ordering classroom materials. Mentors were hired to support target teachers with the implementation of the enhanced language and literacy program activities. Mentors coached one hour per week for each teacher in their first year of training and twice a month for teachers in the second year of training (the average caseload for mentors was 15 teachers). Training included multi-day summer training for coordinators, mentors, and teachers in addition to training across the school year. Control classrooms were asked to continue a "business as usual approach." Fidelity of model implementation, observation of classroom teaching, and pre- posttest child assessment were collected.	Across two years, the sample consisted of 20 Head Start sites, from which 750 teachers (500 target, 250 control) in 370 classrooms were randomly selected to conduct pre- and posttest assessments (10 children were randomly selected per class).	Significant moderators of the impact of the intervention effectiveness were the presence of a research-based early literacy curriculum, higher levels of teacher education, and a full-day versus half-day program.
Lonigan and Schatschneider (2008)	Does implementation of the *Literacy Express* Curriculum or the *DLM Early Childhood Express and Open Court Reading Pre-K* Curriculums result in better child outcomes, measures of classroom environment, or measures of classroom instruction than implementation of *High Scope* Curriculum?	This study was part of the PCER report on the Effects of Preschool Curriculum Programs on School Readiness. Thirty public pre-kindergarten teachers from 16 schools were recruited to the study using convenience sampling techniques. Schools were grouped into triplets depending upon their Florida school grading report and the average teaching experience of the teachers. Random assignment of schools to one of three treatment conditions was then applied to these triplets (control-*High Scope* , *Literacy Express, and DLM Early Childhood Express supplemented with Open Court Reading Pre-K*).	Children in this sample (N=282) were an average of 4.6 years old. The majority of children were African-American (59 percent) or white (30 percent). Teachers in this study (N=30) were primarily female and either white (83 percent) or African-American (13 percent). They had an average of 16 years teaching experience with an average of nine years teaching preschool. The majority of teachers had either a bachelor's degree (53 percent) or graduate degree (27 percent). The majority of teachers had a current teaching license/certificate (80 percent) and some had a state-awarded preschool certificate (40 percent) or a CDA (23 percent).	Because there were three conditions in this study, there were only approximately five schools assigned to each condition. Therefore, sample size may be an issue.

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Table A-1a. Language and Literacy Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Lonigan and Whitehurst (1998)	Can adults (caregivers and parents) trained in dialogic reading via videotape and brief role-playing effectively encourage children's language and vocabulary growth? What is the relative effectiveness of caregivers using dialogic bookreading vs. parents using dialogic bookreading?	Children were randomly assigned to three experimental groups or a control group. The three experimental groups were "school reading," "home reading," and "school plus home reading." The interventions lasted for six weeks. Parents and teachers were trained via videotape in dialogic reading, a technique that encourages caregivers to engage children as active participants in joint reading sessions. Children in the school condition or school plus home condition were read to daily by a teacher or aide in a group of five or fewer children (in a location separated from other children in the classrooms). For the home and school plus home conditions, parents were encouraged to read to their children daily. A total of six books were used--the same books in the classrooms and at home.	The sample consisted of 91 3- and 4-year-olds from low-income families. The children attended four child care centers in Nashville, Tenn., which mainly served families eligible for subsidized child care. The sample was 91.2 percent African-American. The children scored significantly below average on tests of receptive and expressive vocabulary before the intervention.	The authors report that all three intervention types had significant effects on children's language development. However, it seems that the results were highly variable; no consistent pattern emerged. Some results were found only for high compliance centers, some for both high and low compliance centers. Furthermore, in general, it appears that the combined (home plus school) intervention was the most effective, but this pattern did not emerge across all of the measures.

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Table A-1a. Language and Literacy Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
McCutchen, Abbott, Green, Beretvas, Cox, Potter et al. (2002)	1) Can professional development of realistic duration develop teachers' knowledge of the structural features of language? 2) Can this PD change instructional techniques? 3) Can this PD help students learn more quickly?	A letter of invitation was sent to over 70 local public (primarily) and private schools, and 40 responded with interest to participate in the study. Schools were matched based on the percentage of students qualifying for free or reduced-price lunches, and one school from each match was assigned to the experimental condition. Preference for the experimental condition was given to schools willing to send a team of teachers (either multiple classroom teachers or classroom teachers and special education colleagues) to training. Teachers participated in a two-week instructional institute the summer before classroom implementation. Teachers received ongoing observational visits and instruction feedback during researchers' regular classroom visits throughout the year. Kindergarten child assessments were administered at four timepoints (Sept.,Nov.,Feb.,May).	Forty-four teachers participated. Twenty-four were assigned to the experimental group and 20 were in the control group. Both groups had a mean of 13 years teaching experience. Four-hundred and ninety-two kindergarten children participated in child outcomes evaluations. [First-grade outcomes have not been tabled.] Students are 50 percent white; 20 percent African-American; 20 percent Asian-American; 5 percent Hispanic; and 5 percent other.	Teachers received stipends for participation.
McGill-Franzen, Allington, Yokoi, and Brooks (1999)	Does increasing children's access to books improve their literacy development? Does training teachers improve children's literacy development? Which is more effective?	Out of the six participating elementary schools, two schools were given teacher training and additional classroom books, two schools were given additional classroom books only, and two schools contained control classrooms. Because three of the schools had more than 50 percent low-income children, and three schools had less than 50 percent low-income children, a stratified randomization process was used to assign schools to conditions, to make sure that each condition included one low-income school and one other school.	Three-hundred and seventy-seven kindergarten children in 18 classrooms in six elementary schools participated in the study.	
National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences (2007)	What is the impact of Early Reading First (ERF) on the language and literacy skills of children enrolled in preschools that receive ERF support? What is the impact of ERF on the quality of language and literacy instruction, practice, and materials that preschools provide? To what extent are variations in ERF program quality and implementation associated with differences in the language and literacy skills of the children served?	The study uses a regression-discontinuity design to assess the impact of ERF funding on children's literacy and language outcomes. Trained staff assessed the language and literacy skills of children in the fall and spring. Observes measured classroom practice in a subsample of study classrooms. Teachers and administrators completed questionnaires, and teachers were asked to rate each study child's social-emotional behavior.	The sample included a treatment group of 4-year-olds in 28 ERF grantee sites, and children attending preschool in 37 sites. Sites were not randomly selected, but were selected based on grant application scores. About three classrooms from each site were selected. About 11 4-year-old students per classroom were randomly chosen to participate. The children in this sample were more likely than children nationally to come from economically disadvantaged homes (monthly income of less than $1,500), come from single-parent families (40 percent compared with 28 percent), and be Hispanic (46 percent compared with 21 percent). Forty-one percent of children spoke a primary language other than English. The largest percentage of teachers were white (54 percent) with 23 percent being Hispanic, and 17 percent black. Twenty-one percent of teachers were fluent in Spanish and English.	ERF teachers did not participate in uniform professional development. Instead, researchers asked teachers what types of activities they participated in, and on what topics. Additionally, researchers asked how teachers' pd was funded. The included analyses cannot and do not address the extent to which ERF contributed to the number of professional development hours reported by teachers.

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Table A-1a. Language and Literacy Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Neuman (1999)	What is the effect of the Books Aloud program on children's outcomes?	This study documents the effects of a formative evaluation of the Books Aloud program, a program designed to "flood" child care programs serving low-income children with high-quality books. 337 non-profit child care centers were served, 17,675 children were served, and a total of 88,960 books were distributed (5 books for every child. Trainers provided 10 hours of training to child care staff on bookreading strategies and thematic instruction. To evaluate the program, a stratified random sample of centers receiving the intervention was taken, and these centers were paired with similar centers not receiving the intervention.	The evaluation sample consisted of 400 children in the intervention sample and 100 children in the control sample. Children were low-income, with over 65 percent receiving child care subsidies. Due to attrition, a post-test only group of children was added to the sample, with 71 Books Aloud children and 57 control children.	
Neuman and Cunningham (2009)	What impact does a coordinated approach to professional development that combines coursework and ongoing coaching in early language and literacy development have on teachers' knowledge and classroom practice, compared to coursework alone and "business as usual," in both center-based and home-based settings?	Participants were stratified by setting (center-based, home-based) and then randomly assigned to one of three groups. Group 1 received a three-credit course in early language and literacy at their local community college. Group 2 received the three-credit course plus ongoing coaching. Group 3 received neither coursework nor coaching (control), with the understanding that professional development opportunities would be available the following year. Pre/post measures of teacher knowledge and teacher practice were collected.	The study started out with 304 sites (168 centers, 136 home-based), but there was 4.3 percent attrition, such that the final sample was 291 sites (177 centers, 114 home-based) across four Michigan cities: Detroit, Flint, Grand Rapids and Lansing. The participants were distributed proportionally by city, ethnicity, and experience across the three study groups (Group 1, 2, and 3).	This study claims to be the first that examines empirically a coordinated approach to professional development (that is, combining coursework with ongoing coaching). This study is also noteworthy in that it examines professional development in both center-based and home-based settings. Although this study clearly demonstrates that coursework plus coaching obtains greater effects on teacher practice than coursework alone or "business as usual," it does not rule out the possibility that equivalent gains in teacher practice could be obtained with coaching alone.
O'Connor, Fulmer, Harty, and Bell (2005)	Can extensive PD to teachers and intensive instruction to students help to reduce reading difficulties for students in the early grades (K-3)?	Longitudinal lagged design. Teachers implemented changes in cohorts over four years of the study, and control data were collected in the first year from the second and third graders in the same schools who did not participate in the intervention. Only students and teachers in the first cohorts during the first year of data collection are reported in this paper. During the first year of the study, kindergarten and first grade teachers received PD, but only the kindergartners received additional intervention provided by the research team. Children were followed through Grade 3.	Principals and all general education (n=16), remedial (n=2), special education (n=2), and speech teachers (n=2) in two schools. Students included 103 kindergartners and 103 first graders in the two schools at base year. Attrition by the end of Year 4 of the study resulted in 90 experimental students longitudinally. The control group was 101 students in Grade 2 and 102 students in Grade 3 at Base year. School 1 was in the Northeast and served primarily low SES. Majority of school was white. School 2 was university-affiliated laboratory school.	The authors note a potential confound with test practice: the children in the experimental classrooms had more language assessments than did the control group children. The authors acknowledge that their design would have been strengthened if they had conducted language measurements of the control group on the same schedule as during the treatment years. The authors also note that there is no way of knowing whether the teachers will sustain the changes in classroom practice beyond the time of the intervention. That is, sustainability was not assessed in this longitudinal study.

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Table A-1a. Language and Literacy Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Podhajski and Nathan (2005)	Does the Building Blocks for Literacy child care provider training program improve children's literacy skills?	The Building Blocks for Literacy Training program followed recommendations from the National Research Council, and included training and mentorship components focusing on strategies for vocabulary development through book reading; phonological awareness; and relationships between speech and print (i.e., how sounds link to letters).	67 providers from 44 child care settings (both center-based and family child care) participated in the training. 88 children were in classrooms of participating providers, as well as a sample of 13 control group children. The rate of attrition was 22 percent. Child care providers were given free tuition, overnight accommodations, meals, 15 continuing education units, instructional material, and books and blocks for their practice.	
Pence, Justice, and Wiggins (2008)	To what extent do teachers receiving training in a language-focused curriculum differ from teachers who do not receive this training in terms of instructional processes and activity contexts? To what extent do teachers who have obtained training in a language-focused curriculum adhere to the curriculum for the entire academic year? What is the quality of program delivery as measured by treatment teachers' reported quality of program delivery and comfort with implementation?	Classrooms were blocked according to funding source. From these blocks, seven were randomly assigned to the treatment condition (implement an experimental curriculum) and seven to the comparison condition (maintain existing preschool curricula).	Fourteen teachers from public preschool programs serving at-risk children in two counties of a mid-Atlantic state were selected for this study. Of these teachers, six were in Head Start classrooms (70 children age 3-5), six were in Title I preschool classrooms (100 4-year old children), and two were in public prekindergarten classrooms (27 4-year old children).	This article primarily focuses on the fidelity of preschool teachers' adherence to a language-focused curriculum.
Roskos, Rosemary, and Varner (2006)	How can a case study of one state's early childhood credentialing programs provide insight into the degree of alignment of professional development with scientifically based reading research and with the goals for child outcomes in reading and writing?	Nine case examples of professional education curricula in CDA, associate's degree, and bachelor's degree programs within Ohio were examined. The literacy-related course work within and between programs were analyzed for external, horizontal, and vertical alignment. External alignment refers to congruency or agreement between a course of study for early educators and the scientific knowledge base in language and early literacy. Horizontal alignment is characterized by markers of consistency, balance, integration of knowledge, skills, and dispositions in the scope or range of instruction. Vertical alignment involves lining up essential concepts, skills, and dispositions to be learned and developing learning trajectories for educators.	A total of 71 higher education institutions in Ohio were identified that offered professional development to early childhood educators. From these, nine early educator preparation programs were randomly sampled for further analysis. Eight of the nine institutions agreed to participate. The final sample included 9 case examples from the eight institutions (three CDA, three associate's degree, and 3 bachelor's degree programs).	The authors suggest that the "gold standard" for professional education curricula in literacy pedagogy, although based in scientific knowledge on early literacy development and beginning reading instruction, may be too demanding, too unrealistic, and too ambitious for any given program in the state to achieve.

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Table A-1a. Language and Literacy Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Wasik and Bond (2001)	What are the effects of interactive book reading groups on children's receptive and expressive vocabulary development?	Two teachers were randomly assigned to the intervention condition, and two were randomly assigned to the control condition. The professional development portion lasted for four weeks, while the intervention to the children continued for another 11 weeks (total 15 weeks; not consecutive). The intervention consisted of training teachers in interactive book reading techniques for large groups (not one-on-one) and book reading extension activities. Books and materials for supporting activities were also provided. The control teachers also received the books, but not the added instruction on how to do interactive book reading in large groups.	One-hundred and twenty-seven 4-year-olds from low-income families; final participation was 121 children (61 in intervention group; 60 in control group). All children attended a Title I early learning center in Baltimore, MD. 95 percent of the children at the center are eligible for free or reduced lunch, and 94 percent are African-American. Children from eight classrooms participated (four teachers, each with a morning and afternoon class).	The authors do not discuss any limitations to their study. However, we note several caveats. There was no information provided on the fidelity of implementation of the intervention across classrooms/teachers. Also, there was no information on the inter-rater reliability for observational data collection or child assessment. Furthermore, there was no information on whether child assessors and classroom observers were blind to the treatment/control group assignments. Any or all of these issues may have effects on the outcomes of the study.
Wasik, Bond, and Hindman (2006)	Does an intensive language and literacy intervention (designed by Wasik & Bond, 2001) have a similar effect in settings comprising Head Start teachers and primarily disadvantaged children? Can training influence how teachers talk to children? Can the impact of the intervention be generalized when larger samples of teachers are involved?	Two Head Start centers were randomly assigned to either intervention or control conditions. The control center was given a list of books used in the intervention sites and a stipend to purchase the books as well as additional titles. Order forms indicated that all but 3 of the books used in the intervention were purchased by the control school, and observations confirmed that the books were used at the site by the control teachers. The intervention site received training as well as books, props, and lesson plans.	Two Head Start centers located in high-poverty neighborhoods. Within these two schools, 16 teachers participated (10 in trhe intervention group, six in the control group). The teachers varied in their educational attainment and years of experience teaching. There were 139 children in the intervention and 68 in the control group (mean age in the fall was three years, 10 months); 99 percent of the children were African-American.	This is a replication of Wasik & Bond (2001) in a Head Start setting and with a larger sample. The training has been modified for use with teachers with limited background knowledge regarding language and literacy development. Although it was stated that in the previous study the training was conducted by an experienced preschool teacher, it is not clear who performed the training in this study (it may have been the authors of the study themselves). In the discussion, the authors state "training teachers in why they should be doing something is equally as important as showing them what they need to do" (p. 72). Unfortunately, the authors did not indicate in this article how the "why" was conveyed in their training.

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Table A-1a. Language and Literacy Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Whitehurst, Arnold, Epstein, Angell, Smith, and Fischel (1994), "A Picture Book Reading Intervention in Day Care and Home for Children from Low-Income Families"	1) Can adults with low to moderate levels of education be trained to use dialogic reading with groups of children? 2) Will this practice have effects on children? 3) Is training parents in dialogic reading, in addition to exposure to dialogic reading in the classroom, more effective than exposure to dialogic reading in the classroom alone?	Teachers and parents were instructed (via videotape) in the "dialogic reading" technique, a way to engage children as active participants in joint bookreading. Children were pre-tested on standardized language measures, then randomly assigned to one of three conditions: school reading, school plus home reading, or control. Post-testing occurred immediately after the six-week intervention. Follow-up testing occurred six months after post-testing.	Seventy-three 3-year-olds from low-income families. About half were black, a quarter were Hispanic, and a quarter white. The children attended five day-care centers in Suffolk County, N.Y.	Compliance with the intervention is needed in order to achieve results. Having dialogic reading in both home and school does not appear to be beneficial beyond having it in school alone (across multiple assessments), perhaps because of variability in the amount of reading occurring at home. Results were not robust across multiple assessments; positive effects were found for only two of the four assessments. Furthermore, positive effects were not persistent; only one of the four assessments showed a continued significant effect of the intervention at six months post-intervention. It is important to note that substantial variability was found in the fidelity with which teachers followed the reading and activities schedule in the classrooms. Also, there was substantial variability in the amount that children who were in the "school plus home" condition were read to at home. Nearly 25 percent of the children who were available at posttest had left their centers before follow-up testing (six months later).
Whitehurst, Epstein, Angell, Payne, Crone, and Fischel (1994), "Outcomes of an Emergent Literacy Intervention in Head Start"	Will an intervention consisting of dialogic reading both in the classroom and at home, as well as participation in a phonemic awareness curriculum, produce positive results on measures of receptive and expressive language, writing, print concepts, and linguistic awareness?	Fifteen Head Start classrooms were randomly assigned to the intervention group or the control group. The intervention consisted of two components. The first component was training in dialogic reading via videotape for both parents and teachers at the beginning of the school year. Lending libraries were established for the families. The second component was a phonemic awareness curriculum implemented in the classrooms for the second half of the school year. Children were pre-tested at the beginning of the school year and post-tested at the end of the school year by doctoral students.	One-hundred and sixy-seven 4-year-olds attending four Head Start centers in Suffolk County, N.Y. 46 percent were white, 45 percent were black, 8 percent were Hispanic, and 1 percent were Asian.	Results were only found for two of the four factors. While the Writing and Print Concepts factors were made up of measures of emergent literacy, the other two factors (Language and Linguistic Awareness) are likely also important for literacy development. In addition, the intervention consisted of two components; it is not possible to determine from this study if one component produced the positive results for Writing and Print Concepts or if both components are necessary.
Whitehurst, Zevenbergen, Crone, Schultz, Velting, and Fischel (1999)	Will an intervention consisting of dialogic reading (a way to engage children as active participants in joint bookreading) both in the classroom and at home, as well as participation in a phonemic awareness curriculum, produce long-term results for children's reading development through the end of second grade?	For the original study, 15 classrooms were randomly assigned to the intervention group or the control group. For the replication cohort, 22 classrooms were randomly assigned to the intervention or control group. The intervention consisted of training in dialogic reading (a way to engage children as active participants in joint bookreading) via videotape for both parents and teachers, as well as the implementation of a phonemic awareness curriculum in the classrooms. Children were pre-tested at the beginning of the Head Start year and post-tested at the end of the year. All children were followed up at the end of kindergarten, the end of first grade, and again at the end of second grade.	The study included two samples. First, 127 children from the original cohort of 167 Head Start children in Suffolk County, N.Y. were followed up. Second, a replication cohort was studied; this cohort consisted of 153 Head Start children attending different Head Start Centers than the original cohort but in the same county. Of the total sample of 280 children, 43 percent were black, 33 percent were white, 18 percent were Hispanic, and 6 percent were "other."	The authors note that the reason effects of the intervention were not found for reading scores at the end of the first and second grades might be that the intervention focused on interactions with picture books and phonological awareness (e.g., finding objects that begin with a certain sound). They suggest that for an intervention to have long-term effects on reading skills, it might need to focus on pre-reading skills such as letter recognition and letter-sound matching. Also, authors found that children's gains in reading skills from year to year were significantly affected by the characteristics of the educational settings, suggesting that learning might depend more on the educational environment than the skills that each child brings to it.

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Table A-1a. Language and Literacy Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Yaden, Tam, Madrigal, Brassell, Massa, Altamirano, and Armendariz (2000)	What kinds of English-language and literacy support can be provided by parents, extended family members, and child-care center employees in a primarily Spanish-speaking community?	This was a quasi-experimental study that followed three consecutive cohorts of 4-year-olds as they move from child care center into kindergarten and elementary school. The focus of this study was on the second cohort, which got the full dosage of the year-long intervention and is currently in kindergarten. The first cohort of 4-year-olds received less than six months of the intervention and is being used as a comparison group. The characteristics of the other comparison groups are not reported, except that they attended other preschool programs. The intervention consisted of three components. The first was providing a two- to three-hour morning language and literacy program. The second component was providing in-classroom support and ongoing inservices regarding emergent literacy theory, activities, and developmental growth in reading and writing for child-care agency teachers and paraprofessionals. The third component, available to all families served by the center, was establishing a book-lending library for the families and offering periodic parent workshops on reading at home.	Fifty-five 4-year-olds attending a comprehensive child care center in downtown Los Angeles, Calif. No characteristics of the study participants (beyond age) were reported. However, for the center as a whole, over 98.7 percent of families have incomes below the poverty line, and over 60 percent of families consist of single mothers with two to three children. The majority of children in the center are Latino, and Spanish is the primary language of communication in the classrooms.	The information on sample and comparison group characteristics, study design, measurement characteristics, and outcomes is all very sketchy in this article. No details are provided about the timing of testing or statistical analyses conducted; no p-values are provided. It is unclear which component(s) of the intervention were responsible for the positive outcomes identified for the intervention group.
Zevenbergen, Whitehurst, and Zevernbergen (2003)	What is the effect of a dialogic reading intervention on the depth of children's understanding of narrative?	Three full-day and 13 half-day classrooms participated in the study and were randomly assigned to intervention and control conditions. The intervention consisted of a 30-week dialogic reading program at school and home and a 16-week phonemic awareness program conducted at school.	One-hundred and twenty-three children who attended preschool at four Head Start centers on Long Island, N.Y. during the 1992-1993 school year. 71 children participated in the intervention condition, and 52 children were members of the control group.	This is a component of the study described in Whitehurst et al. (1994) and Whitehurst et al. (1999).

Table A-1b. Language and Literacy Studies: Features of Professional Development

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Adger, Hoyle, and Dickinson (2004)	The LEEP training was delivered in 10 sessions. Each session began with a 45-minute Professional Conversation (participants discussed a set of questions in groups of two to five), followed by approximately two hours of instruction (including demonstrations, discussion, and a short break), and a follow-up professional conversation and planning period.	Taught as a four-credit academic course by Head Start technical assistance providers for the New England region.	Two full-day Saturday sessions and eight three-hour late afternoon sessions delivered from November 2000 to March 2001.	Providers served low-income children. All participants were teachers or administrators of Head Start programs in the New England area.	Literacy development, especially emergent literacy.	Prior research indicates that achievement levels in kindergarten and first grade are highly related to later success, and that the achievement gap in literacy-related skills precedes children's entry into school. This is the impetus for early literacy instruction in preschool. Researchers in the sociocognitive tradition (e.g., Vygotsky) believe learning occurs within dynamic, social interactions. This is the basis for a discourse analysis of the professional conversation within the LEEP training sessions.	Sessions focused on the following topics: children's construction of literacy, oral language, awareness of sound, connecting sound and print, emergent writing, book reading (two sessions), language learning through curriculum, environments for enhancing language and literacy, and sustaining teachers' learning.
Assel, Landry, Swank, and Gunnewig (2007)	Teachers participated in four days of training by the respective publishing companies, specific to the curricula they taught. Training occurred in small groups and included instruction in all content areas. Research staff also attended the trainings. The training was "learner-centered and knowledge-based", building upon what teachers knew and were already practicing in their classrooms. Curriculum mentors supported target teachers in the selected classrooms. They provided ongoing technical assistance to teachers for about 1.5 hours two times a month. During visits, mentors assisted with lesson planning, room arrangement, demonstrations, curriculum fidelity, classroom schedules, and provided assistance around behavioral issues and side-by-side coaching. Mentors completed Curriculum Fidelity Checklists three times during the course of the year. The checklists were also administered to non-mentored teachers by research staff. All teachers received feedback on how well they were implementing the curriculum three times after the completion of the fidelity checklist.	Administrators received a comprehensive summary report surrounding the language and literacy skills of the children enrolled in their programs. The senior research team met monthly with the head administrators of the program.	Four days of teacher training occurred prior to implementing the curriculum. Target teachers met with mentors two times a months for 1.5 hours. Research staff met monthly with administrators. The curriculum was implemented across the school year. The Fidelity Implementation Checklist was completed three times during the year, as was the CIRCLE measure. Pre-intervention assessments occurred at the beginning of the school year, and post-intervention assessments at the end of the year.	Title I and Head Start programs were included in the study. There were differences based on site (Title I, Head Start, universal pre-K) in ethnic diversity. The Head Start and Title I sites had a large percentage of Hispanic children (both over 50 percent), many of whom were English Language Learners.	Language and literacy skills.	The authors report that instructional approached used in both of the curricula have been shown to be effective in prior research.	Both curricula focused on building skills in letter knowledge, phonological awareness, language, and motivation to read. Differences across the curricula included a greater focus in Let's Begin on letter knowledge and early phonological skills. Both contain home components that contain materials for parents. The Let's Begin curriculum has 25 thematic units divided across seven domains: (1) Oral Language and Listening; (2) Alphabetic and Story Knowledge and Writing; (3) Science and Math; (4) Personal/Social Development; (5) Large and Small Motor Skills; (6) Art and Music; (7) Reach the Home. The Doors to Discovery has a major focus on the development of vocabulary and receptive and expressive language development. It was designed to encourage children's literacy across 5 areas: (1) oral language; (2) phonological awareness; (3) Concepts of Print; (4) Alphabet knowledge; (5) Writing and comprehension.

Table A-1b. Language and Literacy Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Baker and Smith (1999)	The PD aimed to link new instructional practices to underlying concepts that support their use. The researchers (a) provided a rationale and theoretical basis for proposed innovations in literacy instruction, (b) demonstrated specific classroom strategies (and provided instructional materials), (c) provided practice and feedback on the use of new teaching techniques via coaching and meetings with teachers, and (d) provided ongoing support as teachers work to develop expertise in new teaching behaviors via coaching and observations. The researchers met regularly with teachers individually and in small and large groups, conducted informal and formal interviews with the teachers, recorded classroom activities in field notes, and provided teachers with a rating scale to indicate the degree of satisfaction with various components of the intervention and process. Teachers helped decide on and plan intervention activities. Non-intervention teachers were included in group discussions, to inform them of the activities and to promote sustainability as children move to older grades.	The principals of the schools were involved in the PD intervention, as were Title I general education teachers and English Language Development teachers.	Formal meetings to plan the intervention were held once a month during both the Implementation and Sustainability years at Glendale, but were not held on a regular basis at Lincoln during the Sustainability year. Classroom observations to assess fidelity of implementation were done twice per month from Nov until May. Information on the timing of informal meetings and small/large group meetings was not provided in the article.	Children at risk for reading difficulties in elementary school.	Early reading.	Yes.	Appendix A of the article lists examples of researcher-developed content used at both schools. References with asterisks in the Reference section of the article note articles shared with teachers regarding beginning reading instruction and phonological awareness.
Byrne and Fielding-Barnsley (1995)	Preschool teachers were given the Sound Foundations manual and advised to "work from the program's manual in whatever way best fitted the school's regimens, consistent with the aim of increasing phonemic awareness in the children." They were also given a kit that included large color posters depicting scenes with objects beginning or ending with the same phoneme. The kit also contained games, worksheets, and an audiotape, all designed to teach the concept of sound sharing among words to preschoolers.		In the main study, investigators worked with children in small groups of 4 to 6 children for approximately half an hour per week for 12 weeks. In this supplemental study, two of the schools used the program for 12 weeks, while the third used it for six weeks. All three teachers worked with large groups of children (average = 20) and individual children may have received a smaller dosage, due to absences. All three schools used the color posters heavily, but two teachers did not address final sounds at all. The use of the games and other kit materials varied by school. No information was provided on how much time per week teachers devoted to these lessons.		Phonemic awareness.	Phonemic awareness is important for literacy development.	Instructors (or teachers) spend a half hour a week training children to classify items on posters, worksheets, and games on the basis of shared sounds (either sounds shared at the beginning of words, or at the end of words). Children were taught 12 phonemes in both initial-word position and final-word position. In the experimental condition, instructors/researchers worked with small groups of four to six children that allowed for intensive teaching, with close monitoring of individual children.
Dickinson and Brady (2006), Example 1: Teacher-Researcher Pilot Project	Teachers participated in group discussions, sharing observations of their own language interactions with children and discussing them. Researchers participated in discussions and provided readings to support providers' understanding of children's language development.		It is unclear how long the sessions lasted, how often they were, or how long the program continued.	Because it was a Head Start setting, most children were from low-income families.	Language development.	Research-based readings were provided to participating teachers and teachers had ongoing contact with knowledgeable researchers.	Not didactic, but the project focused on teacher-child language interactions.

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Table A-1b. Language and Literacy Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Dickinson and Brady (2006), Example 2: Literacy Environment Enrichment Program (LEEP)	The two three-day sessions consisted of discussions, demonstrations and lectures, and hands-on activities. Between sessions, participants applied course content in "carefully sequenced" assignments.	Supervisors and teachers were required to attend trainings as a team, which facilitated on-site support for teachers implementing new practices. Some assignments were completed with supervisors. Course is also credit-bearing.	Two intensive three-day sessions, separated by three months.		Children's language and literacy development, broadly defined.	Yes.	Participants learned about children's language and literacy development, book reading strategies, selection of books, use of thematic approaches to instruction, strategies for phonemic awareness, etc.
Dickinson and Brady (2006), Example 3: Technology-Enhanced Literacy Environment Enrichment Program (T-LEEP)	T-LEEP began and ended with day-long face-to-face sessions. The first session established relationships among trainees, oriented them to the interactive television (ITV) technology, the Literacy Village (training website with literacy resources and discussion area). Eight intermediary sessions included Professional Conversations (facilitator guided activities to explore topics and discuss homework; 45 min.); ITV sessions (facilitator guided participants in analysis and discussions, and utilized videotaped vignettes, work samples, case material, etc.; two hours); and Professional Collaborations (face-to-face session of supervisor-teacher teams to plan implementation of assignments; 45 min.). The final session wove together course themes and included discussion of teachers' learning and connection with early learning standards.	As in LEEP, teacher-supervisor teams participated together.	Over a six-month span, T-LEEP supervisor-teacher teams participated in 10 sessions, spaced two to three weeks apart. The first and last sessions were day-long, and the intermediate sessions, using distance education technology, were half-day sessions.		Language & Literacy Development.	Yes.	Explicit discussion of oral language, emergent writing, and phonological awareness.
Dickinson and Brady (2006), Example 4: Striving to Achieve Reading Success (STARS-LEEP)	Teachers and supervisors participate in three two-day sessions learning about children's language and literacy development, and discussing strategies to support it. Assignments are given during the five week breaks between sessions.	Supervisor component of LEEP program strengthened, with supervisors taught to analyze teachers' language and literacy practices, and improve the quality of interactions with teachers. Training integrated into professional development lattice by collaborating with Connecticut Charts-A-Course (CCAC).	Three two-day sessions, most often Fridays and Saturdays. Each session is spaced five weeks apart.	Most children are from low-income backgrounds.	Children's language and literacy development, broadly defined.	Yes.	Not specified.

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Table A-1b. Language and Literacy Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Dickinson and Brady (2006), Example 5: Program-Delivered Literacy In-Service Training (PD-LIT)	A single staff member, trained on the training materials and who has helped develop them to some extent, provides in-center in-service training to all center staff. There are eight sessions of four hours each. The center may keep the materials for future use.	All members of a child care center's staff participated, so staff members could provide ongoing support for each others' efforts. Also, because training materials were basic (overhead transparencies, videotapes), and because training was given by a staff member, the training and associated practices could become institutionalized.	The training consisted of eight four-hour modules.		Children's language and literacy development, broadly defined.	Yes.	Not clearly described.
Dickinson and Caswell (2007)	The intervention was delivered by the regional Head Start Training and Technical Assistance system in New England. LEEP was given as a 45 hour course and participants received four credits for participation. It was delivered in two three-day sessions (in late Oct. and early Nov. and late Feb) with support for applications provided in between sessions. Sessions included lectures, videotapes of classroom activity and work samples, as well as opportunities for discussion. Participants also read books about emergent literacy and teachers completed four performance-based assignments. Supervisors also attended the training and completed a one-credit practicum that focused on issues related to supervision. Instructors made site visits to meet with supervisors to analyze the needs of teachers, plan feedback, and evaluate the effectiveness of supervisors' work with teachers. Supervisors and teachers were also supported by telephone and email correspondence.	Programs were required to send teams to the LEEP training that included a supervisor and one to three teachers. Supervisors were asked to help teachers to adopt the strategies, provide on-site support and sustain changes after the training.	Researchers recruited participants over a two-year period, and both groups of teachers (year 1 and year 2) are included in the analyses. Teachers and supervisors participated in two three-day trainings lasting 45 hours (one in late Oct. and early Nov., and one in late Feb.). During the intervention period, instructors made site-visits to meet with supervisors. Pre-test data was collected in October before the LEEP course began, and post-test data was collected in April and May after the completion of the course.		Children's language and literacy development	Yes.	The goal of the course was to help teachers build knowledge about literacy development, to employ the knowledge, and to learn to use appropriate classroom strategies. Participants read books about emergent literacy and teachers completed four performance-based assignments. Strands of research from which the curriculum emerged include emergent reading and writing, greater awareness of the sound structure of language, oral language skills, and curriculum development.
Foorman and Moats (2004)	Training consisted of an introductory summer workshop of two to four days; two to three three-credit courses each year focusing on foundation concepts in reading; monthly in-class visits including demonstration lessons and consulting; semi-annual meetings for principals and "school-based change facilitators"; and regular, informal contact with project staff. Course focused on the interplay between knowledge / research and practice. Teachers were also taught to use reading, word, and spelling assessments to flag children with difficulty.		The intervention was ongoing throughout the school year, and consisted in multi-day kickoff workshops, courses throughout the year, and monthly site visits.		Reading and language development.	Yes.	The professional development fostered teachers' skill at teaching phonological awareness, reading, spelling, vocabulary, comprehension, and writing.

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Table A-1b. Language and Literacy Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Fountain, Cosgrove, and Wood (2008)	The ELLM literacy curriculum was implemented in addition to the existing curricula in the classrooms. Training included a two day summer training session, weekly classroom visits by ELLM literacy coaches, monthly site-specific literacy team meetings, and quarterly teacher get-togethers. These trainings focused on the ELLM curriculum, ELLM learning materials, and strategies to help children acquire important emergent literacy skills.	None reported	ELLM training and support were ongoing throughout the school year.	Florida-UNF researchers intentionally recruited low-performing schools (with scores of D or F based on the Florida Comprehensive Assessment Test [FCAT])	Early literacy development.		ELLM is a literacy-focused curriculum including: curriculum and literacy building blocks, assessment for instructional improvement, professional development for literacy coaches and teachers, family involvement, and collaborative partnerships.
Gettinger and Stoiber (2007)	The EMERGE professional development component is designed to improve teachers' understanding of language and literacy and their application of evidence-based practices. EMERGE teachers participate in monthly three-hour professional development training sessions to guide them in: (1) implementing instructional components, (2) conducting monthly progress monitoring, (3) using information about children's performance to inform their instruction and plan small group instruction, and (4) designing high-quality literacy environments. The second type of professional development is on-site early literacy coaching and mentoring, and collaborative planning with the literacy coach for two hours every week. The EMERGE literacy coach has an advanced degree in early childhood education and certification as an early literacy coach. The objectives of the coaching are to work one-on-one with teachers and children; monitor implementation integrity through observations; and provide scaffolded, individualized support for teachers.	None reported.	Teachers participate in monthly three-hour professional development training sessions. They also engage in on-site early literacy coaching for two hours per week.	The sample includes 90 percent children from low-income families.	Language and literacy.	This program is based on several comprehensive reports of children's early literacy skills including: Teaching Our Youngest (Early Childhood-Head Start Task Force, 2002), Preventing Reading Difficulties in Young Children (Snow et al., 1998), Teaching Children to Read (National Reading Panel, 2000), and Put Reading First: The Research Building Blocks for Teaching Children to Read (Ambruster et al., 2003).	EMERGE has the following key components: (1) scientifically based early literacy curriculum, instruction, and activities provided at increasing levels of intensity across a three-tiered intervention hierarchy; (2) screening, monthly progress monitoring, and outcome assessment to guide instructional decision making and identify children who require a more intensive focus on early literacy skills; (3) high-quality, literacy-rich classroom environments; and (d) ongoing professional development combined with literacy coaching and collaborative planning. See Mode of Professional Development Delivery column for more specific information about PD content.

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Table A-1b. Language and Literacy Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Jackson, Larzelere, St. Clair, Corr, Fichter, and Egertson (2006)	ECEs participated in a 15-week HUR course to promote early literacy practices for children birth-5. The goals were to strengthen teachers' practices and improve children's language and literacy skills. The national satellite broadcast of HUR included 44 hours of live, professional development and was available for in-service and college credit. Learning objectives were established for seven content areas and each areas consisted of five hours of training. The broadcast allowed for dial-in questions, reflection on practice, and discussion of content. An interactive website provided further support and collaboration among participants. A smaller group of HUR participants chose to participate in the mentoring component. Mentors participated in a one-day training that emphasized mentoring practices. Follow-up consultation was also provided to mentors. Each mentor met with their matched participant four to six times for two to four hours per session over two months. Sessions were focused on helping to meet ECEs goals, based on the mentee's classroom ratings on the ECERS-R.	None reported.	Fifteen-week 44 hour training for ECEs. For HUR+ mentoring participants, four to six two to four hour sessions over a two-month period.	Seven communities with the highest poverty concentration in Nebraska were selected. The sample included 25.2 percent of children who spoke Spanish at home.	Children's literacy skills.	The HUR curriculum was based on the early literacy research synthesis of the National Reading Council (Snow et al., 1998).	Course content areas included: curriculum, assessment, talking, playing, reading, writing, and learning.
Justice, Mashburn, Hamre, and Pianta (2008)	At the start of the year, teachers completed a two-day professional development workshop that began with a 1.5 hour discussion of quality professional development. A two-hour session described six key areas of language and literacy development which focused on the areas that would be emphasized in the curriculum they would be implementing. The areas were defined and then research indicating their importance was discussed. At the end of the session, teachers received guidance on how to create a weekly lesson plan that incorporated each area of the curriculum. Additionally topics included child assessment, using the curriculum's website, and building teacher-child relationships. The authors note that discussion of language and literacy instruction was a minor component of the workshop.	None reported.	Teachers participated in one two-day workshop at the beginning of the school year.	All participating classrooms were designed specifically to serve 4-year-olds exhibiting social and/or economic risks. Risk factors include: (1) poverty, (2) homelessness, (3) parents or guardians are school dropouts, have limited education or are chronically ill, (4) family stress, (5) developmental problems, (6) limited English proficiency.	Language and literacy	Review of research on high-quality literacy and langauge instruction and child outcomes	The curriculum implemented was My Teaching Partner--Language and Literacy Curriculum. It is designed to provide supplemental instruction in langauge and literacy and provides (1) a 36-week scope and sequence of six instructional targets in language and literacy (phonological awareness, alphabet knowledge, print awareness, vocabulary and linguistic concepts, narrative, and pragmatics and social language), (2) weekly lesson plans including specific objectives for addressing each of the targets and sample lesson scripts, and (3) supplementary materials (e.g., 50 storybooks, posters, and tapping sticks) and manipulatives for delivering lessons, including access to the website providing videos of high-quality implementation.

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Table A-1b. Language and Literacy Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Justice, Pence, and Wiggins (2008)	Five of the seven teachers assigned to receive LFC training completed a three-day training workshop on LFC implementation at the start of the school year. This included background information on language development. The two remaining teachers attended one-on-one make-up session. Follow-up training sessions were then held throughout the school year. All teachers maintained a Professional Development log throughout the year to evaluate the extent of PD experienced by treatment and control group teachers.	None reported	The initial training days took place in August, 2003. The follow-up sessions were conducted in November 2003 and January and February 2004.	Head Start sites were recruited.	Language acquisition		Language-Focused Curriculum was designed for use with children with language limitations, including children with language impairment, children from disadvantaged backgrounds, and English-language learners. It emphasizes the daily inclusion of high-quality teacher-child conversations within teacher-led and child-led interactions.
Landry (2002)	Teachers were trained in four-day, small-group, interactive workshops on specific ways to teach early literacy skills including language. They were taught information on separate literacy and language domains of development, and activities such as story extenders, phonological awareness games, and interactive bookreading, to help children develop language skills. Workshops also included time for developing lesson plans with literacy objectives and role playing these lesson plans. Teachers also received weekly 1-hour in-class coaching and meetings with researchers about their progress.		Four-day training was followed by regular weekly one-hour classroom visits by researchers.		Children's early language and literacy skills	Yes.	The workshops included two-hour sessions on the following: 1) the six key essential responsive teaching practices; 2) language enrichment; 3) doing effective read alouds; 4) print and book awareness; 5) motivation to read; 6) phonological awareness; 7) letter knowledge and early word recognition; 8) written expression.
Landry, Assel, Gunnewig, and Swank (2008)	Teachers learning a new curriculum were given two days of training at the beginning of the pilot school year and three days of refresher training in the evaluation year. There was also one day of follow-up training in the pilot year.	None reported	Two days of initial training and one day of follow-up training in 2002, three refresher days in 2003.	Children in Head Start and Title I schools were primarily low income.	Early literacy success.		Doors to Discovery is a curriculum based on the five areas identified by the International Reading Association and the National Association for the Education of Young Children as the foundation for early literacy success: oral language, phonological awareness, concepts of print, alphabet knowledge and writing, and comprehension. Let's Begin with the Letter People is a comprehensive curriculum through which literacy is integrated across several topic areas such as health and safety, science, art, mathematics, spatial concepts, and music, as well as development of large and small motor skills. The curriculum focuses on specific literacy and language skills including oral language, phonemic awareness, and letter knowledge.

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Table A-1b. Language and Literacy Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Landry, Swank, Smith, Assel, and Gunnewig (2006)	Training included multi-day summer training for coordinators, mentors, and teachers, implemented with the use of teaching manuals. Mentors and coordinators were trained in a three-day session on topics ranging from "how-to" procedures for side-by-side coaching and identifying and meeting teacher training needs across the school year. Using videotaped excerpts, mentors were taught how to use the teacher observation checklist. Teachers participated in a four-day, small group workshop their first year of training, and a two-day refresher in their second year. The training was divided into two-hour "learning pods" and each involved the presentation of didactic information, discussion, problem solving on implementation issues, and role playing of teaching behaviors to use in the classroom. The content areas included a range of topics. Coordinators and mentors were also asked to participate in one-day monthly meetings where they discussed various aspects of the intervention including ensuring that their observations of teachers were reliable. Target teachers engaged in ongoing small-group training with the site coordinator or mentor with the content being determined by the needs of the target teachers.		The professional development lasted for two years, with some teachers only participating the second year. Mentors and coordinators were trained in a three-day summer session. Teachers in their first year of training participated in a four-day summer workshop, and teachers in their second year received a two-day refresher training. The coordinators and mentors participated one-day meetings once a month along with ongoing problem solving with intervention staff. Teachers participated in ongoing small-group training throughout the year with the site coordinator or mentor.	Head Start sites applied and received funding for the state-initiated project. Therefore, as required by federal guidelines, all participating children were from low-income families. The selected program sites included urban (60 percent) and rural (40 percent) programs.	Children's language and literacy development	The content areas included in the training have been supported by prior research as means to enhance early literacy skills	The following content areas were included in the teacher training: (a) professional practices (including room organization, daily routines, and supportive interactive teaching styles); (b) language enrichment and "scaffolding" language and learning throughout the day; (c) conducting book readings in ways that promote language and literacy skills; (d) using effective teaching strategies to build language comprehension and expression; (e) print and book awareness; (f) motivation to read; (g) phonological awareness; (h) alphabet knowledge; and (i) written expression.
Lonigan and Schatschneider (2008)	Each treatment control condition was provided training for four days in late July or early August. The first two days of this training were provided in a workshop setting and the last two in team planning activities. In addition to the initial training, all treatment group participants attended a curriculum-specific two-hour professional development meeting every other month. Finally, in half of the schools in which multiple classrooms were assigned to a treatment group, teachers were supported by a coach 8-10 hours per month.	None mentioned.	Each treatment control condition was provided training for four days in late July or early August. The first two days of this training were provided in a workshop setting and the last two in team planning activities. In addition to the initial training, all treatment group participants attended a curriculum-specific two-hour professional development meeting every other month. Finally, in half of the schools in which multiple classrooms were assigned to a treatment group, teachers were supported by a coach 8-10 hours per month.	None mentioned.	emergent literacy, oral language, phonological sensitivity, print awareness, phonemic awareness, social, emotional, intellectual, aesthetic, and physical	The *Open Court Reading Pre-K* is research-based. No empirical support is specified for the other curriculum tested in this intervention.	The workshop portion of the initial training provided participants with an introduction to the curricula materials and opportunities for hands-on application. Bimonthly professional development meetings provided direction on curricula implementation and other topics. Coaching sessions, for those classrooms that received them, used demonstrations, feedback, and troubleshooting techniques to support curriculum implementation. *Literacy Express* is a literacy-focused curriculum that focuses on emergent literacy, oral language, phonological sensitivity, and print awareness. The curriculum uses theme-based units to facilitate large and small group literacy activities. The *Open Court Reading Pre-K* Curriculum focuses on phonological, phonemic, and print awareness activities presented in eight units. The DLM Early Childhood Express Curriculum is a comprehensive curriculum focusing on the promotion of children's social, emotional, intellectual, aesthetic, and physical development. It uses hands-on learning activities based on 36 weekly themes.

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Table A-1b. Language and Literacy Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Lonigan and Whitehurst (1998)	Readers (both teachers and parents) were trained on dialogic reading primarily through a video-tape training. Part 1 presented a set of rules for bookreading, followed by vignettes of adult-child bookreading that exemplified the rules. Then, vignettes of inappropriate bookreading were shown, and the trainer asked readers for criticism. After the videotape, the trainer engaged the readers in role-playing, presenting various examples of child behavior and giving the reader feedback on using the dialogic reading rules.		Part 1 took 30 minutes, and Part 2 took 20 minutes to complete. Part 1 and Part 2 were separated by three weeks.	Children were from low-income families, and many were receiving child care subsidies. The sample was 91.2 percent African-American.	Strategies for bookreading, to promote language and literacy development.	Yes.	Dialogic reading encourages bookreading to become a dialogue between the reader, and the child, encouraging the adult to ask questions, add information, and prompt child to respond to the book.

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Table A-1b. Language and Literacy Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
McCutchen, Abbott, Green, Beretvas, Cox, Potter et al. (2002)	Teachers in the experimental group participated in a two-week summer instructional institute that involved day-long interactions between teachers and researchers. A major component of the institute was reviewing the research on phonology and phonological awareness and its development in children and relationship to other forms of language and literacy development. Then, teachers were encouraged to develop lessons on phonological awareness, orthographic awareness, comprehension, and reading-writing connections. These lessons and instructional suggestions from researchers were provided to teachers in a portfolio to take back to their classrooms. After the institute, the research team regularly visited the classroom to observe the teaching, to assess student outcomes and discuss these with teachers, and to provide teachers feedback on their teaching strategies.		An intensive two-week summer institute kicked off the project. Throughout the following school-year, teachers were visited in classrooms on an ongoing basis. (Unclear how often.)		Phonological awareness, and its role in balanced reading and language instruction.	Yes.	The two-week training taught information on 1) phonology, phonological awareness, and its role in balanced reading instruction; 2) the typical sequence of development of children's phonological awareness; 3) the relationship between phonological awareness and children's reading and writing skills; 4) the importance of letter-learning; and 5) the importance of a broad and balanced literacy instruction including explicit comprehension instruction.
McGill-Franzen, Allington, Yokoi, and Brooks (1999)	The mode of delivery is unclear.		Thirty hours of training total, consisting of three full-day sessions and seven two-hour sessions. The first sessions were followed by the shorter sessions at regular intervals.		Children's language and literacy development, and effective classrooms supports.	Yes.	Topics included in training: physical design of the classroom; effective book displays; importance of reading aloud to children; interactive techniques for reading aloud; environmental print; author, genre, and content themes in the book collection; small-group lessons based on books; emergent writing activities; literacy activity during play.
National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences (2007)	Teachers participated in a variety of professional development activities including in-service training, mentoring, continuing education classes, or tutoring. The in-service training fell under one of eleven categories including: phonemic & phonological awareness, literacy - rich environments, concepts of print writing and prewriting, oral language, facilitating emergent literacy, alphabetic knowledge, oral comprehension and cognition, early childhood growth and development, and classroom management. Researchers did not ask teachers how their professional development was distributed across training areas.	None reported.	Varied by site, but all children were assessed and classroom observations occurred in the fall and spring.	The authors report that ERF participants were more disadvantaged than the national average. The goal of ERF was to enhance the quality of programs serving low-income families.	Oral language, phonological awareness, print awareness, and alphabet knowledge	The authors report that the ERF program is based on the research on the skills that children need to become successful readers including oral language, phonological awareness, awareness of print conventions, and alphabet knowledge. Additionally, the professional development activities were grounded in scientifically based reading research and knowledge of early language and literacy development.	ERF grants were provided to support the following: (1) A high-quality oral language and print-rich classroom environment; (2) Activities and materials developed according to scientifically-based research that will help develop children's oral language, phonological awareness, print awareness, and alphabet knowledge; (3) Screening and assessments to monitor children's acquisition of skills to guide instruction; (4) Professional development formulated according to scientifically based reading research; (5) Integration of the instructional materials, activities, tools, and measures into the grantee's existing program.

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Table A-1b. Language and Literacy Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Neuman (1999)	The training combined basic theoretical and developmental principles with concrete activities teachers might try in their classrooms. Training was sometimes provided in local libraries, sometimes in one-on-one visits in classrooms. The training approach had to be modified throughout the program since many providers were not available to come for trainings, initial trainings were found to be ineffective, and some providers considered more basic elements of care (i.e. sanitation, socialization) more important.		Differed from site to site.	Children were from low-income families, and over 65 percent were receiving subsidies. Many had few center resources (such as substitutes) to facilitate participation in training.	Early literacy development.	Yes.	The training was designed to enhance teachers' knowledge of early literacy and its development through storybook reading. Also addressed was the physical environment in book areas, story extenders, and book care.
Neuman and Cunningham (2009)	Course work: A three-credit course in early language and literacy development was developed by the study authors along with colleagues at area community colleges. Lectures were followed by simulation and hands-on activities. Two weeks were devoted to each core competency. Videotaped examples of best practice were used. Teachers had assignments that were carried out in their own classrooms. They would report back on the assignments. Coaching: 32 weekly, one-on-one and on-site coaching sessions occurred for 1-1.5 hours each session. Coaching sessions for the first 15 weeks were aligned with the professional development course content (but coaching started two weeks after the start of the course). Coaches engaged teachers in reflective practice and goal setting, helped to identify desired outcomes and strategies to achieve them, collaboratively developed action plans, and assisted teachers with their in-class assignments from the course.	Four community colleges collaborated in the development of the three-credit course in early language and literacy development. Weekly debriefing meetings with the instructional coordinator at each community college helped to build linkages between the professional development provided at the school and in the classroom.	Coursework: 15-week, 3-hour course in early language and literacy development (45 hours total). Coaching: Weekly for 1-1.5 hours each time with 32 sessions total (up to 48 hours of coaching).	Teachers in licensed child care centers and homes in four economically disadvantaged areas of Michigan: Detroit, Flint, Grand Rapids, and Lansing.	Early language and literacy development	Yes. Core competencies addressed in the coursework were based on accreditation standards from NAEYC, the International Reading Association (IRA), and the state licensing requirements. They were also aligned with measures of quality in early care settings (the ECERS and ELLCO). Coaching was based on a model outlined in a literature review by Koh & Nueman (2006): on-site, balanced and sustained, facilitative of reflection, highly interactive, corrective feedback, and prioritizes.	The content of the course work focused on developing providers' knowledge in the following areas: oral langauge comprehension, phonological awareness, letter knowledge and the alphabetic principle, print convention, strategies for working with second language learners, literacy assessments, parental role in early language and literacy development, and linkages between literacy and other aspects of the curriculum. About two weeks was spent on each of these topics over the 15-week course. The first 15 weeks of coaching focused on the same topics (aligning with the coursework), and the remaining 17 weeks of coaching also drew upon the course material and engaged providers in instructional efforts to implement best practices.
O'Connor, Fulmer, Harty, and Bell (2005)	A research team provided PD in two areas: (1) scientifically based reading instruction (findings of effective reading instruction from the NRC and the National Reading Panel) and (2) interpretation of assessment results for students in the teachers' classrooms. The researchers suggested benchmarks for average performance, and the teachers linked instructional activities to the benchmarks. Children identified as having reading difficulties were given additional, intensive instruction by Special Ed. teachers in each grade, as needed. Researchers demonstrated activities, and teachers discussed and rehearsed activities in small groups. The afternoons were devoted to discussions among grade-level teachers across schools and the research team, timelines for implementation, and schedules for coaching, data collection, and data sharing.	The principals of the two schools, all general education, remedial, special ed, and speech teachers agreed to participate. Student participants were all children in kindergarten and first grade in the schools. Children in grades 2 and 3 in the first year of the study served as the control group.	Three full-day and four two-hour professional development sessions annually during the first three years of the study.	Children at risk for reading difficulties in elementary school.	Reading.	Yes. The researchers based the PD on recommendations for effective reading instruction from the National Research Council and the National Reading Panel.	The content of the PD sessions shifted across years as teachers of higher grades were added to the intervention. Each session began with the research evidence for emphasizing particular components of reading (e.g., phonemic awareness, phonics, and vocabulary in K-1; the alphabetic principle, vocabulary, word study, and fluency in Grades 1-2; multi-syllabic word reading approaches and comprehension strategies such as retelling and summarizing in Grades 2-3). The sessions also included activities to support these components.

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Table A-1b. Language and Literacy Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Podhajski and Nathan (2005)	Providers participated in a two-day immersion on the Building Blocks for Literacy program, which provided information about child language and literacy development, and translated these findings to practice. Trained mentors visited child care centers multiple times over six months, and modeled how to incorporate concepts and activities into daily routines. The mentor also encouraged the provider to try the activities, and provided constructive feedback for improving implementation.		Training occurred over six months. A two-day immersion training began the program. Over the full six-month period, each provider was visited by a trained mentor once a months for 45 min to one hour.		Children's language and literacy development, broadly defined.	Yes.	The training focused on vocabulary development through book reading; phonological awareness; and relationships between speech and print (i.e., how sounds link to letters); comprehension.
Pence, Justice, and Wiggins (2008)	Treatment: Professional development was provided for 15 hours over the course of three days shortly before school began. The content of this professional development was as follows: Day 1-- background information on child language development, Day 2--theoretical overview of language-focused curriculum (LFC), guidelines for developing a language focused classroom, features of a model classroom, and an outline of curriculum objectives/sample activities (didactic, video, and discussion modalities used). Day 3--teachers practiced designing LFC activity contexts and implementing language stimulating techniques within these contexts. A refresher half-day training was offered in the middle of the academic year that focused on language stimulating techniques through the use of self-evaluation and videotaped observations. Comparison: Teachers in the comparison group received 15 hours of professional development on the same three days as treatment teachers, though the content for the comparison group was limited to neutral topics, such as behavior management.	None mentioned.	Professional development was offered to both the treatment and comparison groups (content varied) five hours over the course of three days shortly before school began. Teachers in the treatment group also received a half-day mid-year refresher course.	All programs in this study (Head Start, Title I, and public Pre-K) were designed to primarily serve children at-risk for academic problems. Eligibility for inclusion in these programs include household income, parent education, family stress, health/developmental concerns, limited understanding of English.	Use of a language-focused curriculum.	The authors mention empirical support for the effectiveness of the language-focused curriculum. However, there is no mention of an empirical basis for the professional development offered to teachers.	The language-focused curriculum implemented in this study focuses on activity contexts (activities teachers structure for their students using materials, props, and classroom organization (Roskos & Neuman, 2002) and instructional processes (teacher-child language focused interactions). The professional development content focused on background information on child language development, a theoretical overview of language-focused curriculum (LFC), guidelines for developing a language focused classroom, features of a model classroom, and an outline of curriculum objectives or sample activities.
Roskos, Rosemary, and Varner (2006)	CDA, associate's degree, and bachelor's degree programs in the state of Ohio.	External validity: evidence was sought for a correspondence to external, research-based standards, and to standards to state-sponsored professional education curricula in reading pedagogy, as outlined in Teaching Early Language and Literacy: A Core Curriculum for Educators (Preschool) (2003) and Teaching Reading and Writing: A Core Curriculum for Educators (Grades K-3), 2nd Edition (2003).	The three types of programs (CDA, associate's degree, and bachelor's degree) have different lengths of time/dosage of literacy instruction. The amount of time spent on literacy methods is mandated at 12 semester hours (a minimum of 180 hours of instruction) in Ohio for the bachelor's degree. All three associate's degree programs had one course on early literacy pedagogy; the authors note that this amount of time might not be sufficient. Only two of the three CDA programs allocated a specific course or set of sessions on early literacy. The authors felt this did not afford enough practice with early literacy techniques (e.g., interactive book reading).		Early literacy.	State early learning guidelines and standards were used as the "gold standard" in this study. They are based on research in language and literacy development. The goal is to align professional development curriculum with research-based practices and specific child outcomes related to literacy.	Each of the nine case examples had curriculum that was categorized based on domain (knowing, assessing, planning, teaching) and content (knowledge and skills). No detail was given in the article on specifics of any of the curricula.

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Table A-1b. Language and Literacy Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Wasik and Bond (2001)	Outside-of-class instruction in vocabulary strategies and interactive book reading. Then, an experienced teacher modeled shared book reading in the classroom, and assisted with other extension activities.		The training component of the program occurred over four weeks (not necessarily consecutive due to scheduling problems).	Low-income children. Intervention was conducted at Title I early learning center, where 95 percent were eligible for free or reduced-price lunches and 94 percent were African- American.	Language development, specifically vocabulary.	Prior work has shown the effectiveness of shared book reading, but little research has demonstrated an effect in classroom settings.	The approach to encouraging vocabulary development focused on interactive bookreading, including 1) defining vocabulary words before and during storybook reading; 2) eliciting children's use of vocabulary through open-ended questions. Teachers were also encouraged to reinforce vocabulary during conversations and activities.
Wasik, Bond, and Hindman (2006)	Training modules include direct instruction of specific language and literacy strategies, modeling of these strategies, and providing feedback to teachers. Monthly two-hour trainings were provided for a total of nine months. Within one week of the monthly training, a researcher modeled the strategy that was the focus of that month's training in each teacher's classroom. Teachers were then given two weeks to practice the strategy in their classrooms, and then the teachers were observed demonstrating the strategy in their classrooms. After observations, teachers were given written and oral feedback on their demonstrations. If necessary, the strategy was modeled again, and the teacher was given additional time to practice before being observed a second time.	None mentioned.	The intervention lasted 9 months, from end of September to beginning of June. The training of the intervention group lasted two hours each month. In addition, Head Start teachers in the intervention group received a minimum of two hours of direct coaching per month.	Low-income children and teachers with limited background knowledge in langauge and literacy development.	Book reading, oral language, vocabulary development	The book reading training module was based on the work of Whitehurst, Arnold, et al. (1994) and Wasik & Bond (2001). Teachers were trained in three components of book reading: asking (open-ended) questions, building vocabulary, and making connections. The oral language training was bsed on the research of Dickinson and Smith (1994) and Snow (1983), instructing teachers how to use conversational strategies to promote multiple opportunities for children to speak, actively listen, and use varying vocabulary.	Intervention teachers were provided with 22 prop boxes which each contained two age-appropriate trade books on a particular "theme" and related concrete objects representing target words in the books, as well as lesson plans with suggested art and center activities related to the theme. Training and coaching sessions focused on book reading and oral language. The book reading training focused on asking questions, building vocabulary, and making connections. Teachers were instructed to read the trade book twice while they were working on a particular theme. They were also instructed to introduce and label the props prior to the first book reading, and ask the children the label the props before subsequen book readings. Teachers were to have discussions with the children about how the props are used and how they appear in the book. Teachers were also instructed to use the vocabulary words during the extension activities. The training in oral language focused on practicing and promoting active listening, modeling rich language, and providing feedback. Teachers were trained to attend to children as they speak, to patiently wait for children to finish speaking, and to respond in a meaningful way. Teachers also taught children to actively listen to each other and the teacher. Teachers were also taught to expand their vocabulary and provide elaborated explanations or restatements of children's speech. Finally, teachers were taught to use open-ended questions to elicit children's elaborated speech.

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Table A-1b. Language and Literacy Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Whitehurst, Arnold, Epstein, Angell, Smith, and Fischel (1994), "A Picture Book Reading Intervention in Day Care and Home for Children from Low-Income Families"	Readers (both teachers and parents) were trained on dialogic reading primarily through a video-tape training. Part 1 presented a set of rules for bookreading, followed by vignettes of adult-child bookreading that exemplified the rules. Then, vignettes of inappropriate bookreading were shown, and the trainer asked readers for criticism. After the videotape, the trainer engaged the readers in role-playing, presenting various examples of child behavior and giving the reader feedback on using the dialogic reading rules.		Part 1 took 30 minutes, and Part 2 took 20 minutes to complete. Part 1 and Part 2 were separated by three weeks.	Low-income children. Most children were from working poor families eligible for child care subsidies.	Language and literacy development through effective bookreading.	Yes.	Dialogic reading encourages bookreading to become a dialogue between the reader, and the child, encouraging the adult to ask questions, add information, and prompt child to respond to the book.
Whitehurst, Epstein, Angell, Payne, Crone, and Fischel (1994), "Outcomes of an Emergent Literacy Intervention in Head Start"	The training session for dialogic reading consisted of teachers and parents watching a 20-minute training video, followed by role-playing of dialogic reading with a trainer and discussion of techniques following the video. In total, this one-time training lasted approx. 30 minutes.		One-time training session of 30 minutes.	Children attended Head Start centers, and were primarily low-income.	Dialogic bookreading and phonological awareness, to promote children's language and literacy skills.	Yes.	Dialogic reading encourages bookreading to become a dialogue between the reader, and the child, encouraging the adult to ask questions, add information, and prompt child to respond to the book. The phonological awareness intervention was an adaptation of Sound Foundations (Byrne & Fielding-Barnsley, 1992), that introduced children to consonant and vowel sounds. [Training on this was not described.]
Whitehurst, Zevenbergen, Crone, Schultz, Velting, and Fischel (1999)	The training session for dialogic reading consisted of teachers and parents watching a 20-minute training video, followed by role-playing of dialogic reading with a trainer and discussion of techniques following the video. In total, this one-time training lasted approx. 30 minutes.		One-time training session of 30 minutes.	Children attended Head Start centers, and were primarily low-income.	Dialogic bookreading and phonological awareness, to promote children's language and literacy skills.	Yes.	Dialogic reading encourages bookreading to become a dialogue between the reader, and the child, encouraging the adult to ask questions, add information, and prompt child to respond to the book. The phonological awareness intervention was an adaptation of Sound Foundations (Byrne & Fielding-Barnsley, 1992), that introduced children to consonant and vowel sounds. [Training on this was not described.]

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Table A-1b. Language and Literacy Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Yaden, Tam, Madrigal, Brassell, Massa, Altamirano, and Armendariz (2000)	In-classroom support and ongoing in-service training.		No information provided.	Spanish-speaking preschoolers, mostly low-income. Spanish-speaking child care "teachers and para-professionals"	Early literacy, reading and writing.	Yes.	In-classroom support and ongoing in-services regarding emergent literacy theory, activities, and developmental growth in reading and writing.
Zevenbergen, Whitehurst, and Zevernbergen (2003)	The training session for dialogic reading consisted of teachers and parents watching a 20-minute training video, followed by role-playing of dialogic reading with a trainer and discussion of techniques following the video. In total, this one-time training lasted approx. 30 minutes.		One-time training session of 30 minutes.	Children attended Head Start centers, and were primarily low-income.	Dialogic bookreading and phonological awareness, to promote children's language and literacy skills.	Yes.	Dialogic reading encourages bookreading to become a dialogue between the reader, and the child, encouraging the adult to ask questions, add information, and prompt child to respond to the book. The phonological awareness intervention was an adaptation of Sound Foundations (Byrne & Fielding-Barnsley, 1992), that introduced children to consonant and vowel sounds. [Training on this was not described.]

Table A-1c. Language and Literacy Studies: Outcomes

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Adger, Hoyle, and Dickinson (2004)	Descriptive	Twenty-nine hours of videotaped data across the nine LEEP sessions were submitted to discourse analysis. In addition, a quantitative coding of the tapes indicated how much time was devoted to Professional Conversation at the beginning and end of each session, and to lecture, video watching, and whole-group discussion during the lecture period. Six of the nine tapes were selected for intensive analysis (representing two sessions per instructor--one early session and one later session each).	Extended discussions among participants and instructors promote joint knowledge building. Meaning is produced interactively, with speakers aligning their contributions to the hearers' needs, and hearers providing signs of attention and understanding (e.g., body orientation, head nods, laughter, repeating each other's words, paraphrase, and overlapping their talk). These are the interactional processes through which learning occurs. An example is used to show how this group of 11 early childhood educators comes up with a multipart statement about the value of re-reading stories to children that weaves together their practical knowledge and research findings. Joint authorship of propositions was a crucial way in which learning was accomplished in the LEEP course.	Not assessed.	Not assessed.
Assel, Landry, Swank, and Gunnewig (2007)	Experimental (Random Assignment to Treatment & Control Groups)	*Teacher practice* : (1) Curriculum Fidelity Checklist was used to assess curriculum fidelity for all intervention teachers. (2) A random sample of classrooms were observed using the CIRCLE-Teacher Behavior Rating Scale (Landry et al., 2002) to understand potential variance across classroom environments and conditions for control and target classrooms. The observations were conducted in the fall, winter, and spring. *Child outcomes* : (1) Pre-school language scale-IV edition - auditory comprehension subscale (PLS) was used to assess complex language understanding; (2) Expressive vocabulary test (EVT) was used to assess expressive vocabulary and word retrieval skills; (3) Developing skills checklist (DSC) assessed a, "full range of child skills and behavior that children typically develop". (4) Woodcock-Johnson test of academic III tests of achievement (WJ-3) - The Letter Word Identification and Sound Awareness/Rhyming subtests were used.	Not assessed.	Curriculum fidelity scores improved over the course of the year, and there was generally a high degree of fidelity. Curriculum fidelity for Doors to Discovery was not as strong as Let's Begin. Control classrooms showed higher overall scores on the CIRCLE measure compared to targets. HS classrooms showed lower scores than Title I classrooms, or universal pre-K. It is unclear whether these differences were true at all three observations.	*Language comprehension findings:* For the PLS-IV Auditory Comprehension subscale there were significantly greater gains for children utilizing a language-literacy curriculum than for those in the control group. This effect was moderated by program site with groups using the curricula increasing at a faster rate than controls, but this was more true in HS classes than Title 1 or pre-k classrooms. Gains on the subscale were only significantly different than controls in the Head Start classes. There was also a significant curriculum by mentoring interactions between HS and Title 1 classes. *Vocabulary Findings:* There were significant differences between classrooms using language and literacy curricula versus controls on overall growth rates of expressive vocabulary was moderated by program site. Children in classrooms receiving the curricula grew at faster rates, but this was particularly true in Head Start and Title 1 classrooms versus universal pre-k. The effect size for HS was .68 compared to .04 for Title I classrooms and -.52 for universal pre-k. There was a significant effect of mentoring v. non-mentoring. Title I classrooms receiving the Doors condition showed greater growth irrespective of mentoring v. non-mentoring while for Let's Begin the growth was greatest in the mentored condition. *Print Knowledge:* On the WJ-3 there was a significant treatment v. control effect which was great in HS than Title I or universal pre-k. There was a curriculum effect of Let's Begin over Doors, varying by mentor status and moderated by program site. *Phonological awareness:* For Rhyming there was a significant difference in slopes for intervention v. control classrooms, with differences between the two conditions that were moderated by program site. For the Auditory Subscale of the DSC there was also a significant slope effect for intervention versus control classrooms, moderated by program site. There was also a significant effect of curriculum with Let's Begin outperforming Doors. There was a mentoring effect moderated by program site.

Table A-1c. Language and Literacy Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Baker and Smith (1999)	Pre-Post w/ Comparison Group (Not Randomly Assigned)	Measures of literacy knowledge of the students were used to track progress. Measures of phonemic awareness included the Yopp-Singer Test of Phoneme Segmentation (Yopp, 1995), Phonemic Segmentation (Kaminski & Good, 1996), and Onset Recognition and Production (Kaminski & Good, 1996). Measures of alphabetic understanding were Letter Naming Fluency (Kaminski & Good, 1996), Letter-Sound Knowledge (adapted from Engelmann & Brunner, 1995), and Subtests from Concepts About Print (Clay, 1985).	Not assessed.	Not assessed.	Glendale's two whole class intervention groups performed significantly better than Glendale's control group on phoneme segmentation (effect sizes were large). Glendale's kindergarten group in the Sustainability year did significantly better than Glendale's kindergarten group during the Implementation year and Lincoln's control group (effect sizes small but improving over time). This suggests that not only were changes being sustained, but the overall program was improving with growing teacher expertise. Growth in concepts about print was considerably higher in the Sustainability year than in the Implementation year. This was likely due to an increased attention on alphabetic understanding in the curriculum. Lincoln's K Plus program was compared to Lincoln's general kindergarten classrooms. Children in the K Plus program showed significant growth in phonemic awareness and alphabetic understanding over the course of both years, but did not reach the level of performance of their peers.
Byrne and Fielding-Barnsley (1995)	Pre-Post w/ Comparison Group (Not Randomly Assigned)	A measure of phoneme identity used by Burne & Fielding-Barnsley (1991) was used here for both pre- and post-test data. A total of 24 items were used to test children's grasp of phoneme identity in initial-word position (e.g., the "s" sound in "sand"). A second set of 24 items tested for final-word position phonemes (e.g., the "s" in "house"). Pre- and post-test measures included word identification, spelling, alphabet, and phoneme identity.	Not assessed.	Not assessed.	The improvement in phonemic awareness (from pre- to post-test) made by the children in the classroom condition exceeded that made by children in the control condition (for initial-position only), but fell below the improvement level shown by the children in the experimental condition. In addition, a similar proportion of children in all three conditions "passed" the criterion for identifying 32 out of 48 phonemes at pre-test (20 percent, 20 percent, and 22 percent for classroom, experimental, and control groups, respectively). But at post-test, the respective percentages of children passing the criterion was 51 percent, 95 percent, and 31 percent.
Dickinson and Brady (2006), Example 1: Teacher-Researcher Pilot Project	Descriptive	Researcher observation.	Not assessed.	There were moderate improvements in teacher-child language interactions. Teachers realized the importance of verbal interactions with children.	Not assessed.

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Table A-1c. Language and Literacy Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Dickinson and Brady (2006), Example 2: Literacy Environment Enrichment Program (LEEP)	Pre-Post w/ Comparison Group (Not Randomly Assigned)	Pre-test (fall) and post-test (spring) classroom observations were conducted using the Early Language and Literacy Classroom Observation (ELLCO; Smith & Dickinson, 2002). Children were also assessed in the fall and the spring, using measures of receptive vocabulary and phonemic awareness (measures not specified). An additional descriptive component of the study followed 10 supervisor-teacher teams two to three years after LEEP training, and observations are used to report on findings.	Assessment not discussed.	The LEEP training was found to enhance classroom practices that foster children's language and literacy development. LEEP participation predicted higher scores on all sections of the ELLCO when compared with the comparison group. When participation in LEEP was added to regression models predicting scores on the classroom Language, Literacy, and Curriculum subscale, power of the model nearly doubled from .37 to .73. For literacy activities, large to moderate effects were also found. Informal observations of 10 supervisor-teacher teams two to three years after the training indicated that there were enduring changes in how and how often books were read, the types of books read, and teachers' use of thematic instruction. Supervisors were also found to provide positive feedback, listen more to teachers, and encourage teachers' efforts.	Children in classrooms where teachers had received LEEP training scored higher on spring measures of receptive vocabulary and phonemic awareness, compared to their peers in comparison classrooms.
Dickinson and Brady (2006), Example 3: Technology-Enhanced Literacy Environment Enrichment Program (T-LEEP)	Quasi-Experimental (No Random Assignment; Controls for Baseline Group Differences)	Pre- and post-test classroom observations were conducted using the Early Language and Literacy Classroom Observation (ELLCO; Smith & Dickinson, 2002).	Not assessed.	T-LEEP participation predicted higher ELLCO scores on all sections, controlling for teacher background factors and post-intervention scores, compared with the comparison group.	Not assessed.
Dickinson and Brady (2006), Example 4: Striving to Achieve Reading Success (STARS-LEEP)	Quasi-Experimental (No Random Assignment; Controls for Baseline Group Differences)	Teachers' description of program and reactions are collected in participant focus groups. Researchers have also collected post-test Early Language and Literacy Classroom Observation scores (ELLCO).	Not assessed.	Caregivers report seeing immediate applications of the training in their classrooms. Participants reported making environmental changes (e.g. displaying writing around the room) and interactive changes (e.g. extending rich conversations with children). The formal evaluation also demonstrated that STARS-LEEP teachers had significantly higher post-intervention scores than control-group teachers on the ELLCO.	Not assessed.

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Table A-1c. Language and Literacy Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Dickinson and Brady (2006), Example 5: Program-Delivered Literacy In-Service Training (PD-LIT)	Unclear	Formal observations used the Early Language and Literacy Classroom Evaluation (ELLCO).	Not assessed.	PD-LIT classrooms were found to have higher scores on the ELLCO than comparison classrooms. (The effect sizes were smaller than for LEEP; however the implementation was only partial when ELLCO scores were collected.)	Not assessed.
Dickinson and Caswell (2007)	Quasi-Experimental (No Random Assignment; Controls for Baseline Group Differences)	Observers used the Early Language and Literacy Classroom Observation (ELLCO) Toolkit including three components: (1) the Classroom Observation and Teacher Interview; (2) the Literacy Environment Checklist; and (3) the Literacy Activities Rating Scale. Two subscales of the Assessment Profile (Abbott-Shim & Sibley, 1998), Learning Environment and Interacting, were used to measure classroom quality not specific to literacy. However, the Interacting subscale was dropped due to lack of variability.	Not assessed.	LEEP teachers made significant gains from fall to spring on all outcome measures. Comparison teachers made significant gains for all measures except the overall and the Writing subscale of the Literacy Activities Rating Scale. There were statistically significant differences between LEEP and control teachers at pre-test, with LEEP teachers scoring higher on the Writing subscale of the Literacy Environment Checklist. At post-test there were statistically significant differences between LEEP and comparison teachers on all overall and subscale scores except for the Writing subscale of the Literacy Activities Rating Scale. Effect sizes on the three overall components of the ELLCO toolkit indicate moderate to large effects of LEEP participation on these outcomes. There was also a moderate effect (r=.32) on the Learning Environment Subscale of the Assessment Profile.	Not assessed.
Foorman and Moats (2004)	Pre-Post w/o Comparison Group	Teacher knowledge was measured by a 19-question multiple-choice Teacher Knowledge Survey (TKS). Teachers' general effectiveness in essential teaching routines and classroom management was assessed using a structured classroom observation entitled the Texas Teacher Appraisal System (TTAS; Texas Education Agency, 1984). Student outcomes at the end of the year only were assessed using the Woodcock-Johnson Basic Reading and Broad Reading Clusters (WJ-R; Woodcock & Johnson, 1989).	Teachers with higher attendance in courses and training sessions had higher knowledge scores on the TKS.	Teachers with higher attendance in courses and training sessions did not show higher scores on classroom effectiveness as measured by the TTAS.	Assessed only in relationship with caregiver skills. Classrooms in which teachers were rated as more highly effective by the TTAS had students with somewhat higher reading scores.

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Table A-1c. Language and Literacy Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Fountain, Cosgrove, and Wood (2008)	Experimental (Random Assignment to Treatment & Control Groups)	The following child outcomes were assessed: mathematics (Woodcock Johnson [WJ] Applied Problems, Child Math Assessment-Abbreviated [CMA-A], Composite Score, and Shape Composition); reading (Test of Early Reading Ability [TERA], WJ Letter Word Identification, and WJ Spelling); phonological awareness (the Pre School Comprehensive Test of Phonological and Print Processing [Pre-CTOPPP], Elision subtest, Comprehensive Test of Phonological Processing [CTOPP], Elision subtest); language assessments (Peabody Picture Vocabulary Test [PPVT] and Test of Language Development [TOLD]); and behavioral outcomes (Social Skills Rating system [SSRS] and Pre School Learning Behavior Scale [PLBS]). Classroom outcomes assessed were overall classroom environment (Early Childhood Environmental Rating Scale Revised [ECERS-R]), teacher-child relationships (Arnett Detachment, Harshness, Permissiveness, and Positive Interactions scales) and classroom instruction (Teacher Behavioral Rating Scale [TBRS], TBRS Written Expression scale, TBRS Phonological Awareness scale, TBRS Book Reading and Oral Language scales, and TBRS Math Concepts scale)	Not assessed	No impact on educator practice was found	Analyses showed significant improvements in language development at the end of kindergarten in those classrooms who received ELLM implementation training.
Gettinger and Stoiber (2007)	Pre-Post w/ Comparison Group (Not Randomly Assigned)	*Child outcomes:* (1) IGDI Rhyming, Alliteration, and Picture Naming (2) Story re-telling task; (3) PPVT-III; (4) Uppercase letter knowledge, print and word awareness, and name writing from the PALS-PreK. The is the extent of the information provided about these measures.	Not assessed.	Not assessed.	On every measures, EMERGE Children outperformed children in control classrooms with effect sizes ranging from .13 (Rhyming) to .45 (PPVT-III).

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Table A-1c. Language and Literacy Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Jackson, Larzelere, St. Clair, Corr, Fichter, and Egertson (2006)	Quasi-Experimental (No Random Assignment; Controls for Baseline Group Differences)	*Classroom Observation Measures:* The Early Language and Literacy Classroom Observation (ELLCO) and Early Childhood Environment Rating Scale - Revised (ECERS-R) were used to assess classroom quality. *Child Literacy Measures:* The Individual Growth and Development Indicators (IGDIS) was used to measure vocabulary in children's primary language. The Woodcock-Munoz Language Survey (WMLS) was used to children's picture naming, verbal analogies, letter-word identification and writing skills. The Test of Early Reading Ability (TERA-3) was used to assess children's early reading including letter identification, awareness of print conventions and using print for reading. The Teacher Rating of Oral Language (TROLL) was used to assess children's oral language use, reading, and writing.	Not assessed.	ECEs in the HUR only group improved their classroom practices significantly more than control ECEs on the total ECERS-R score, and three subscales (personal care, activities, parents staff). The HUR+ mentoring group did not improve significantly more than the control ECEs on any ECERS-R score. Both of the HUR groups improved significantly more than control ECEs on some ELLCO measures. The HUR-only group improved significantly more on the literacy environment checklist. The HUR+ mentoring group improved significantly more than the controls on the literacy environment checklist and on two scores on the literacy activities rating scale.	The HUR-only group had significantly greater gains than the control group on total scores on the TROLL and the TERA, and marginally larger gains on the broad ability score on the Woodcock-Munoz. Overall, mentoring did not add any major benefit above the HUR-only training. Significantly greater gains than the control group were made by the HUR+ mentoring children on only the TROLL writing subscale, and the TERA meaning subscale. HLM was also used to determine whether there was a relationship between classroom practices and children's literacy skills, regardless of intervention group. Most of the ECE's classroom practice scores predicted significantly greater child gains on the student-completed measures, but not the ECE-completed measures.
Justice, Mashburn, Hamre, and Pianta (2008)	Descriptive	*Procedural Fidelity:* The MTP-LL Implementation Checklist with nine items (e.g., all students can see the teacher, teacher langauge is in general accordance to the script in the lesson plan) was developed for this study to assess the degree to which teachers adhered to step-by-step procedures for implementing the language and literacy lesson plans as written. The checklist was completed by a coder while viewing the submitted DVDs. Scores were differentiated into Fidelity to Routine and Fidelity to Teaching. A total score was also calculated. *Quality of Language and Literacy Instruction:* Each of the recorded lessons was scored using two new scaled developed for the Classroom Assessment Scoring System (CLASS): Language Modeling and Literacy Focus.	Not assessed.	Instruction was of low quality. The average Language Modeling rating was 2.59 out of seven, and 59 percent received at one or two. The average Literacy Focus rating was 2.61 and 44 percent of teachers received a 1 or 2. Quality of language modeling and literacy focus were not significantly correlated. Predictors associated with quality: Quality of language instruction was negatively associated with teachers' level of education (effect size = .06). Attending more langaage and literacy workshops was positively related to language modeling (es = .05). Twenty percent of the variance in quality of language instruction was explained by teacher, classroom, and lesson characteristics. Quality of literacy instruction was associated with teachers' higher self-efficacy ratings (es = .06), more adult-centered beliefs (es = .06), classrooms with a higher percentage of children with IEPs (es = .03), and procedural fidelity ratings, specifically those items focused on teaching (es = .04). Twenty-five percent of the variance in quality of teachers' literacy instruction was explained by these predictors.	Not assessed.

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Table A-1c. Language and Literacy Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Justice, Pence, and Wiggins (2008)	Experimental (Random Assignment to Treatment & Control Groups)	The following child outcomes were assessed: mathematics (Woodcock Johnson [WJ] Applied Problems, Child Math Assessment-Abbreviated [CMA-A], Composite Score, and Shape Composition); reading (Test of Early Reading Ability [TERA], WJ Letter Word Identification, and WJ Spelling); phonological awareness (the Pre School Comprehensive Test of Phonological and Print Processing [Pre-CTOPPP], Elision subtest, Comprehensive Test of Phonological Processing [CTOPP], Elision subtest); language assessments (Peabody Picture Vocabulary Test [PPVT] and Test of Language Development [TOLD]); and behavioral outcomes (Social Skills Rating system [SSRS] and Pre School Learning Behavior Scale [PLBS]). Classroom outcomes assessed were overall classroom environment (Early Childhood Environmental Rating Scale Revised [ECERS-R]), teacher-child relationships (Arnett Detachment, Harshness, Permissiveness, and Positive Interactions scales) and classroom instruction (Teacher Behavioral Rating Scale [TBRS], TBRS Written Expression scale, TBRS Phonological Awareness scale, TBRS Book Reading and Oral Language scales, and TBRS Math Concepts scale)	Not assessed	No impacts were found on classroom instruction outcomes. Impacts on classroom quality and teacher-child interaction outcomes could not be determined because of unreliable (inflated) data from 8 classrooms on the relevant measures	No impacts on child outcomes were found.
Landry (2002)	Pre-Post w/ Comparison Group (Not Randomly Assigned)	The teacher behavior checklist, used for both assessment of intervention effects, and in discussions between teachers and researchers to develop self-reflective practice, included: use of literacy related activities; environment and portfolios of literacy skills; responsive teaching practices; team teaching; effective book reading; oral language use. This was collected on a monthly basis. Children were administered the following battery assessments at pre-test in the fall, and again at post-test in the late spring: Peabody Picture Vocabulary Test, Expressive Vocabulary Test, Preschool Language Scale, Developing Skills Checklist subtests for print concepts, letter knowledge, and phonological awareness.	Not assessed.	Teachers in the intervention made significantly greater gains than comparison teachers in all areas, with average gains of about .75 on a five-point scale on oral language, literacy activities, team teaching, and best practice subscales. Conducting effective book reads showed the most dramatic change of about 1.5 points.	Results are somewhat unclear, but do indicate that children in intervention classrooms outperformed children in control classrooms on the language and literacy assessments.
Landry, Assel, Gunnewig, and Swank (2008)	Experimental (Random Assignment to Treatment & Control Groups)	The following child outcomes were assessed: mathematics (Woodcock Johnson [WJ] Applied Problems, Child Math Assessment-Abbreviated [CMA-A], Composite Score, and Shape Composition); reading (Test of Early Reading Ability [TERA], WJ Letter Word Identification, and WJ Spelling); phonological awareness (the Pre School Comprehensive Test of Phonological and Print Processing [Pre-CTOPPP], Elision subtest, Comprehensive Test of Phonological Processing [CTOPP], Elision subtest); language assessments (Peabody Picture Vocabulary Test [PPVT] and Test of Language Development [TOLD]); and behavioral outcomes (Social Skills Rating system [SSRS] and Pre School Learning Behavior Scale [PLBS]). Classroom outcomes assessed were overall classroom environment (Early Childhood Environmental Rating Scale Revised [ECERS-R]), teacher-child relationships (Arnett Detachment, Harshness, Permissiveness, and Positive Interactions scales) and classroom instruction (Teacher Behavioral Rating Scale [TBRS], TBRS Written Expression scale, TBRS Phonological Awareness scale, TBRS Book Reading and Oral Language scales, and TBRS Math Concepts scale)	Not assessed	In Doors to Discovery classrooms, a positive impact was found on early literacy instruction and early language instruction. In Let's Begin with the Letter People classrooms, a positive impact was found on classroom quality and early literacy instruction.	No impacts on child outcomes were found.

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Table A-1c. Language and Literacy Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Landry, Swank, Smith, Assel, and Gunnewig (2006)	Quasi-Experimental (No Random Assignment; Controls for Baseline Group Differences)	A teacher behavior rating scale was developed to assess changes in language and literacy instruction. The scale included the following content areas which were linked to the pd content areas: (a) general types of activities and materials, including responsive teaching behaviors; (b) lesson plans/dynamic assessments; (c) centers; (d) book reading behaviors; (e) print and alphabet knowledge; (f) phonological awareness; (g) written expression; (h) oral language use with students; and (i) team teaching. Target teachers in year 1 were rated six times, and the control teachers three times. In year 2, newly trained teachers were rated monthly, and second-year trained teachers were rated four times a year. Teachers also completed the Teacher Orientation Scale (adapted from Payne, 1996)at the beginning of year 1, which assessed whether they placed more emphasis on social-emotional or cognitive development. About 35 percent of the total number of classrooms across the target and control conditions was randomly selected for assessment, and 10 children from each classroom were randomly selected. Children were assessed at pre-and post-test (fall and spring) using the Memory and Auditory Analysis subscales of the Developing Skills Checklist (DSC; CTB/McGraw Hill, 1990); the Peabody Picture Vocabulary Test-III (PPVT-3; Dunn, Dunn, & Dunn, 1997); the Expressive Vocabulary Test (EVT; Williams, 1997); and the Preschool Language Scale, third edition (PLS-3; Zimmerman, Steiner, & Pond, 1992). Teachers also completed a survey at the end of year 1, developed for the use of this study, to assess their perception of the impact of the early literacy skills focus on children's social-emotional development.	Teachers showed "less" growth in phonological awareness.	Across target teachers (based on effect sizes, small = .20-.49; moderate = .50-.79; large > .80), 60 percent showed strong growth and 30 percent showed moderate growth in most areas on the rating scale. At the end of year 1, teachers placed a stronger emphasis on academic versus social-emotional orientation compared to control teachers.	A multilevel, mixed model was used, and the classroom (instead of child) was used as the unit of analysis. More than 85 percent of teachers perceived increases in social-emotional behavior. The intervention in year 1 had positive effects on children alphabet knowledge (large and moderate effect sizes at 40 percent of sites) and phonological awareness (large and moderate effect sizes at 35 percent of sites). Children in target classrooms made greater gains in following two-part commands (PLS Auditory Comprehension subscale) and in their ability to use language (PLS Expressive Comprehension subscale). About one-third of sites demonstrated large and moderate effect sizes in auditory comprehension, and 26 percent demonstrated large effect sizes for gains in expressive language skills. More sites showed small to large gains in vocabulary development than in syntactic and semantic language skills. Fifty-five percent of sites showed small to large effect sizes for gains in children's vocabulary knowledge (PPVT-3) and 40 percent in children's ability to label objects and actions (EVT). In year 2, comparing children's skill gains on the PLS-AC after the intervention v. when they were in a control classroom, 73 percent of the sites showed small to large effect sizes, representing greater gains in children's language understanding. Sixty-nine percent of sites showed similar effect sizes on the PLS-EC showing greater gains in children's use of language, 45 percent of sites had teachers assist children in making greater gains in receptive and expressive vocabulary, 50 percent of sites showed gains in children's alphabet knowledge, and 45 percent in phonological awareness. Children of target teachers in their second year of training compared to controls, and showed gains across all skills. There were few differences in child outcomes based on teachers being in their first vs. second year of training. Additional professional development resulted in only a small number of sites showing significantly greater gains in vocabulary and phonological awareness.
Lonigan and Schatschneider (2008)	Experimental (Random Assignment to Two Treatment Groups & A Control Group)	Mathematics: Woodcock Johnson Applied Problems, Child Math Assessment Abbreviated Composite Score and Shape Composition Reading: Test of Early Reading Ability (TERA), Woodcock Johnson Letter Word Identification, Woodcock Johnson Spelling. Phonological awareness: Preschool Comprehensive Phonological and Print Processing (Pre-CTOPPP), Elision subtest, Comprehensive Test of Phonological Processing Kindergarten (CTOPP), Elision subtest. Language Assessments: Peabody Picture Vocabulary Test (PPVT), Test of Language Development (TOLD)- Grammatic Understanding Subtest. Behavioral Assessments: Social Skills Rating System (SSRS)- Social Skills and Problem Behaviors scales, Preschool Learning Behaviors (PLBS) Overall Classroom Environment: Early Childhood Rating Scale-Revised (ECERS-R). Teacher-Child Relationships: Arnett Detachment, Harshness, Permissiveness, Positive Interactions Classroom Instruction: Teacher Behavior Rating Scale (TBRS) Print and Letter Knowledge, Written Expression, Phonological Awareness, Book Reading and Oral Language, and Math Concepts scales	Not assessed.	*Literacy Express*- A statistically significant difference between the control and treatment group was found on the ECERS-R during the spring pre-kindergarten follow-up with the treatment group scoring higher than the control group (d=1.29). There was also a statistically significant difference on the Phonological Awareness subscale of the TBRS with the treatment group providing more instruction in phonological awareness compared to the control group (d=1.26). *LM Early Childhood Express supplemented with Open Court Reading Pre-K* - A statistically significant difference between the control and treatment group was found on the Phonological Awareness subscale of the TBRS with the treatment group providing more instruction in phonological awareness compared to the control group (d=1.41).	*Literacy Express*- A statistically significant difference between the control and treatment group in behavioral outcomes was found during the kindergarten follow-up with *Literacy Express* classrooms exhibiting weaker learning behaviors than the control group (d=-.38). *LM Early Childhood Express supplemented with Open Court Reading Pre-K* - Statistically significant differences favoring the treatment group were detected between the control and treatment group scores on: the Woodcock Johnson Applied Problems assessment for the spring of pre-kindergarten (d=.36) and the spring of kindergarten (d=.48); the fall assessment of the Woodcock Johnson Letter Word Identification Test (d=.41); the pre-kindergarten spring assessments of the TERA (d=.68), Woodcock Johnson Letter Word Identification Test (d=.51), and Woodcock Johnson Spelling Test (d=.46); the spring kindergarten assessments of the TERA (d=.76) and Woodcock Johnson Letter Word Identification Test (d=.50); the spring pre-kindergarten (d=.32) and spring kindergarten (d=.38) assessment of the Pre-CTOPPP/CTOPP; and the fall pre-kindergarten TOLD Grammatic Understanding assessment (d=.38); and spring pre-kindergarten and spring kindergarten TOLD Grammatic Understanding assessment (d=.40 and d=.46, respectively) and PPVT (d=.40 and .48, respectively).

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Table A-1c. Language and Literacy Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Lonigan and Whitehurst (1998)	Experimental (Random Assignment to Treatment & Control Groups)	Children were assessed at pre-and post-test using the Peabody Picture Vocabulary Test-Revised (PPVT-R; Form L at pre-test, Form M at post-test; Dunn & Dunn, 1981); the Expressive One-Word Picture Vocabulary Test (EOWPVT at pre-test; Gardner, 1979; EOWPVT-R at post-test; Gardner, 1990); the Verbal Expression subtest of the Illinois Test of Psycholinguistic Abilities (ITPA-VE; Kirk, McCarthy, & Kirk, 1968). In addition, 66 children at post-test were shown two books and asked open-ended questions. The interactions were audiotaped and then coded. Validity: "At pretest, scores on each of the three tests were only moderately correlated (ranging from r = .27 to r = .66), suggesting that these tests assessed somewhat different dimensions of oral language." Reliability: "Indices of internal consistency for each test are high (e.g., split-half reliabilities: PPVT-R = .80, EOWPVT = .94, ITPA-VE = .86)." The authors also reported on the correlations between pre- and post-test for the measures; correlations ranged from .57 to .73, indicating "moderately high reliability across time and form."	Not assessed.	Not assessed.	In the high compliance centers, the combined intervention group (home plus school) significantly outperformed the control group on the EOWPVT, but none of the three experimental groups were significantly different from each other, and the differences between the two other experimental groups and the control group were not significant. In the low compliance centers, the school group performed significantly lower than all three of the other groups. On the ITPA-VE, all three intervention groups scored significantly higher than the control group (regardless of compliance). Scores for the home group were significantly higher than scores for either the school group or the combined group. No significant effects were found for the PPVT. Regarding recorded interactions with books, the three experimental groups scored significantly higher on a majority of the variables (e.g., mean length of utterance, diversity of words) than the control group (there were few significant differences between the three experimental groups) in high compliance centers only.

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Table A-1c. Language and Literacy Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
McCutchen, Abbott, Green, Beretvas, Cox, Potter et al. (2002)	Quasi-Experimental (No Random Assignment; Controls for Baseline Group Differences)	Teachers were given an assessment of their knowledge of language structure, the Informal Survey of Linguistic Knowledge (Moats, 1994; Moats & Lyon, 1996). Teachers' general knowledge was also assessed using the Cultural Literacy Test (Riverside Publishing, 1989). Teachers' practice was also observed on multiple occasions throughout the school year, and extensive field notes were coded into for major categories: knowledge affordance; literary activity; textual context; and group context. In addition, kindergarten children were given a battery of five assessments at four timepoints (Sept.,Nov.,Feb.,May). The Test of Phonological Awareness (TOPA; Torgesen & Bryant, 1994) was used to test their phonological awareness. The listening comprehension from the Metropolitan Readiness Tests (MTR6; Nurss & McGauvran, 1995) was used to test their listening comprehension. A timed alphabet writing task validated by Berninger & Rutberg, 1992 was used to test orthographic fluency. Lastly, word reading was assessed using the Gates-GacGintie Reading Tests (MacGintie & MacGintie, 1989).	The teachers who participated in the intervention deepened their phonological knowledge after participation in the workshop.	After participation in the workshop, experimental group teachers spent significantly more time on activities directed toward phonological awareness than control-group teachers (mean 7.8 minutes as compared to mean 3.3 minutes), with an effect size of .82. Experimental group teachers were also found to spend more time on explicit comprehension instruction (mean = 1.82 minutes) than control group teachers (mean = .02 minutes). There was no difference in the amount of time spent on orthographic activities between experimental and control group teachers.	The experimental condition was not related to kindergarteners' growth in phonological awareness or listening comprehension, but was associated with growth of orthographic fluency. The children in the experimental condition gained, on average, about 50 percent more in letter production than children in control classrooms. Performance on word reading, measured only at a single timepoint, was the same for children in the experimental and control groups. Growth of phonological awareness was significantly related to teachers' use of phonological awareness strategies.
McGill-Franzen, Allington, Yokoi, and Brooks (1999)	Experimental (Random Assignment to Treatment & Control Groups)	Students in all 18 classrooms were pre- and post-tested using the following measures: Peabody Picture Vocabulary Test - Revised (PPVT-R); Concepts about Print and Diagnostic Survey (CAP; Clay, 1993). In addition to child assessments, observations of instruction were taken using the Classroom Literacy Environment Profile (CLEP). Interrater reliability on this instrument has been found to be consistently in the 80-90 percent range. Teachers were also interviewed, and analyzed teachers' weekly read-aloud logs, which indicated how many books were read per week in each classroom.	Not assessed.	Children whose teachers had attended training had almost twice as many books read aloud to them each week as their peers whose teachers did not participated in training. Furthermore, in classrooms where teachers received training, CLEP observations showed that book displays were found to be attractive, the classrooms had richer print environments, and teachers were more likely to link reading and writing activities together.	Post-test and gains scores analyses indicate that the training intervention had positive effects on children's achievement, particularly on measures focusing on literacy growth. Effects were present, but more modest on measures of children's vocabulary (PPVT) and letter knowledge.
National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences (2007)	Quasi-Experimental (No Random Assignment; Controls for Baseline Group Differences)	Children's language and literacy skills: (1) The Pre-LAS (Duncan & DeAvila, 1998) assessed English proficiency; (2) The Preschool Comprehensive Test of Phonological and Print Processing (Pre-CTOPPP; Lonigan et al., 2007) assessed print and letter knowledge; (3) The Expressive One-Word Picture Vocabulary Test (EOWPVT; Brownell, 2000) assessed expressive vocabulary; (4) The Preschool Language Scale (PLS-4; Zimmerman et al., 2002) assessed auditory comprehension; and (5) The Social Competence & Behavior Evaluation (30-item) - Teacher Rating (La Freniere & Dumas, 1996) assessed social competence, anger-aggression, and anxiety-withdrawal. *Classroom observations and surveys*: (1) The Teacher Behavior Rating Scale (TBRS; Landry, 2004) and 11 items from the Early Childhood Environment Rating Scale - Revised (ECERS-R; Harms et al., 1998) were used to assess classroom practice and overall quality.	Researchers report that teacher knowledge and skills were measured indirectly though teaching experience and professional development, which contribute to knowledge and skills. ERF did not impact years of teaching experience. ERF significantly increased the number of hours of professional development that focused on language and literacy topics. ERF had a positive impact on the mode of training with a higher proportion of ERF teachers getting professional development on language and literacy topics through mentoring or tutoring. A larger proportion of ERF teachers also reported receiving workshop training on language and literacy topics.	ERF had statistically significant positive impacts on language environment of the classroom, book-reading practices, the variety of phonological-awareness activities and children's engagement in them, materials and teaching practices to support print and letter knowledge and writing, and the extensiveness and recency of child assessment practices. Additionally, ERF had positive impacts on more general aspects of classroom quality including the quality of teacher-child interactions, the organization of the classroom, and the planning of activities for children.	ERF had significant positive impact on children's print and letter knowledge (d = 0.34) but not on phonological or oral language. ERF did not impact children's social-emotional skills.

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Table A-1c. Language and Literacy Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Neuman (1999)	Pre-Post w/ Comparison Group (Not Randomly Assigned)	A battery of children's assessments was conducted in September, and again in May. The Test of Early Reading Abilities (TERA; 1981; reliability: .89) was used to evaluate whether children could identify signs in their environment. Children were given a letter-naming test (Clay, 1979: reliability: .97), a test to measure their understanding of print concepts (Clay's Concepts of Print, 1979: reliability: .95), a test to measure their understanding of writing (Purcell-Gates, 1996; reliability: .90), and one to evaluate their understanding of narrative (Purcell-Gates, 1996: reliability: 1.0) Researchers assessed children's receptive vocabulary using the Peabody Picture Vocabulary Test (PPVT). Researchers also made coded observations of the book area in each classroom, child-teacher interactions, and collected daily schedules and teacher interviews. A follow-up battery of children's assessments was administered 6 months after the intervention. (Assessments were modified slightly--e.g., testing letter knowledge of all 26 letters instead of a sample--to avoid a ceiling effect.	Not assessed.	Following the intervention, 56 classrooms had a book reading area, as compared to 21 before the intervention. 83 in total out of 100 made clear efforts to enhance children's print environment. Observations indicate that teacher-child literacy interactions almost doubled over the seven-month intervention period. Teachers self-report of reading activities reveal that teachers who received the intervention were more likely to read more often, for more minutes, and in more subject areas, both to groups and to individual children, than the control group.	Comparisons of children in the Books Aloud intervention classrooms and comparison children revealed that Books Aloud children showed statistically significant greater scores at post-test compared to their counterparts on measures of concepts of print, letter name knowledge, concepts of writing, and concepts of narrative. There were no differences found on receptive language scores or environmental print. A follow-up assessment 6 months after the end of the project indicated that effects on children's outcomes endured. Children exposed to Books Aloud scored about comparison children on five out of six measures of early language and literacy development.
Neuman and Cunningham (2009)	Experimental (Random Assignment to Treatment & Control Groups)	Teacher Knowledge was measured by the Teacher Knowledge Assessment of Early Language and Literacy Development. This was a multiple choice, true/false assessment to determine growth in knowledge between pre/post assessments. Two forms were created (one for pre-test, one for post-test). Each assessment had 45 items that addressed the eight core competencies of language and literacy, and 22 items that addressed foundational knowledge in child development (based on NAEYC standards). Teacher Practice was assessed using the Early Langauge and Literacy Classroom Observation (ELLCO; Smith & Dickinson, 2002) in center-based settings, and the Child/Home Early Language and Literacy Observation (CHELLO; Nueman, Dwyer & Koh, 2007) in home-based settings.	No significant differences were found in teacher knowledge between teachers who received coursework plus coaching, coursework alone, or the control group. Specifically, neither treatment group outperformed the control group on post-test knowledge scores (accounting for pre-test scores as a covariate). The two control groups had equivalent post-test scores, indicating that coaching did not provide additional benefit for teacher knowledge. There were no significant differences between center-based and home-based settings on teacher knowledge.	Significant improvements in language and literacy practices were found for teachers who received both the three-credit course on language and literacy and the ongoing coaching. The effect size was large and considered to be educationally meangingful for both center-based and home based settings (Cohen's d = .77 for center-based and .82 for home-based settings). Improvements were seen in the Book Area, Writing Area, Physical Environment, Support for Learning, and Teaching Strategies. Cousework alone had little effect on improving educator practices in either center-based (Cohen's d =.23) or home-based settings (Cohen's d = .01). Examination of shared items across the ELLCO and CHELLO showed that although scores were lower at pre-test for home-based providers compared to center-based providers, by post-test, providers who had received both coursework and coaching were virtually at the same level of quality as center-based providers who had received both coursework and coaching.	Not assessed.
O'Connor, Fulmer, Harty, and Bell (2005)	Pre-Post w/ Comparison Group (Not Randomly Assigned)	Phonemic segmentation and letter naming (O'Connor & Jenkins, 1999) were given in kindergarten in Oct, Jan, and May and were given in first grade in Oct. Three subtests of the Woodcock Reading Mastery Tests-Revised (WRMT-R, Woodcock, 1998) were given in grades 1 to 3 in Oct., Jan., and May. The Peabody Picture Vocabulary Test, third edition (PPVT-III; Dunn, Dunn, & Dunn, 1997) in March in the first and fourth year, and to the control groups in March. Teachers were also surveyed about their instructional practices for teaching reading. Observations of 40 to 80 minutes in each classroom (twice a year for control group, three times a year for intervention groups). In the last year of the study, videotaped 60 to 80 minutes of instruction in each of the intervention classrooms (except for two teachers). Because of a lack of a control group in kindergarten, outcomes in kindergarten were not assessed.	Not assessed.	General education teachers agreed to teach reading by grouping children by ability level. In kindergarten, grouping was easy because teachers used learning centers regularly. In the older grades, teachers kept their instructional group times short (10 to 15 minutes per group at the beginning of the year, and 20 to 30 minutes near the end of the year). Whole group instruction was also used in grades 1-3. Special ed teachers were already conducting instruction closely in line with the intervention model (i.e., small group instruction). However, the researchers note that two teachers made no changes to their instructional practice, despite attending all meetings and contributing to discussions. These two teachers did not differ from the other teachers on years of experience (10+ years) and were well regarded by others.	Professional Development alone (layer 1) improved reading outcomes significantly over the control group for all reading measures except Word Identification at the end of Grade 2, and all reading measures by the end of Grade 3. Children in layer 2 classes (PD plus additional, intensive instruction) outscored controls on all of the reading measures at both Grade 2 and Grade 3. Scores of all groups of students (varying reading ability and SES) improved over time. SES did not influence response to treatment significantly. Although higher SES students performed better at beginning and end of year, learning gains across schools were similar, and students without disabilities in the low SES school were above the national average by the end of third grade. In addition, fewer students were being identified with learning disabilities (LD) by third grade. However, the authors were not confident that this was due to the intervention, nor whether rates might rise again in fourth grade dude to the more difficult reading material in the later grades of elementary school.

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Table A-1c. Language and Literacy Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Podhajski and Nathan (2005)	Pre-Post w/ Comparison Group (Not Randomly Assigned)	Providers completed a demographic survey. Providers who participated in training were also administered at pre- and post-test an assessment of pre-literacy development and general language structure using Knowledge of Language Structure Questionnaire (KLSQ), consisting of 30 multiple-choice items that sampled content from the training course. Internal consistency was high (.87). At the end of the study, providers also completed a course and mentorship evaluation, to evaluate their opinion of the efficacy of the program. Children in both intervention and control classrooms were evaluated using the Preliteracy Skills Screening Test (PLSS), which measures rhyming, sentence repetition, naming, blending, sentence segmentation, letter naming, syllable segmentation, deletion, and multi-syllabic word repetition. Internal consistency was high (.85).	Child caregivers who received training were found to have statistically significant increases on KLSQ scores of language knowledge, using paired t-tests. Before the training, they scored 82 percent correct on average; afterward, it jumped to 91 percent.	Not assessed.	Children in classrooms in which teachers participated in the Building Blocks program showed significantly greater preliteracy gains than controls over the 6-month time period, as measured by the PLSS. Additionally, a larger proportion of children in intervention classrooms moved out of at-risk preliteracy level as compared to control group children.
Pence, Justice, and Wiggins (2008)	Experimental (Random Assignment to Treatment & Control Groups)	Forty-five-item curriculum fidelity checklist administered fall, winter, spring and based on core curriculum features, subscales: instructional processes- focused contrast, modeling, event cast, open question, expansion, recast, redirect; and implementation during activity contexts daily structure, dramatic play, art, story, group, music. Chronbach alphas of instructional process ranged from .67 to .80 depending on the wave of data collection; observers had 93 percent agreement in scoring. Chronbach alphas of implementation activity context ranged from .88 to .98, observers had 97 percent agreement in scoring. A teacher self-administered questionnaire was used to measure teachers' assessment of the quality of program delivery and comfort of implementation.	Not assessed.	Teachers in the treatment group were rated higher on each of the instructional process fidelity items (except open questions) when compared to comparison teachers. Effect sizes were as follows: focused contrast (.67), modeling (.35), event cast (.89), expansion (.50), recast (.98), redirect (.82). Teachers in the treatment group also scored higher to a statistically significant degree on indices of some of the activity context categories. Effect sizes of significant differences were as follows: daily structure (2.12), dramatic play (2.82), music (1.24), and art (marginally significant, 1.55). Treatment teachers were found to increase their use of language-stimulation techniques from fall to spring, with mostly medium to large effect sizes (focused contrast, d=.52; modeling, d=.45; event cast, d=.94, open question, d=2.05; expansion, d=.90, recast, d=.83; redirect, d=.12). Treatment teachers' fidelity to the activity contexts item transitioned from high scores in the fall to low scores in the winter and a rebound to high scores (matching those in the fall) in the spring.	Not assessed.
Roskos, Rosemary, and Varner (2006)	Descriptive	Three sources of data were used: 1) course descriptions; 2) syllabi and related documents for all early literacy-related course work; and 3) telephone interviews with program coordinators lasting about 30 minutes. Information was compared to a "gold standard" for literacy pedagogy, as defined by the state of Ohio. Information from these three sources was also used to categorize curriculum components by domain (knowing, assessing, planning, teaching), and by content goal (knowledge and skill).	The degree of external alignment was strong among all three bachelor's degree programs, minimal to moderate among the associate's degree programs, and weak to minimal among the CDA programs. The degree of horizontal alignment was moderate among the bachelor's degree programs, minimal among the associate's degree programs, and weak to minimal among the CDA programs. The degree of vertical alignment was strong among the three bachelor's degree programs, but minimal/moderate among the associate's degree programs, and weak to minimal among the CDA programs. No curricula by program type fully met the "gold standard" of state-sponsored professional education curriculum in preschool and primary grade literacy pedagogy.	Not assessed.	Not assessed.

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Table A-1c. Language and Literacy Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Wasik and Bond (2001)	Experimental (Random Assignment to Treatment & Control Groups)	Peabody Picture Vocabulary Test - III (PPVT-III; Dunn & Dunn, 1998) was used as both a pre-test and post-test. A second receptive vocabulary test, modeled after the PPVT-III, as well as an expressive vocabulary test, were made for randomly-selected vocabulary words (out of the 100 introduced as part of the intervention). These two latter tests were only administered post-intervention. In addition, classroom observations were conducted in each classroom during the 9th and 11th week of the intervention; all teachers were observed while they read the same two stories. A frequency count was tallied for the number of times teachers used 10 target vocabulary words from the stories.	Not assessed.	A significant main effect of group and word, as well as a significant group X word interaction, were found for the frequency count of vocabulary words used during observed book reading sessions. Intervention teachers used some target words more often than the control group teachers.	A treatment by trial interaction was found for the PPVT-III, indicating that the intervention and control groups did not differ from each other at pretest on the PPVT-III, but that the intervention group performed better than the control group on the PPVT-III at posttest. Both the AM and PM intervention children outperformed their control group counterparts on the receptive and expressive vocabulary posttests.
Wasik, Bond, and Hindman (2006)	Experimental (Random Assignment to Treatment & Control Groups)	*Child outcomes*: (1) PPVT-III (Dunn & Dunn, 1997), (2) EOWPVT-III (Brownell, 2000), and (3) alphabet knowledge (naming all 26 letters). *Teacher outcomes:* (1) observed book readings (pre/post) were coded for (a) informational questions related ot the book, (b) informational talk related to the book, (c) managerial questions unrelated to the book, and (d) managerial talk unrelated to the book. (2) teachers were observed for 30-40 minutes during activities other than book reading and a checklist of observed behaviors coded for four components of active listening, four components of providing feedback, and four components of modeling rich language. Observations occurred 6 times. Behaviors specific to each training were included in each observational protocol which followed that set of training sessions. *Fidelity of implementation*: Teachers were scored by the authors on how well they engaged in three dimensions: (a) utilzation of trained strategies, (b) material use as part of the lesson, and (c) integration of the theme throughout activities to facilitate the consistent use of vocabulary. Each item was scored on a 3-point scale (0=not observed and not implemented, 1=observed inconsistently, 2=observed consistently).	Not assessed.	Teachers were similar at pretest with regard to the amount of informational open questions, closed questions, or teacher talk that occurred before, during or after a book was read. However, at posttest, teachers in the intervention group talked more in general during book reading compared to teachers in the control group. Intervention teachers asked more open-ended questions at posttest, and also showed a significant increase in the use of open-ended questions during book reading from pre- to posttest. Control teachers did not show a significant change in the use of open-ended questions during book reading from pre- to posttest. Nevertheless, there was variability among intervention teachers in the amount of open-ended questions used at posttest. Observations indicated that 90 percent of all intervention teachers used strategies to elicit child speech in activities other than book reading. Only 60 percent of these teachers encouraged children to use the theme-related vocabulary outside of book reading. Only 40 percent offered explicit prais to children demonstrating active listening. Partial correlations revealed that teacher behaviors during book reading and outside of book reading were correlates to children's posttest receptive vocabulary, but only teachers' behaviors during reading were correlated with children's expressive vocabulary. In addition, there were more significant associations between teacher behaviors and receptive vocabulary than between teacher behaviors and expressive vocabulary. The strongest correlations were for predictive, reactive, and recalling-reinforcing questions before reading. There were no assocations between the use of props and children's language skills.	ANCOVAs (controlling for pretest) revealed that children in the intervention condition had significantly larger expressive and receptive vocabularies at posttest than children in the control condition. There was a moderately strong effect size for expressive (d = .44) and a large effect for receptive (d = .73). Alternative explanations of these findings were explored and eliminated. Using classroom as the unit of analysis rather than the child, significant differences were still found, suggesting that the significant differences in the initial analyses were not due to Type I error. Partial correlation analyses revealed that higher posttest scores on the PPVT-III (receptive vocabulary) were associated with higher levels of implementation of the intervention on the part of the teacher. An ANCOVA on posttest alphabet scores revealed that the control children did better than the intervention children, suggesting that the intervention teachers were not more skilled than the control teachers. Pretest scores were not different, suggesting that children in the two groups were initially equivalent in skills prior to the intervention. Finally, hierarchical regression analyses indicated that both pretest and condition were significant predictors of posttest scores for vocabulary, but child age was not.

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Table A-1c. Language and Literacy Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Whitehurst, Arnold, Epstein, Angell, Smith, and Fischel (1994), "A Picture Book Reading Intervention in Day Care and Home for Children from Low-Income Families"	Experimental (Random Assignment to Treatment & Control Groups)	The same assessments were used as pre- and post-tests: Peabody Picture Vocabulary Test-Revised (PPVT-R; Dunn & Dunn, 1981), Expressive One-Word Picture Vocabulary Test-Revised (One Word; Gardner, 1990), Illinois Test of Psycholinguistic Abilities, expressive subscale (ITPA; Kirk, McCarthy, & Kirk, 1968), and Our Word (expressive vocabulary test of the researchers' devising). The Family Reading Survey (Whitehurst, 1990) was also gathered. Construct validity: Only moderate correlations between the four measures at pretest suggest that they are capturing slightly different dimensions of language (r's ranged from .37 to . 52; M=.46). Each test was reported to have moderately high reliability across time and across forms (for PPVT-R and One Word), as measured by correlations between pre-and posttest scores for the control group (r's ranged from .62 to .80).	Not assessed.	Not assessed.	ANCOVAs revealed that children in the reading conditions outperformed those in the control condition on the One Word and Our Word posttests. For example, children in the reading conditions gained approximately double the number of words in the Our Word posttest. Significant effects of condition also existed for the One Word at the six-month follow-up. However, those children in the least compliant center (i.e., the one with the lowest frequency of classroom reading) did not benefit from the intervention as did those children in the other centers. There was no effect of the intervention on PPVT or ITPA scores at posttest or follow-up.
Whitehurst, Epstein, Angell, Payne, Crone, and Fischel (1994), "Outcomes of an Emergent Literacy Intervention in Head Start"	Experimental (Random Assignment to Treatment & Control Groups)	The same assessments were used as pre- and post-tests: Peabody Picture Vocabulary Test-Revised Form M (PPVT-R; Dunn & Dunn, 1981), Expressive One-Word Picture Vocabulary Test (One Word; Gardner, 1981), Illinois Test of Psycholinguistic Abilities, expressive subscale (ITPA; Kirk, McCarthy, & Kirk, 1968), and Developing Skills Checklist (DSC; CTB, 1990). Validity: A principal components analysis was conducted using the 21 post-test measures, and four factors emerged: Language, Writing, Linguistic Awareness, and Print Concepts. Most of the factors had loadings on subtests in a way the authors expected; however, the analysis was not quite as clean for Print Concepts, which had loadings on a measure of rhyming and a measure of sound blending, which would both logically fall with Linguistic Awareness. Reliability: "Split-half reliability is high for each measure (PPVT-R = .80, One Word = .94, ITPA = .86, and DSC = .84). Other measures of reliability and validity are reported in the manual for each	Not assessed.	Not assessed.	A principal components analysis was conducted using the 21 post-test measures. Four factors emerged: Language (e.g. receptive vocabulary, expressive language), Writing (e.g. write first name), Linguistic Awareness (e.g. segment words), and Print Concepts (e.g. name letters, distinguish words/pictures/numbers). Children in the intervention group performed significantly better on Writing and Print Concepts, but not on Language and Linguistic Awareness, as compared to the control group. There was a significant difference for the Identify Sounds and Letters subtest of Linguistic Awareness factor. The authors also considered how children's outcomes related to their parents' compliance with the intervention (assessed at post-test by testing parents' knowledge of which books they had read to their children and their report of the frequency of shared reading). The analysis controlled for parent IQ, parent education, and frequency of shared reading at pre-test. Parents' compliance with the intervention was a significant predictor of children's performance on the Language factor.
Whitehurst, Zevenbergen, Crone, Schultz, Velting, and Fischel (1999)	Experimental (Random Assignment to Treatment & Control Groups)	The pre-test consisted of the Peabody Picture Vocabulary Test-Revised (PPVT-R; Dunn & Dunn, 1981) and the Developing Skills Checklist (DSC; CTB, 1990). The same assessments were used for post-testing at the end of Head Start and the end of kindergarten, with the addition of the Expressive One-Word Picture Vocabulary Test (One Word; Gardner, 1981). The assessments used at the end of the first and second grades were the Word Reading subscale of the Stanford Achievement Test-Eighth Edition (Psychological Corporation, 1989) and the Word Attack subscale of the Woodcock Reading Mastery Tests-Revised (Woodcock, 1987). Reliability: "Each assessment device was standardized, was normed on a national sample of children, and had internal reliability of .80 or higher as determined from the standardization sample."	Not assessed.	The authors note that there was variability in the degree to which Head Start teachers fully implemented the curriculum.	Children in the intervention groups performed significantly better than control group children on the PPVT and the DSC (total score, made up of tests of Memory [e.g., naming letters, blending sounds into words], Auditory [e.g., segmenting sentences, rhyming], Print Concepts [e.g., holding a book properly, differentiating print from pictures], and Writing [e.g., printing first name, writing from left to right] at the end of the Head Start year, as well as at the end of kindergarten (with the addition of the One Word at the end of kindergarten). However, there were no significant differences between the two groups of children on the two reading scores at the end of the first and second grades.

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Table A-1c. Language and Literacy Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Yaden, Tam, Madrigal, Brassell, Massa, Altamirano, and Armendariz (2000)	Quasi-Experimental (No Random Assignment; Controls for Baseline Group Differences)	The Spanish Concepts About Print Test (Escamilla, Andrade, Basurto, Ruiz, & Clay, 1996) was used as a pre- and post-test. Piagetian clinical interviews were used to capture knowledge of written language concepts (Ferreiro & Teberosky, 1982). Home visits were used to capture literacy activities. From the classroom the following were gathered: children's writing products, field notes, photographs, and video. Archival records and test scores were obtained from the elementary school.	Not assessed.	Not assessed.	During the preschool year, the 55 4-year-olds who had a full year of the intervention showed a significant gain in knowledge about print. Furthermore, at the beginning of their kindergarten year, these children outscored children from other preschool programs on tests of upper- and lower-case letter identification, and vowel and consonant recognition in English.
Zevenbergen, Whitehurst, and Zevernbergen (2003)	Experimental (Random Assignment to Treatment & Control Groups)	At pre-test and post-test, each child was administered an adapted version of the Bus Story, a standardized story-retelling task (Renfrew, 1969). After being read a short story with 12 pictures, a child is asked to retell the story to the examiner while looking at the pictures. Narratives were scored on reference to internal states; qualifying comments (e.g. like, almost); use of dialogue; reference to absent characters, objects, or events; causal statements (e.g. because, so that); wh- questions; direct questions. This test has been found to have adequate test-retest (.70) and interrater (.66) reliability. Children were also given the Expressive One-Word Picture Vocabulary Test - Revised (EOWPVT-R; Gardner, 1990).	Not assessed.	Not assessed.	A MANCOVA model controlling for differences in general expressive language abilities (as measured by scores on the EOWPVT-R) found that children in the intervention group included significantly more evaluative devices in their narratives at Time 2 than the control group.

Table A-2a. Early Mathematics Studies: Methodology

Study	Research Questions	Research Design	Sample	General Comments
Arnold, Fisher, Doctoroff and Dobbs (2002)	Can the incorporation of math-relevant activities into preschool children's daily activities (circle time, transitions, mealtime and small group activities) affect the children's scores on standardized math assessments and their enjoyment of math (measured by self-report and teacher report)?	The eight classrooms were matched on full- vs. half-day status and morning vs. afternoon hours within centers, and one of each matched pair was randomly assigned to the intervention condition. After teachers were trained, they implemented the program for six weeks, during which they tracked and rated their use of the various math activities. There were pre-test assessments of the children's emergent math skills and interest in math activities. Teachers completed surveys about children's interest in math activities and their own attitudes towards teaching math. The assessments were repeated after the intervention ended, and experimental teachers also completed a questionnaire about program satisfaction and feasibility.	One-hundred and twelve children from eight classrooms in two Head Start centers participated (six half-day and two full-day). Children averaged 53.18 months at pretest. 45 of the children were Puerto Rican, 44 were African American, 11 Anglo American, six Asian and six biracial. Median family income for the sample was $13,229. 16 teachers from the classrooms (all female) participated. Six were Puerto Rican, 6 Anglo American, two African American, and two of unknown ethnicity.	

Table A-2a. Early Mathematics Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Casey, Erkut, Ceder, amd Young (2008)	(1) Can a geometry intervention for kindergarteners improve their spatial reasoning skills, skills that have been found to relate to mathematical achievement yet which have received little focus for young children? (2) Can the narrative context of an oral storytelling activity serve as an effective strategy for teaching spatial concepts to young children? and (3) Can this approach be appealing to a broad spectrum of students from diverse racial and ethnic backgrounds? (4) Given the early differences in spatial skills found in research, are there sex differences in the degree to which children benefit from a spatial intervention?	Study 1: Teachers were randomly assigned to the intervention (story +geometry intervention) and control conditions. Random assignment was not at the student level however. Control group children received regular mathematics curriculum while intervention group children received the supplementary materials of the story + geometry activities in addition to the regular curriculum. Study 2: Teachers were randomly assigned to story +geometry intervention or to geometry-alone intervention. Same activities in both groups but in first group information was presented within a story context as if told by the dragon puppet.	Study 1: 155 half-day kindergarten children in lower middle class ethnically and racially diverse suburban community (80 girls; 75 boys). 60 percent of students in the school system were of minority background and 31 percent qualified for free or reduced-price meals. All six teachers in a public school volunteered to participate. They taught both morning and afternoon classes, so 12 classes were in the sample. Study 2: 63 students in full-day kindergarten taught by four teachers in three elementary schools in an urban school system. Across the three schools, 81 percent of the students were of minority background. Communities schools were in low income areas. 74 percent of students in these schools, on average, qualified for free or reduced price lunch.	Previous evidence suggests that learning material in a story context results in greater retention and recall; findings are quite robust. Thus, the authors hypothesized that making mathematical content integral to a story would improve learning and retention. Some other studies in low SES samples with young children have found greater improvement in mathematical achievement when a mathematics-literacy approach was used.

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Table A-2a. Early Mathematics Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Clements and Sarama (2008)	"Research questions included the following: Can Building Blocks be implemented with high fidelity, and does the measure of fidelity predict achievement gains? Does Building Blocks have substantial positive effects on the quality of the mathematics environment and teaching? What are the effects of the Building Blocks curriculum, as implemented under diverse conditions, on the mathematics achievement of preschoolers? A final, secondary, question was, If these effects are significant, does the increase in the quality of the mathematics environment and teaching mediate the effects on mathematics achievement? "	Random assignment of the 24 low income classrooms to Building Blocks, the Preschool Mathematics Curriculum, or to continue mathematics activities as their school usually carried them out. Similarly, random assignment of the 12 mixed income classrooms to one of the three groups. Groups are: Building Blocks, comparison and control groups. "Children in all classrooms were assessed at the beginning and end of the school year using the EMA. Teachers began teaching mathematics after the beginning assessments were completed. Mentors collected fidelity data in the intervention classrooms in three time periods: early fall (after mathematics instruction had begun), winter, and late spring. COEMET observers similarly collected three times during the year. "	Sample included preschools serving low income children (Head Start and pre-k), and preschools serving a more diverse population (mixed low and middle income) in New York state. From more than 100 volunteers in the first group, 24 teachers were randomly selected. From more than 20 volunteers in the second group, 12 teachers were randomly selected. 8 children wererandomly selected in each classroom (selected children were in appropriate age range to attend kindergarten the coming year and had returned informed consents). One teacher left the sample because of illness and four children moved. Final sample of 35 teachers and 276 children. Complete data for 253 children.	Research design involves two research based curricula and a control group with mathematics activities as usually carried out in the children's school. The two research based curricula involved similar dosage. They differed in that Building Blocks did not have separate units focusing on mathematics topics, but interwove topics into different activities at different levels. The curriculum research framework used to develop Building Blocks involved substantial formative evaluation. In addition, teachers were to adapt the small group activities according to their assessment of children's development and understanding while in the Preschool Mathematics Curriculum activities were closely adhered to.

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Table A-2a. Early Mathematics Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Sophian (2004)	Does a mathematics curriculum for Head Start 3- and 4-year-olds, focusing specifically on the use of alternative units and the effects of variation in unit size on numerical outcomes (focusing heavily throughout on measurement and geometric shapes) improve math assessment scores?	Twelve Head Start sites were identified as full-day programs in a single city in Hawaii. The experimental curriculum was presented in three sites in different sections of the city. A further three received a beginning literacy curriculum, and three received only the pre- and post-testing for the study. The sites were selected based on a matching procedure rather than a random selection procedure, based on attrition statistics for each center, child ethnicity, proportion of children with special needs and teacher credentials. Two of the sites were eliminated because they served highly transient populations. Three were identified as geographically close and serving a high proporiton of families of Hawaiian ethnicity. These were distributed across the three conditions (one math, one literacy, one control condition). Other sites were assigned to the condition to obtain approximately equal number of children in each condition while keeping similarity as high as possible on characteristics noted.	The math curriculum was presented in three sites with 46 children ranging from two years, nine months to four years, seven months at start of study. The beginning literacy curriculum was presented in three sites with 48 children ranging in age from 2 years, six months to four years, seven months. The control condition occurred in three sites with 29 children ranging from two years eight months to four years seven months. All children in sites received the condition, but only children with consent were assessed.	Sites were matched based on information from year prior to intervention. Children in the math and literacy groups during the intervention year were similar in background but one of the nonintervention sites had no Hawaiian children unlike other sites. Teacher years of experience differed somewhat across sites, with a somewhat lower range for the literacy site and nonintervention site than math site. Authors note that including literacy intervention group controls for added training and stress, but may have unintended consequences of diminished focus on math while literacy is focused upon. Authors also note that there was a mid-year correction to strengthen the implementation of home activities in the math intervention group. The author notes that the litearcy intervention, that here served as a comparison group, did not affect math outcomes but did affect literacy outcomes. This itself is an important finding, supporting a hypothesis that shorter PD interventions that are very focused and follow-up may support improvements in specific outcomes.

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Table A-2a. Early Mathematics Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Starkey, Klein, Clements, and Sarama (2008)	Does implementation of Pre-K Mathematics supplemented with DLM Early Childhood Express Math software produce gains in child and classroom outcomes compared to a control curriculum?	This study was part of the PCER report on the Effects of Preschool Curriculum Programs on School Readiness. A total of 40 Head Start and public preschool classrooms were randomly assigned in the fall of the pilot study year using block randomization. They were assigned either to the treatment condition (Pre-K Mathematics supplemented with DLM Early Childhood Express Math software) or the control condition. To conduct analyses on low-income Asian American and Spanish speaking populations, two of each of these classrooms were randomly assigned to treatment and control conditions.	Forty Head Start and public preschool classrooms (20 from New York, 20 from California) were recruited to participate. Data were collected on a total of 314 children in the fall of the preschool year and 283 at the end of the kindergarten year. Children were 4.3 years old at baseline data collection and were ethnically diverse: 45 percent African-American, 23 percent Hispanic, and 18 percent white. All 40 participating teachers were female, and 38 percent were white, 33 percent African-American, 13 percent Hispanic, and 10 percent Asian. The teachers had an average of 19 years of teaching experience and 40 percent had a graduate degree.	The implementation of these two curricula components resulted in increased children's mathematical knowledge at the end of prekindergarten, compared with the control group. However, there was no statistically significant difference between control and treatment groups at the end of the kindergarten year.

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Table A-2a. Early Mathematics Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Starkey, Klein and Wakeley (2004)	Can a conceptually broad prekindergarten math curriculum be implemented, and does it have positive consequences for children's math knowledge?	Successive-cohort design. Initial cohort of comparison children did not receive intervention; a subsequent cohort of intervention children did receive the intervention. Comparison children were enrolled in schools that implemented the intervention in the following year. Children in intervention group assessed using a pre-test post-test design in fall and spring of pre-K year. Comparison group children assessed only in spring of pre-K year.	One-hundred and sixty-three typically developing pre-k children from preschools serving middle income families (41 in intervention and 42 in comparison group) and low income families (37 in intervention and 43 in comparison group). Children were 3 years, 9 months to 4 years, 9 months at baseline. Race/ethnicity for low-income/middle-income samples: African-American 32 percent, 10 percent; Caucasian: 13 percent, 63 percent; Latino 41 percent, 7 percent; Interracial and other 14 percent, 20 percent. Mothers' education: HS or less 38 percent, 1 percent; some post-secondary 38 percent, 11 percent; BA+ 16 percent, 83 percent. Teachers' mean years of experience: 7.6, 14.8. Teachers' education: two of five with BA+, four of five with BA+.	New assessment measure developed for study. Inter-rater reliability high, but no evidence presented on construct validity, factor structure, or validity. As authors note, the absence of fall assessment scores for comparison group children weakens the design. Authors also note that repeated testing in intervention group only might mean that increases in score reflect familiarity with assessment and comfort with assessment situation as well as gains in knowledge. An advantage of the design noted by the authors is reduced risk of contamination because no classrooms received the intervention during the initial year.

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Table A-2a. Early Mathematics Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Young-Loveridge (2004)	This study examined the effectiveness of a program aimed at improving numeracy among 5-year-old children through tutoring provided to pairs of children. This tutoring incorporated number books and games. The study examined the immediate and long term (up to 15 months post-intervention) benefits of books and games for children's learning.	Children in intervention contrasted with children from same schools and other schools. Children were not randomly assigned to group, but pre-test scores controlled for in analyses. Analyses considered group differences (net of pre-test scores) immediately after intervention, and six and 15 months afterwards.	One-hundred and fifty-one 5-year-old children from six low socioeconomic status schools in New Zealand with scores in the lower two-thirds on a measure of numeracy. 48 percent were European, 44 percent Maori, 4 percent Pacific Islander, 4 percent other. Approx one-sixth of the students at two of the schools participated in the school-based intervention described here. A similar number of children at two other schools participated in a home-based intervention using the same books and games. The remaining two-thirds of the children were in two contrast groups: those in the same classes as those in the intervention (within school contrast) and those in two different schools (across school contrast). Attrition over the period of study resulted in final sample of 106 children: 23 in the intervention and 83 in the contrast groups. There were no differences between the within school and across school contrast groups so these were combined for analyses.	Author notes that many papers in the research literature note the potential of combining mathematics and literacy. But that evidence to date focuses on increasing participation in mathematics activities, and not on differences in achievement. Author also notes that increasing focus by Western governments on mathematics has emphasized numeracy skills. Findings indicate that children's rank ordering in terms of mathematics skills tends to be stable across the primary and secondary school years, though gap between highest and lowest scores tends to grow. This suggests that intervening early can have lasting effects on children's mathematics achievement. Note that this intervention used two specialist teachers. They received feedback from the project director as they worked with the children. However there was no plan to provide professional development to classroom teachers to ehance their teaching of mathematics, and the large effect size is attributed in part to the use of specialists. It is not clear if this intervention should be viewed as a professional development intervention.

Table A-2b. Early Mathematics Studies: Features of Professional Development

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Arnold, Fisher, Doctoroff and Dobbs (2002)	Teachers volunteered their time to be trained in the intervention program. They were paid $15 per hour for completing the intervention questionnaires. Teacher training involved a 2-hour meeting prior to the start of the intervention. The meeting emphasized how to implement the activities, following four principles: encouraging/praising; keeping it fun; following children's lead and adjusting activities to the kids; labeling what children do to provide feedback and scaffolding. Practical plans for implementing with specific examples. "Teachers were also taught to help children learn the process of problem solving, with examples and discussions of specific ways to encourage this, in the context of an example activity" (p. 765). Member of the research team checked in with each teacher once/week to address any aspect of program not going smoothly. Usually lasted 1-2 minutes, but sometimes a longer discussion was requested.	Not addressed.	Training involved two hours prior to implementation of the intervention. There was a weekly visit by a member of the research team to check in and make sure everything was proceeding smoothly. In most instances the visit lasted one to two minutes.	Low-income children. The eight classrooms were all in Head Start centers. Children and teachers were mostly of minority backgrounds.	Mathematical skills.	Previous research suggests that early mathematical skill and interest in math both predict later math achievement. But very little work has involved an evaluation of an attempt to increase one or both, with especially little research focusing on enhancing interest in math. The particular skills targeted in the activities are derived from the research.	"The intervention strove to incorporate math into the regular classroom routine. The activities were designed to be fun for the children and to provide choices and flexibility for the teachers" (p. 764). Activities for circle time, activities for small groups, transitions, and meal times were discussed. Teachers asked to implement one activity per day during first unit, and two transition or mealtime activities, and one small group activity each day during second unit. 85 activities to choose from in a workbook. The activities targeted counting, recognizing and writing numbers, one-to-one correspondence, comparison, change operations, and understanding numbers and quantity. Examples: finding objects that are bigger and smaller than the children; bar graphs of children with different color eyes.

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Table A-2b. Early Mathematics Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Casey, Erkut, Ceder, amd Young (2008)	PI of project gave a brief training session to the teachers in the intervention group. Teachers received Tan and the Shape Changer book, poster, and kit with all materials needed for the activities. Teachers were told that they could choose to use the outline of the story to tell it in their own words, or could half tell and half read the story from written scripts. Watched videotaped clips of how other teachers presented the stories and activities to their students. Book given to teachers provided rationale, objectives and vocabulary for each geometry activity. Book provides step by step instructions on how to organize and present each activity/lesson.	Not addressed.	Study 1: Brief training provided by project director. Teachers were observed carrying out the activities, but there is no mention of whether feedback was provided. Study 2: project director gave story + geometry group training as for intervention group in study 1. Geometry alone intervention group received book containing the same instructions and content for the activities, but without a puppet or story context.	Sample for study 2 intentionally in low income communities.	Mathematical skills.	Previous evidence shows that contextualizing learning in a story context results in greater retention and recall.	Mathematics curriculum used by kindergarten teachers in this community was Math Advantage (Harcour-Brace). In Study 1, in the Story + Geometry Intervention, In the story context, the mathematical ideas develop in tandem with the story over eight sessions. Children participate in the story. Focus of geometry activities is on triangles, moving from combining triangles in collages, through different activities to puzzles and working with 3D shapes. Teachers presented the stories and large and small group activities in twice a week classroom sessions over a four-week period. A member of the research team observed each activity being presented.

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Table A-2b. Early Mathematics Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Clements and Sarama (2008)	Both intervention groups received training (an initial four day training and two-hour refresher classes once every other month). Both groups addressed the following topics in the context of their assigned curriculum: supporting mathematical development in the classroom, recognizing and supporting mathematics throughout the day, setting up mathematics learning centers, teaching with computers, small-group activities, and supporting mathematical development in the home. Only the Building Blocks training focused on learning trajectories. A central tool to support teachers' understanding of learning trajectories was a Web-based application, Building Blocks Learning Trajectories. This application provides scalable access to the learning trajectories via descriptions, videos, and commentaries of both the developmental progressions of children's thinking and instruction. Monthly in-class coaching included monitoring, reinforcing, suggesting alternatives, and collaborative problem solving, emphasizing only one or two issues per visit and focusing on implementation of the specific curriculum.	Not addressed.	Four days of training and a two hour refresher class once every other month. On-site coaching once per month focusing on implementation of the specific curriculum.	Sample intentionally included classrooms serving low-income children as well as classrooms serving mixed SES groups.	Mathematical skills.	"Building Blocks—Foundations for Mathematical Thinking, Pre-Kindergarten to Grade 2: Research-Based Materials Development was funded by the National Science Foundation to create and evaluate mathematics curricula for young children based on a theoretically sound research and development framework." Three categories (with phases within each) are involved: (1) General a priori foundation; (2) Learning model; (3) Evaluation	Two curricula were contrasted with a control group in which teachers continued to use school's ongoing mathematics activities. The Building Blocks intervention was developed following all phases of the curriculum research framework, including formative evaluation. It involved small group activities once per week and whole group activities of about 5 minutes to 15 minutes four times per week as well as letters to families and two 10-minutes computer sessions per week. The Preschool Mathematics Curriculum had seven units based on National Council of Teachers of Mathematics standards, with small group activities twice per week and whole group activities of about 10 minutes per day, as well as letters home and 5 to 10 minutes per week using DLM Early Childhood Express software.

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Table A-2b. Early Mathematics Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Sophian (2004)	Two-day training workshop in August and a one-day training workshop in January. Meetings were also held at each site every three weeks for distribution of lesson plans and materials, an opportunity to ask questions, and discussion of ongoing and recently completed lessons. Research coordinator observed implementation in each classroom at least once/week and consulted with teachers, giving feedback.	Other Head Start staff who worked closely with the teachers, teacher mentors and managers attended the training workshops.	Two-day workshop prior to intervention and one day in middle of school year. Meetings every three weeks and on-site observation and consultation every week. Teachers received weekly lesson plans and materials. Encouraged to engage children in making predictions, observing, discussing patterns. Usually done in small groups.	All children were in Head Start centers. Most children in sample were Asian American and Hawaiian.	Mathematical skills.	Evidence from short-term studies that preschool age children are responsive to instruction about unit size and number. Research raises possibility that difficulties with math may often concern issue of alternative units. Present work addresses some issues where research is unclear.	The mathematical content spanned three domains: 1) The possibility and consequences of choosing different counting units; 2) different dimensions along which quantities can be compared and the consequences of using different units of measurement; 3) relationships among geometric shapes, especially part-whole relationships and comparing areas. In second half of year, charts and graphs were introduced. Core ideas (e.g., the possibility of adopting different units) revisited in multiple lessons. Teachers received weekly materials and lesson plans. Home activities distributed on weekly basis.

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Table A-2b. Early Mathematics Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Starkey, Klein, Clements, and Sarama (2008)	During the pilot year of implementation, treatment group teachers in California and New York participated in two four-day workshops at the beginning and middle of the school year. Ongoing, on-site training was provided by project staff about twice a month. A refresher workshop was offered in the second year of implementation. Throughout the first year, project staff observed each intervention classroom and feedback was given at the end.	Not addressed.	Training workshops during the first year of implementation took place in September and February for California teachers, and September or October and February for New York teachers. The refresher workshop took place in late summer preceding the second year of implementation.	Half of all children were in Head Start centers. Also, researchers targeted low-income Asian Americans and classrooms instructed in Spanish.	Mathematical skills.		The Pre-K Mathematics curriculum focuses on 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 for use by parents and preschool-age children in home settings. The DLM Early Childhood Express Math software includes 26 numerical, quantitative, geometric, and spatial activities.

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Table A-2b. Early Mathematics Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Starkey, Klein and Wakeley (2004)	Five-day summer workshop; four-day winter workshop. Each covered about half of the small-group and computer-based activities. Teachers provided with curriculum manual. Workshops: Overview of early math development and each topic, demonstration and practice of activities, practice with computer, assessment and home curriculum, discussion. On-site training for each unit (once per month); discuss problems; observation of fidelity of implementation with feedback.	Not addressed.	Five-day workshop prior to start of school and four-day workshop mid year.	Low-income as well as middle-income children. See sample description for more specifics.	Mathematical skills.	Math content of curriculum based on development research about nature and extent of early math knowledge. Units explicitly linked with the National Council of Teachers of Mathematics standards for pre-k through grade 2.	Pre-K Mathematics curriculum: 27 small-group activities (new one each week engaged in twice per week) with concrete materials, organized into units to foster connections among related concepts. Enumeration and Number Sense; Arithmetic Reasoning, Spatial Sense, Geometric Reasoning, Pattern Sense and Unit Construction, Non-Standard Measurement and Logical Relations. Easier and more difficult versions of activities; suggestions for how to support children experiencing difficulty; system for recording individual children's learning. Coordination with computer activities, math activity centers, home curriculum.

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Table A-2b. Early Mathematics Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Young-Loveridge (2004)	Researcher video-taped sessions and made a written summary of what happened during sessions. Made suggestions to the specialist teacher about possible actions to challenge the children beyond existing competencies. This helped assure consistency across schools. "The purpose of the program was to develop children's knowledge of number word sequences, their accuracy, reliability and automaticity in using the enumeration process, experience with forming collections of particular sizes, and knowledge of stylized (spatial) number patterns and numerals, all skills shown previously to be strongly predictive of later success in mathematics..." (p. 86). Note: researchers do not clearly describe this as a professional development intervention.	Not discussed	Feedback during course of the intervention sessions	The teachers were specialists. There was not outreach to classroom teachers. The children were from low SES schools.	Mathematical skills.	Curriculum approach was grounded in research noting the potential of combining literacy and mathematics activities. However the authors note that the combination of literacy activities and games was central to the intervention.	The children attended the intervention sessions in pairs for 30 minutes every weekday over seven weeks. Sessions included number stories, rhymes and games. Games with simplified dice eventually progressing to conventional dice. During number stories, children asked to check quantities described by counting objects on pictures, predict next quantity, naming numerals in the story. Familiar board game and then new one introduced by teacher. Children learned to read numbers on dice, used counting process to move piece on board, counting sticks accumulated as progressed on board. Use of playing cards to increase knowledge of numeral sequences to 10. Teacher questioned children and gave hints, modeled correct counting processes, drew atten-tion to patterns on game board.

Table A-2c. Early Mathematics Studies: Outcomes

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Arnold, Fisher, Doctoroff and Dobbs (2002)	Experimental (Random Assignment to Treatment & Control Groups)	The Test of Early Mathematics Ability (TEMA-2) was administered at pre- and post-test. Teachers also rated each child's interest in mathematics activities using the Level of Interest Survey (LIS; rate interest in sorting toys, counting activities, number-manipulative activities, and math activities overall) and the Relative Interest Survey (RIS; ranks each child's preference for 10 common activities). The two interest measures were then aggregated into Overall Teacher Interest Survey (OTIS). Children also reported on their own mathematical interest, using the Children's Math Interest Self-Report (CMIS), and by rating how fun numbers and math toys are. Ratings from 1 to 5 were summed across the four items to create an index of children's interest in math-related activities. Teachers reported on their attitudies about teaching math readiness. Teachers in the intervention group charted the activities they tried with daily tracking forms and whether they found the activities good. After the intervention, experimental group teachers rated their overall satisfaction with the program and its feasibility.	Teachers in the intervention group reported significant changes in their feelings of liking and competence about math at post-test compared to pre-test, and compared with control teachers. They described math as more fun to teach and reported that they felt they had improved their teaching of math.	Not assessed.	Significantly greater increase over time on TEMA for intervention group; effect size in the large range. Boys showed greater change than girls. Less improvement for Anglo children than Puerto Rican and African American. Children in the intervention group were reported by their teachers to increase more in interest in math (OTIS score). Children in the intervention group showed greater increase in their interest in the math toys.

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Table A-2c. Early Mathematics Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Casey, Erkut, Ceder, amd Young (2008)	Experimental (Random Assignment to Treatment & Control Groups)	Study 1: Near and far transfer tasks assessing part whole relations. In the near transfer tasks there were close similarities between the types of items used in the activities and in the testing. The far transfer tasks are designed to assess whether learning has transferred to problems less closely related to those used in training. Triangles subtest of Kaufman Assessment Battery for Children used for near transfer task. Some modifications made to procedures. The far transfer test was a Tangram test that assessed children's ability to solve a wider range of part-whole puzzle problems using a variety of puzzle pieces.	Not assessed.	Not assessed. Teachers were observed implementing the activities but there was no measure of educator practice.	Study 1: No difference between children in morning vs. afternoon kindergarten so combined. Difference at pre-test by condition, with the control group scoring higher on near transfer task at pre-test than intervention group. There was no difference at pre-test on far transfer task. On the triangle task, there was significant overall improvement over time. The intervention group improved significantly more (with girls driving this finding). For girls only, improvement over time varied by condition. Boys improved both in the treatment and control group, while girls in the treatment group improved significantly more. On the tangram task (far transfer) there was overall improvement over time, but there was no indication that the treatment group improved more and no interactions with child gender. Study 2: no pretest differences. On both the triangle and tangram tasks, there was overall improvement over time and the geometry + story group improved more. On the tangram task, girls improved significantly more than boys across both intervention conditions.

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Table A-2c. Early Mathematics Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Clements and Sarama (2008)	Experimental (Random Assignment to Treatment & Control Groups)	(1) The Fidelity instrument includes "sections for each component of the implemented curriculum, such as a specific small-group or family activity. Only activities prescribed in the curriculum implemented are evaluated, and ratings are conducted in reference to the printed curriculum " (2) The Classroom Observation of Early Mathematics–Environment and Teaching (COEMET), "measures the quality of the mathematics environment and activities with an observation of three or more hours and is not connected to any curriculum". There are 31 items, all but four of which are four-point Likert scales and there are three main sections, Classroom Elements, Classroom Culture, and Specific Math Activities (SMA). Assessors complete a SMA form for each observed math activity. (3) the "Early Mathematics Assessment (EMA) is a measure of preschool children's mathematical knowledge and skills that features two individual interviews of each child. All sessions are videotaped.The EMA assesses children's development in a comprehensive set of mathematical topics...rather than mirroring any curriculum."	Not assessed.	(1) No evidence of difference across the Building Blocks and comparison group in terms of fidelity of implementation of the curriculum, with both showing positive fidelity scores. There was no change over time in fidelity of implementation, and no interaction of time by group. Fidelity was not related to children's gain scores (2) There was a significant effect of treatment group for the COEMET, with Building Blocks showing highest scores, followed by PMC and then by control group. Only Building Blocks and the control group differed significantly however. The COEMET accounted for a significant amount of children's gain scores. Building Blocks had higher number of math activities, more computers running math programs, and more teacher engagement with children during math activities. No effects for class SES or program type.	On the Early Mathematics Assessment, both intervention groups had higher scores than the control group, and children in the Building Blocks group scored higher than those in the Preschool Mathematics Curriculum group. There were no differences by classroom type or SES. Partial mediation of EMA scores by COEMET was supported. "Both intervention groups outperformed the control group on verbal counting strategies, sequencing, identifying shapes, representing shapes, and patterning...Similar relative gains in some of the topics emphasized in all treatment groups, such as object counting and comparing number, suggest that research-based activities in the intervention groups may have been particularly effective. The Building Blocks curriculum made the most substantial gains relative to both other groups in verbal counting, recognition of number and subitizing, comparison of shape, and shape composition. Examination of children's behaviors on individual items suggests that these children were more accurate and increased the use of more sophisticated mental strategies. "

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Table A-2c. Early Mathematics Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Sophian (2004)	Pre-Post w/ Comparison Group (Not Randomly Assigned)	Mathematics subscale of the Developing Skills Checklist: naming shapes, reproducing and extending patterns, counting, identifying numerals, matching sets and numerals, joining and separating sets, identifying ordinal positions, and logical operations. Development of a supplementary assessment instrument to focus specifically on knowledge about measurement and about combinations of shapes (the foci of the intervention). While the DSC had good internal consistency reliability, the authors note that the new measure did not, and is of limited value in evaluating the intervention. It is nevertheless reported on as group differences were found. Note that it is not clear from the article whether these were teacher- administered measures. If teacher-administered, there is a possibility of bias.	Not assessed.	Not assessed.	The math intervention group scored significantly higher than either the literacy intervention group or the no intervention control group on DSC post-test scores, controlling for age and DSC pre-test scores. The same pattern was found for the new supplemental measure, with higher scores for the math intervention group than either other group controlling for age and pre-test scores.

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Table A-2c. Early Mathematics Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Starkey, Klein, Clements, and Sarama (2008)	Experimental (Random Assignment to Treatment & Control Groups)	The following child outcomes were assessed: mathematics (Woodcock Johnson [WJ] Applied Problems, Child Math Assessment-Abbreviated [CMA-A], Composite Score, and Shape Composition); reading (Test of Early Reading Ability [TERA], WJ Letter Word Identification, and WJ Spelling); phonological awareness (the Pre School Comprehensive Test of Phonological and Print Processing [Pre-CTOPPP], Elision subtest, Comprehensive Test of Phonologica Processing [CTOPP], Elision subtest); language assessments (Peabody Picture Vocabulary Test [PPVT] and Test of Language Development [TOLD]); and behavioral outcomes (Social Skills Rating system [SSRS] and Pre Scool Learning Behavior Scale [PLBS]). Classroom outcomes assessed were overall classroom environment (Early Childhood Environmental Rating Scale Revised [ECERS-R]), teacher-child relationships (Arnett Detachment, Harshness, Permissiveness, and Positive Interactions scales) and classroom instruction (Teacher Behavioral Rating Scale [TBRS], TBRS Written Expression scale, TBRS Phonological Awareness scale, TBRS Book Reading and Oral Language scales, and TBRS Math Concepts scale).	Not assessed.	No impacts were found on ECERS-R, Arnett, and Teacher Behavior Rating Scale including the Math Concepts scale.	Pre-K Mathematics supplemented with Early Childhood Express Math software had a positive effect on children's early mathematics skills at the end of pre-kindergarten compared to the control condition. Effects at the end of pre-K were found for the Child Math Assessment-Abbreviated Composite Score and Shape Composition. However there were no detectable effects at spring of the kindergarten year.

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Table A-2c. Early Mathematics Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Starkey, Klein and Wakeley (2004)	Pre-Post w/ Comparison Group (Not Randomly Assigned)	Child Math Assessment (CMA): new instrument developed for study to assess children's informal math knowledge across a broad range of concepts, including number, arithmetic, space/geometry, measurement, patterns and logical relations. 16 tasks each with multiple problems. Administered in two 20 minute to 30 minute testing sessions on separate days with order counterbalanced. Children's performance coded from videotapes of testing sessions. High inter-rater reliability. Scores for each task and for CMA as a whole.	Not assessed.	Teachers were observed during each on-site training visit to confirm fidelity of implementation of a small-group activity. The paper indicates only that feedback was provided to the teacher as needed. No data based on these observations are reported, and no indication is given of the extent to which feedback was needed. A teacher interview administered at the end of the intervention indicated that there had been no organizer math curriculum prior to the intervention, no mathematics learning or readiness goals or assessments.	Pre-test to post-test increases for children in the intervention. Increases significant for both income groups but greater for low-income children. Comparison of spring CMA scores for intervention and comparison groups indicated that intervention group children scored significantly higher in the spring in both lower- and middle-income groups. Low-income intervention group children had scores in the spring that were not statistically different from those of middle-income children who had not participated in the intervention. Scores increased significantly in the intervention group on all 16 tasks. For spring scores, significant difference by group for 10 of the 16 tasks favoring intervention children.

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Table A-2c. Early Mathematics Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Young-Loveridge (2004)	Pre-Post w/ Comparison Group (Not Randomly Assigned)	Individual task-based interviews used to assess children's numeracy before and after the intervention. Pre-test included counting, pattern recognition, enumeration, numeral recognition, and addition and subtraction with concrete as well as imaginary objects. The post-tests included the same tasks augmented with more difficult items of the same type as well as additional tasks focusing on number facts, sequence knowledge, ordering sets and numerals, identifying one more than, enumeratition span, counting on, understanding of more, multiple counting, writing numerals, and place value understanding. High reliability in scoring the tasks. Interviews carried out pre-test and at the end of the two-month intervention, six and 15 months after the intervention. Assessments were carried out blind as to group.	Not assessed.	Not assessed	Significant Treatment effect qualified by a significant Treatment by Time interaction. An initially very large (approx. 2 school days) effect of the program diminished over time to just over one school day six months after intervention and one-half school day 15 months after intervention. Greatest progress made in knowledge of number sequences, stylized number patterns, numeral identification, making small collections of objects, and addition of two collections.

Table A-3a. Child Social Behavior Studies: Methodology

Study	Research Questions	Research Design	Sample	General Comments
Brigman, Lane, Switzer, Lane, and Lawrence (1999)	Does a particular curriculum, Ready to Learn, that focuses on learning skills and social skills as taught to 4- and 5-year-olds in a regular classroom by their regular teachers enhance their attending, listening and social skills?	There were 10 classrooms in three preschools. Five classes were randomly selected to use the Ready to Learn Curriculum (RTL) and five were comparison classes. There was a certified preschool teacher and a teacher's assistant in each class. The experience and training (not further defined) of the teachers in the treatment and comparison groups were found to be similar.	One-hundred and forty-five 4- and 5-year old children in 10 classrooms in three preschools participated. All three centers were in an urban area and with similar populations. The ethnic makeup in all classes was approximately 95 percent black and 5 percent white. There was a certified preschool teacher and a teacher's assistant in each class.	Assessors and observers may not have been "blind" as to treatment condition of the classes. It is difficult to discern from the article exactly what approach the RTL program used. The article refers to the teachers using a kit with storybooks that introduced the learning-social skills to the children, audiotapes of the stories, and a teacher manual. According to the article, the manual included descriptions of each of the five teaching strategies and follow-up role-play and dramatic activities to reinforce targeted skills. The teachers were asked to use the activities and strategies in a structured format for two hours per week for 12 weeks before the posttest and for 24 weeks after the post test. They were also asked to use the story structure questions and positive peer reporting throughout the week to reinforce the targeted skills during regular lessons. With these details, it is still difficult to grasp exactly what the curriculum involved and how it was presented to the children. It is not clear why there were impacts on only one of two listening comprehension measures.

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Table A-3a. Child Social Behavior Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Denham and Burton (1996)	Does a classroom-based intervention that includes relationship-building, training in understanding emotions, and interpersonal cognitive problem solving training improve children's social and emotional behavior?	Seven child care classrooms from a suburban area (number of programs not noted) were assigned to intervention. 10 children were selected from those classrooms for pre- and post-assessments. The classrooms were not randomly assigned, and it is unclear if teachers' motivations to participate in the training differed at the outset. The intervention was 32 weeks with activities on emotions (based on the PATHS curriculum introduced two days per week). Problem solving activities using I Can Problem Solve curriculum used during the other two days. A multiple regression model was used to predict outcomes.	One hundred and thirty children observed at pre-test (70 from seven intervention classrooms--10 per class--and 60 from the same child care programs but not receiving the intervention. Age range was 3.5-5.0; 76 percent of the children were ethnic minorities. 63 intervention and 42 comparison were available for posttest (19 percent dropout). Children who dropped out in the intervention group were more likely to pay full fees. There were no other differences in the characteristics of dropouts. The teachers in the intervention were primarily from ethnic minority groups. Credentials (just under half having a degree in early childhood) and experience (3-15 years) varied. All teachers had received 16 hours of in-service training in High Scope.	The number of classrooms participating in the intervention is described but not the number of total programs. Thus it is unclear whether the intervention occurred in more than one classroom per program. The study does not use a nested design to account for multiple children recruited from the same classroom. Also, it is not clear if teachers in the intervention group volunteered to attend the training while teachers in the comparison group did not volunteer. NOTE: the study design is quasi-experimental with non-equivalent control groups and pretest/posttest assessments. For assessment of intervention fidelity, teachers completed quarterly reports. They could request consultation. They also filled out weekly ratings of their application of techniques and their perception of effectiveness.

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Table A-3a. Child Social Behavior Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Domitrovich, Cortes, and Greenberg (2007)	Do children whose teachers implemented the Preschool PATHS in their classrooms for one school year exhibit significantly better skills at posttest in four domains: emotional knowledge, inhibitory control, attention, and problem solving? Do teachers and parents of children who participated in PATHS describe these children as more competent and as exhibiting less problem behaviors compared to peers who did not participate in the program?	Two Head Start programs participated in the study. Head Start programs were in multiple buildings with varying number of classrooms. The study utilized a randomized clinical trail with a wait-list control group. Randomization took place at the building level. A mixed block design was used due to the varying number of classrooms within buildings. Blocks were created that included at least two matched classrooms with similar neighborhood population density. The final sample included 10 intervention and 10 control classrooms.	Two-hundred and forty-six 3- and 4-year-old children (120 boys and 126 girls) participated in the study. Ethnic makeup was relatively diverse and included: 47 percent African-American, 38 percent European-American, and 10 percent Hispanic. The number of students per classroom ranged from 7-16. Seventy-two percent of primary caregivers were biological mothers.	Not much description of content of training workshops, or materials used both during the pd, and the teaching of the 30 PATHS lessons. Although the authors write that PATHS Coordinators were responsible for ensuring implementation fidelity, impact of PD on educator knowledge and practice were not assessed.

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Table A-3a. Child Social Behavior Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Franyo and Hyson (1999)	When child care providers receive training about child temperament, do they show increased knowledge about temperament concepts and increased acceptance of children's behaviors and feelings?	Thirty participating centers were randomly assigned to one of three groups: Workshop group (received training; 14 centers, n=119), waiting list group (received training after all data were collected; three centers, n=50) and survey group (no training but completed baseline measures assessing knowledge of temperament and acceptance of children; 13 centers, n=123). Workshop and waiting list control group were considered the experimental design groups (169 caregivers from 17 centers). The survey-only group expanded sample for survey data at baseline. Despite random assignment the waiting list control group had fewer African-Americans. Background questionnaire, KATS and ACS completed about one week before training, the KATS and ACS immediately after training, and KATS and ACS completed four weeks after. The waiting list control completed materials on same timetable.	Two-hundred and ninety-two caregivers of children 6 years old and under in licensed child care centers in Baltimore County, Md. Letters of introduction sent to random sample of such centers, and enrollment was on first-come first-serve basis among those expressing interest. Participation was not mandatory at centers but fulfilled state training requirements.	Note that teachers participated in training on a voluntary basis within participating centers (though authors indicate that most participated). Also that number of centers in waiting list control was only three (while workshop group involved 14). No explanation of this difference is given. Authors note difference in race or ethnicity between workshop group and waiting list control group. There was no direct observation of caregiver behavior. No child assessments were completed. There was a wide range in the ages of children cared for.

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Table A-3a. Child Social Behavior Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Girolametto, Weitzman and Greenberg (2004)	Can child care providers learn to facilitate peer interaction by using verbal support strategies (e.g., prompts, invitations or suggestions to interact) during naturalistic play activities, and can they maintain their use of verbal supports four months after in-service training? Do children respond to adults' verbal supports?	Random assignment to experimental and control groups by center so that colleagues from the same center could attend the in-service program together. Four centers (Eight caregivers) assigned to experimental group and three centers (nine caregivers) assigned to control group. Pre-test, post-test and follow-up three months after post-test to examine maintenance of gains (with new group of children).	Seventeen child care providers who worked in seven licensed day care centers in metropolitan Toronto. All had completed two years of community college with diploma in early childhood education. No significant differs between experimental and control groups on age, years of education or years of experience. All classrooms had ratios of 1:8, most with class size of 24 (but 3 with only 16). At pretest, children ranged from 32-54 mos.; most attended child care full time. No differences by group on age, gender time in day care, full- vs. part-time.	Control group received a "placebo" intervention focusing on adult-child interaction. The structure was identical to the peer interaction experimental group, but the focus differed. Discussion notes that experimental group child care providers increased their use of verbal support strategies that facilitated communication between peers and invited peers to interact together, but that there were no differences in strategies to restrict children's interactions or refer children to their peers indirectly (e.g., through praise or comments about similarities). Children in experimental group responded to a larger number of opportunities and received more continuations from their peers; evidence that inservice training can increase the overall frequency of per interactions. Discussion notes that this study focused on frequency but not quality of peer interactions. Authors note that booster sessions may be needed to help some child care providers maintain gains. Note small number of caregivers and children in study.

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Table A-3a. Child Social Behavior Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Gowen (1987)	Can caregivers in a day care center be trained to facilitate children's play through increasing overall verbal involvement, and specifically nondirective verbalizations, commenting to children on their play?	Target set for caregiver verbal involvement of 50 percent of observed intervals during observations of playtime. after first workshop. Target set for directive verbalizations of 25 percent of total utterances after second workshop. Pre-workshop observations had been carried out for a different purpose, and were used to document pre-workshop directive verbalizations. But observational procedures not the same before and after workshops, so this is not strictly a pre-post test design. Assessments of knowledge given before and after each workshop.	Seven teachers and seven teacher aides in the seven classrooms of a day care center (full staff). 50 children enrolled in the center ranged in age from 7-62 months.	Note that observational procedure prior to the workshops differed from the procedures used after the workshops. Sample sizes for waves of observation differ somewhat so averages not based on identical group of caregivers. Results section notes that because intervention was very clear as to desired behaviors, observations likely reflect optimal rather than typical behavior. Evaluation of the workshops by the caregivers indicated that "most of the caregivers preferred workshop components that involved creativity and action" (p. 64). This study does not present child outcomes. Work documenting an association between caregiver behavior and level of child play or other outcomes (e.g., verbal ability in the children) is lacking in this study an in the literature review presented. We only know that teacher behavior can meet targets for overall verbal involvement and nondirective verbalizations. We also don't know if there would be maintenance of these targets following a period of months.

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Table A-3a. Child Social Behavior Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Hendrickson, Gardner, Kaiser and Riley (1993)	What is the effectiveness of a structured coaching procedure on teaching behavior aimed at increasing the positive interactions of socially withdrawn preschool-age children?	Multiple baseline across subjects design with three teachers and three socially withdrawn preschoolers. Baseline involved observations of teachers in routine activities; coaching initiated sequentially across the three teachers. Coaching subsequently discontinued and maintenance data collected once every week for three weeks (short term maintenance) and after a three-month delay. Follow-up data could not be collected for one child who had moved. With one teacher a "withdrawal phase" was also used in which coaching was discontinued and teacher was asked to conduct her activities as she had before coaching.	Three day care providers between 21 and 23 years of age, one with B.A. degree (toddler transition class), one with A.A. degree (infants and toddlers) and one a certified preschool-elementary school teacher (4-year-olds). One child with severe social interaction deficits linked with each teacher (2y, 4m girl in protective custody with 6m development delay; 2y, 7m girl with mild cerebral palsy and significant language and motor delay; 4y, 6m boy with mild mental disability, ADHD and significant expressive language delay).	Re fidelity of implementation: A written record from each coaching session was reviewed to determine that each of the seven segments had occurred. Videotapes of the coaching sessions were also reviewed. Both approaches verified correct execution of the major elements of the coaching process. Re limitations: Authors note that it is not clear if increases in support and social interactions would have occurred without an observer present. Potential of observer bias. Coaching occurred immediately prior to observations, and this timing may have increased likelihood of observing supportive behaviors. Re PD approaches in general: "From a practical point of view, coaching has the advantages of being relatively low in cost and easy to implement. It is an approach to staff development that involves teachers in evaluation and goal setting." (p. 224). It is difficult to discern from article the number of coaching sessions completed with each teacher. This varied somewhat by teacher. Perhaps 9-14 coaching sessions if observations always followed coaching.

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Table A-3a. Child Social Behavior Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Lynch, Geller and Schmidt (2004)	Does a resiliency-based curriculum--Al's Pals: Kids Making Healthy Choices--increase preschool-age children's social competence and decrease antisocial or aggressive behavior?	Thirty-three of 37 classrooms in a large Head Start program in Lansing, Mich., were randomly assigned (17 intervention, 16 control) to receive the curriculum or to serve as a control	No details provided about the teachers who were trained in the curriculum and who completed the ratings of the children. There were no significant differences in age, gender or ethnicity for children in the intervention and control groups. The average age of children was approximately 52 months; half were Caucasian, one quarter were African-American, and one quarter were Hispanic or other ethnicity. There were 399 children in the study (218 in the intervention classrooms and 181 in the control classrooms).	The report provides information from the experimental study as well as from other non-experimental studies. These studies show a similar pattern of results. One limitation noted in the study is that teacher ratings are the sole source of data about children in the classrooms. Intervention teachers may be biased toward positive ratings for the children.

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Table A-3a. Child Social Behavior Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Raver, Jones, Li-Grining, Metzger, Champion, and Sardin (2008)	Did the Chicago School Readiness Project (CSRP) have an impact on teachers' management of children with disruptive behavior and teachers' ability to foster an emotionally positive classroom climate?	This study used a randomized control trial design and analyses focused on intent-to-treat. In other words, the average impact on classroom quality was assessed regardless of the number of trainings teachers participated in. The intervention was implemented for two cohorts of teachers, with Cohort 1 participating from fall to spring in 2004-2005 and Cohort 2 participating from fall to spring in 2005-2006. Classroom quality and climate observation measures were conducted in the fall and spring to test for differences, both at baseline, and after treatment, in the intervention and control groups.	A total of 87 teachers participated in CSRP at baseline, with 90 teachers participating in the spring (four teachers left, and seven more were enrolled). Teachers were primarily African-American (70 percent) and Latina (20 percent), with an additional 10 percent being European American. A majority held an associate's degree or higher. At baseline a total of 543 children participated in CSRP classrooms. By spring, the number was 509. A total of 35 classrooms were included.	Teachers in control group sites received staffing support in the form of a Teacher's Aide to try to ensure that teacher-child ratios were similar in control and intervention classrooms.

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Table A-3a. Child Social Behavior Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Reynolds and Kelley (1997)	What is the effectiveness of a "response cost" treatment procedure for improving the behavior of aggressive preschoolers?	Multiple baseline design. Baseline, introduction of response cost system with explanation to child and opportunity for teacher and child to role play prior to beginning, treatment, withdrawal (teacher ceased implementation), resume treatment.	Four preschool children between 3 and 5, referred by parent or school for aggressive behavior in class, observed during baseline to show more than eight aggressive acts per hour on average, score within average range on WPPSI, and obtain consent. Four of the children were white, from two-parent families with both parents college educated. One child was black, from a single parent family, whose mother had high school education plus vocational training.	Very small sample (four children).

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Table A-3a. Child Social Behavior Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Rhodes and Hennesy (2000)	Previous studies of training involve limited hours of training (e.g., 20) and do not focus on child outcomes. This study asks if more extensive PD is associated both with observed caregiver behavior and child outcomes.	Pre-post test design with training group and matched comparison group. Groups matched to extent possible on education, training and work experience (not matched on ratios, but these were not found to differ). Group size also not matched on, and found to be significantly larger for training group. According to authors, the lack of a waiting list made it impossible to use random assignment.	Thirty-three caregivers participated in pre-test and 29 remained for post-test. 16 completed Foundation Course, 17 located through the Irish Preschool Playgroup Assn. (IPPA) to form the comparison group. All approached agreed. Matched on education, training, and work experience. Caregivers in both groups had completed the 20-hour intro. course or equiv. Sixty-nine percent training group; 53 percent comparison had completed post-secondary school level qualifications in child-related field.	"Participants in the course were usually self-funding, and the very low level of pay of those working the early years settings is a barrier to participation for many caregivers" (p. 563). The IPPA trainers were graduates of the Foundation Course, had completed an Irish Preschool Playgroups Association (IPPA) course for trainers, and were enrolled in a nationally recognized course in adult education. More members of the training group compared to the control group had completed postsecondary school-level qualifications in child related field favors training group. A single observer carried out all observations, and was not blind as to group. Interrater reliability was strong. But is this sufficient to assure no bias? It seems strange to me that the comparison group children did not show change over six to seven month time period, something also noted by authors. SES was not controlled in this study and is not described. Dropout rate was higher in comparison group.
Schottle and Peltier (1996)	Should schools employ behavior management consultants to deal with behavior problems among students?	First 24 students referred for behavior management consultant became experimental group and next 16 students became contrast group.	Kindergarten through third-grade students enrolled in at risk schools in a Nevada school district. Students had all been referred to behavior management consultant when efforts of on-site staff unsuccessful. Students not receiving special ed. services.	No sample description for students or teachers. Article refers to experimental group but study did not follow random assignment design. No information is given about nature of individual intervention plans that were developed in terms of approach. No information is provided about content of group sessions in contrast group. No table provides specific data on outcomes; article provides overview summary only.

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Table A-3a. Child Social Behavior Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Webster-Stratton, Reid, and Hammond (2001)	Do the Incredible Years: Parent Training and Teacher Training Programs reduce parent, child, and teacher and classroom risk factors associated with conduct problems and strengthen the protective factors that help to prevent conduct problems?	Fourteen Head Start centers (36 classrooms) were randomly assigned with two classes assigned to the experimental condition for every one assigned to the control group. The experimental group participated in the Incredible Years Training Series (23 classrooms from nine centers) and children in the control classrooms received the regular Head Start program (13 classrooms in five centers). Assessments occurred in the fall and late spring and consisted of home and classroom observations and teacher and parent reports. There were one-year follow-up assessments in the spring of the kindergarten year including parent reports and home observations.	The sample included 272 Head Start mothers and their 4-year-old children and 61 Head Start teachers from 34 HS classrooms (23 intervention and 13 control classrooms). The ethnicity of the children was 19.1 percent African-American, 18.0 percent Hispanic, 22.1 percent Asian American, 1.5 percent Native American, 2.2 percent combination, and 36.8 percent Caucasian. Average family income was $11,600.	The experimental and control groups were not equivalent on several factors including minority status. Experimental families reported significantly more risk factors than control families.

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Table A-3a. Child Social Behavior Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Webster-Stratton, Reid and Hammond (2004)	What are additive effects of a theory-based teacher training intervention targeted at specific classroom risk factors (classroom management skills and collaboration with parents) in combination with either parent training, child social skills training, or both?	Families were assigned at random to one of six conditions: parent training alone (PT); parent training plus teacher training (PT +TT); child training alone (CT); child training plus teacher training (CT + TT); parent, child and teacher training (PT, CT + TT), and a waiting list control group. Baseline assessments in Sept. and Oct. and random assignment to one of six groups in Nov. Treatment from mid-November through April. Post-treatment assessments at the end of the school year. One year later in spring, assessments repeated. Assessments involved parent (M and F) report, teacher report, observation in the home, observation in the classroom and peer interaction in laboratory.	One-hundred and fifty-nine families with a 4- to 8-year-old child with referral for child misconduct occurring over at least six months; parent report of at least 10 problems on the Eyberg Child Behavior Inventory; child met criteria of oppositional defiant disorder (ODD); did not have debilitating physical impairment; and child was enrolled in preschool or elementary school. 90 percent of children were boys; mean age of 70.99 months; 79 percent Euro-American. 26 percent of sample in preschool. 72 teachers in the TTS condition, each with one child. All participated in the four days of training and meetings at school.	Lack of previous research examining added benefits of providing teacher training on top of parent training, child training, or both for children with oppositional defiant disorder. In addition, no treatment studies use classroom observation. "We did not include a TT-only condition because we did not believe training teachers by itself would be a realistic treatment option for diagnosed children because of the central role that parents play in the development of conduct problems" (p. 107). Lack of TT-only condition makes it impossible to consider separate effects of TT. Can look at effects of the three groups involving TT (PT+TT, CT+TT, PT+CT+TT) compared to control group. Especially important in regard to classroom practices. But especially for child outcomes, can ask if including TT appeared to function additively (effect sizes stronger than for CT or PT only?). In general, there was little evidence of an additive effect of TT on child outcomes. Parents and teachers reported more satisfaction with outcomes when teachers were also trained. Cell sizes were small.

Table A-3b. Child Social Behavior Studies: Features of Professional Development

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Brigman, Lane, Switzer, Lane, and Lawrence (1999)	Teacher training for the five treatment group teachers and their five assistants occurred in two seven-hour workshops in Sept. These were followed by half-day workshops in Nov., Jan. and March to review skills and strategies, to discuss progress and difficulties in implementing the program.	Both teachers and teaching assistants were included, but there is no discussion of directors or other staff members	Two seven-hour workshops at start of school year with three half-day workshops in Nov., Jan. and March to follow-up (see column I)	"Inner city preschool children" with approximately 95 percent black and 5 percent white. There is no description of socio-economic status	Listening comprehen-sion, attending, and social skills	According to the authors, the RTL program focuses on skills that the research indicates are predictors of long term school success. In addition, research supports the effectiveness of the strategies chosen.	Ready to Learn focuses on three skill areas: listening comprehension including story structure; attending skills; and social skills. The skills are taught using five teacher strategies: (1) modeling-coaching-cuing); (2) positive peer reporting; (3) student story telling; (4) student story re-telling; and (5) the encouragement council.

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Table A-3b. Child Social Behavior Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Denham and Burton (1996)	Four different one-day workshops were provided. Sessions dealt with each of the four components of the intervention (building relationships, understanding emotions, and interpersonal cognitive problem solving). The training involved interactive discussions, multi-modal presentation of materials, and assignments.	Not noted.	Teachers received four one-day workshops.	Sixty-nine of the 130 children were identified as "at risk" (from disadvant-aged environments meeting eligibility criteria for subsidized or court-ordered child care)	Children's social-emotional competence	The content was based on research in relationships, emotional understanding and recognition, and interpersonal cognitive problem solving..	The curriculum focused on techniques such as "floor time" to build a warm relationship between teacher and children. Didactic activities emphasizing the labeling of emotions were used (based on the PATHS curriculum). Emotion regulatory techniques were encouraged with children. The final piece of the curriculum was interpersonal cognitive problem solving emphasizing the development of multiple problem solving options, evaluating the options and working step-by-step to achieve a goal.

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Table A-3b. Child Social Behavior Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Domitrovich, Cortes, and Greenberg (2007)	In year 1 of the project (note that this seems to be the year after the pilot phase) teachers in the intervention classrooms participated in a two-day summer training, and then a one-day booster training in January. Each site designated one to two Head Start supervisory staff members to serve as PATHS Coordinators. The coordinators were responsible for facilitating implementation across classrooms and sites. Coordinators met with teachers on a regular basis individually and in small groups to provide support and address problems. During the intervention year, PATHS coordinators conducted monthly classroom visits to provide technical support and monitor implementation. After the visit the Coordinators completed an implementation rating scale. The program developers provided monthly consultation to the PATHS Coordinators.	One to two Head Start supervisory staff members were designated to serve as lead PATHS Coordinators. All teachers interested in the curriculum were allowed to participate in year 3. No discussion of assistant teachers or HS directors or other staff (other than 1-2 "supervisory staff").	In the first year, staff worked with the research team to create and pilot the curriculum materials. In the second year, the intervention teachers were trained in August and implemented the curriculum in their classrooms between Sept.-May. A one-day booster session was held in January. Head Start supervisory staff members met with teachers on a regular basis individually and in small groups. PATHS Coordinators conducted monthly visits to provide technical support to intervention teachers and monitor implementation. The program developers provided monthly supervision to PATHS Coordinators. In the third year of the study, teachers in the wait list control group and all other teachers interested in the curriculum received training and program materials.	The sample was relatively ethnically diverse (as described in sample column) and the authors report a mean annual income of $7,039.	Social-emotional curriculum designed to improve children's social-emotional competence and reduce problem behavior	The Promoting Alternative Thinking Strategies (PATHS; Kusche and Greenberg, 1994) curriculum was modified to be developmental appropriate for early childhood. The authors report that it is based on the ABCD (Affective-Behavioral-Cognitive-Dynamic) model of development (Greenberg and Kusche, 1993), and expands on previous curricula designed to improve children's social emotional and behavioral skills (e.g., the Incredible Years, Webster-Stratton and Reid, 2004).	The PATHS curriculum contained 30 lessons that were delivered once a week by teachers during "circle-time". The curriculum was divided into thematic units on compliments, basic and advanced feelings, a self-control strategy, and problem solving. The primary objectives of the curriculum were to (1) develop children's awareness and communication regarding their own and others' emotions; (2) teacher self-control of arousal and behavior; (3) promote positive self-concept and peer relations; (4) develop children's problems solving skills by fostering the integration of their self-control, affect recognition, and communication skills; and (5) create a positive classroom atmosphere that supports social-emotional learning. The teachers also provided extension activities and were taught how to scaffold children's learning during a child's emotional reaction or problem with a peer.

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Table A-3b. Child Social Behavior Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Franyo and Hyson (1999)	Workshop group participated in a three-hour training conducted on-site at one of 11 centers. three small centers joined a larger center for three of the sessions (for total of 14 centers). Six to fourteen caregivers in each session. The authors discuss the issue of what can be expected realistically from a three hour training. They note that attitudes toward children may be too global a change to occur with a three hour workshop.	According to Table 1, sample included center directors, head teachers, assistant teachers, aides and "other" so full staff was involved. Not clear if this was the case in each center.	Three hour training.	Children ranged in age from infants (0-12 months old) to 6-year-olds. Centers are described as varying widely in SES, or race/ethnicity, and location, but child population is not described further.	Knowledge and response to child temperament.	Training used information from a literature review (Franyo, 1996) and interviews with center directors, results of two field tests, and comments of experienced workshop facilitators.	Temperament was presented as a concept that is characterized by individual differences; has a biological basis; is somewhat stable over time; and is expressed in a manner that is subject to environmental circumstances.

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Table A-3b. Child Social Behavior Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Girolametto, Weitzman and Greenberg (2004)	Six-week program with three group evening sessions to teach program strategies, and three videotaping sessions in day care center.	Not noted.	Three group sessions of 2.5 hours each. Each videotape session involved five minute videotape of a caregiver-child interaction followed by 30 minutes of individual feedback and discussion regarding the use of program strategies.	No report on family SES or race or ethnicity.	Facilitating peer interactions.	Theories of language acquisition suggest that more frequent peer interactions may facilitate language development. Social cognitive theories suggest more interaction will support development of skills to negotiate social interactions.	The three group sessions involved interactive lectures, observation and analysis of videotapes illustrating program strategies, large- and small-group discussions, and role plays of strategies. 1) Importance of peer interactions and effects of language skills on peer interactions. 2) How well-defined lay areas and appropriate activities can encourage interactions with peers. 3) Verbal support strategies discussed and illustrated (e.g., prompting, indirect suggestions re sit cues, peer referrals).

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Table A-3b. Child Social Behavior Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Gowen (1987)	(1) Three-day workshop on "Introduction to Learning Through Play; (2) half-day workshop two months later on "Communication Skills; and (3) a six- hour staff development meeting after each workshop. In addition, each trainee met twice with an evaluator to review results of the classroom observations of their behavior. Two of the trainers available for informal consultation as needed	All teachers and teacher aides included in training. Trainers were available on site for consultation. Inclusion of Director or other staff members not noted.	Three-day workshop followed by half day workshop two months later. One hour staff development meeting after each workshop. Two trainers available at center for informal consultation.	Study carried out in day care center for low income children	Facilitating play thorough nondirective interactions.	Two citations for basis for intervention in findings that adult behavior can support the development of higher level play behavior in children.	In first workshop, aim was to increase appreciation of caregiver's role as facilitator for learning through play. Caregivers trained to comment to children during play in way reinforced exploration and play. Second workshop focused on increasing use of nondirective language and decreasing use of directive language during playtime and mealtime. Teachers practiced identifying nondirective and directive language during workshop and follow-up meeting. Approaches included guided group discuss, role-playing, modeling of desired behaviors, videotapes, written vignettes, exercises.

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Table A-3b. Child Social Behavior Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Hendrickson, Gardner, Kaiser and Riley (1993)	One-on-one coaching and observation in classroom. Setting was center serving children from 6 weeks to 5 years. Approx one-fourth of children had multiple disabilities and one-third had a single disability. Coaching conducted in any available quiet area of center. After teachers 1 and 2 had attended three coaching sessions, were invited to take charge of one or all of eight steps in coaching process. Teachers 1 and 2 also observed and participated in coaching of another teacher.	Not noted.	Each coaching session lasted about 20 minutes.	Each of three study children were socially withdrawn and had development disabilities or delays.	Child social interaction for socially withdrawn children with disabilities or delays.	Research cited for approach as used with older children, but authors note (p. 215) that there are not studies with preschool-age children.	Eight segment coaching process. A 15-25 minute coaching session preceded classroom observations made during the intervention. Step 1) Teacher asked for three things she liked about lesson. 2) Teacher asked if would change anything. 3) Coach data on teacher's behavior. 4) Then on target child's behavior. 5) Coach shared three positive observations based on observation data and anecdotal notes (at least one based on data). 6) Coach offered suggestions for teacher to consider. 7) Coach suggested teacher set observable goal. 8) Teacher ideas for behaviors she might use in next session.

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Table A-3b. Child Social Behavior Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Lynch, Geller and Schmidt (2004)	Teacher training in the Al's Pal's curriculum is provided by "expert trainers" in a two-day workshop. The training is described as "interactive" and combines theory and practice. The training focuses on establishing a "resiliency-promoting classroom environment" which is nurturing, provides opportunities for children to be involved and to make decisions, and establishes clear norms. Teachers practice techniques during the training that promote children's abilities to cope and solve problems. Teachers sign a participation agreement that allows them to participate as long as they have received the training. "Consultation and advanced training" are available (though no details are provided).	Program administrators are encouraged to attend the teacher training. They also receive a monitoring and observation form to assist them in monitoring implementation of the curriculum.	The training lasted two days	Curriculum and training implemented in a large Head Start program.	Social-emotional development	The PD content is based on resiliency research.	Teacher training curricula not described in detail. Classroom curriculum that teachers implement involves two lessons (lasting 15-20 minutes) per week over 23 weeks. Lessons include discussion led by puppets, role-playing and use of music, books, artwork and movement. The curriculum kit for teachers "furnishes all needed materials and gives clear instructions on how and in what order to conduct the lessons".

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Table A-3b. Child Social Behavior Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Raver, Jones, Li-Grining, Metzger, Champion, and Sardin (2008)	The CSRP included four components: (1) The teacher training component in the fall (with booster training in mid-winter for new staff); (2) Mental Health Consultants' (MHC) coaching of the strategies learned in the training in fall and winter; (3) MHC's support for teachers' stress reduction in winter; and (4) MHC's one-on-one direct consultation services to children in the spring.	Trainings were offered for lead and assistant teachers.	All treatment teachers were invited to participate in five trainings on Saturdays, each lasting six hours, in the fall and winter. MHC's providing coaching one morning a week in the fall and winter. MCHs provided stress reduction in the winter, and one-on-one services to children in the spring.	Head-Start funded sites were selected based on their location in high-poverty neighbor-hoods.	Behavior management and classroom climate	CSRP is based on research on classroom management and effective professional development as it relates to collaboration, coaching, and teacher stress. It is also based on recent interventions used to support children's social emotional development (e.g., Webster-Stratton et al., 2001).	During the five trainings, a behaviorally and evidence-based teacher training package was selected and purchased, and a Licensed Clinical Social Worker delivered 30 hours of training over fall and winter, adapting the Incredible Years teacher training module. Teachers received placement of a MHC with a master's degree in Social Work in their Classrooms one morning a week. MCHs followed a manualized approach. In the winter, MCHs worked with teachers to try to help reduce their stress. Finally, in the spring, MCHs provided child-focused consultation with a small number of children in the classroom.

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Table A-3b. Child Social Behavior Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Reynolds and Kelley (1997)	Handout plus instruction. No duration given. Experimenter confirmed appropriate implementation through observation. No details regarding number of visits. Chart shows number of days of implementation; varies by child with maximum of about 35 days (including baseline, treatment, withdrawal, second treatment).	Not noted.	Not specifically noted. Handout provided, instruction provided, child and teacher did role play and received feedback, experimenter observed to assure fidelity of implementation (implies that feedback was given during implementation).	Three of four children were white with highly educated parents. One child was black and had a high school educated single mother with vocational training.	Aggressive behavior.	Not clearly noted. There is one citation in introducing the approach, but content is not described.	Handout explained procedure for selecting target behaviors, goals, and rewards as well as how to implement. Told to make point loss obvious, immediate and consistent, and to accompany with reprimand. Target behaviors selected. Teacher encouraged to praise appropriate behavior often. Procedure (explained to child; CH + T role played) involved losing one of five smiley faces on chart contingent upon aggressive behavior. Rewards if one remained at end of observation period (40 min.) and if on four of five days at least one remained at end of observation period. Fidelity confirmed with observations.

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Table A-3b. Child Social Behavior Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Rhodes and Hennesy (2000)	One-hundred and twenty hours of training, with 90 hours of instruction ("tuition") and 30 hours of observation over a six- to seven-month period. Location not noted, but course provided by two instructors with appropriate qualifications (qualifications are described). Auspice was Irish Preschool Playgroups Association. This was an advanced course and all participants had taken elementary course or equiv.	Not noted.	One-hundred and twenty hours of training (90 hours "tuition" and 30 hours of observation). Two evenings per week for 24 weeks (September to March). Each class was two hours.	Participants had to pay for course and low level of pay was a barrier. It was helpful that course was part time and did not require time off work.	Caregiver sensitivity; child cognitive and social development.	Basis in research of specific elements of training are not discussed	The Irish Preschool Playgroups Association (IPPA) offers an advanced course called the Foundation Course in Playgroup Practice. This involves 120 hours of training. It covers four broad areas: the needs of children, the value of play, the curriculum, the development function of playgroups. (A table in the paper gives examples of topics covered in each area).
Schottle and Peltier (1996)	Experimental group: one-on-one planning with eight to ten follow up visits to class. Contrast group: five three-hour group sessions (location not given).	Referral made by school counselor.	Joint development of behavior modification plan with eight to ten follow up visits to class in experimental group. Five three-hour group sessions in contrast group with same consultant.	Kindergarten through grade 3 students in "at risk schools."	Behavior management.	Not clear from article. There is reference to research and distinct approaches taken in previous interventions, but use of this in current work not clear.	In experimental group teachers received one-on-one intervention from behavior management consultant, developing behavior intervention plan collaboratively with eight to ten follow up visits to class. Contrast group had same consultant with five three-hour group classes.

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Table A-3b. Child Social Behavior Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Webster-Stratton, Reid, and Hammond (2001)	Teachers and teacher assistants participated in a six-day training series, once a month, from November to April. Teachers viewed videotapes of other classroom teachers and then discussed teacher-student interactions that they viewed. In the fall, 13 family service workers from the experimental centers completed a three-day parent group leader training. The group leaders (family service workers) (a) followed the detailed training manual and session protocol for each session; (b) were observed conducting groups at least once by the project director; (c) conducted their first parent group with a trained staff member; (d) attended supervision meetings; (e) kept detailed weekly checklists of group process, intervention content completed, weekly parent attendance, and parents' reactions. Eighteen 12-week parent groups were conducted during the first year. Four booster sessions were offered to parents in the kindergarten year. Parents viewed videotapes of modeled parenting skills with group leaders, and then discussed the parent-child interactions.	Teachers and teacher assistants participated in the training. Family service workers were also trained to lead parent groups.	Teachers and teacher assistants participated in a six-day training series, once a month, from November to April. In the fall, 13 family service workers from the experimental centers completed a three-day parent group leader training. Eighteen 12-week parent groups were conducted during the first year. Four booster sessions were offered to parents in the kindergarten year.	Average family income was $11,600, 55.8 percent single-parent, 33.9 percent less than High School education. Overall high-risk sample.	Child behavior, particularly non-compliance and aggression	This study is based on research on oppositional defiant and conduct disorder, as well as a previous randomized train of the Incredible Years Parent Training Program (Webster-Stratton, 1998).	*Parent Training* : The parent training groups teach positive discipline strategies, effective parenting skills, strategies for coping with stress, and ways to strengthen children's social skills. During training sessions, group leaders and parents viewed videotapes and then discussed parent-child interactions. Group leaders (family service workers) followed an intervention manual with specified content for each session. *Teacher Training:* The teacher training curriculum focused on teaching classroom management and discipline strategies and promoting social competence in the classroom. Teachers were also taught to prevent peer rejection. Training topics included: (a) promoting positive relationships with students and families; (b) strengthening student social skills; (c) using incentives to motivate students with behavior problems; (d) teaching how to be proactive; (e) handling misbehavior; (f) teacher children problem solving; (g) helping students verbalize feelings; and (h) collaborating with parents.

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Table A-3b. Child Social Behavior Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Webster-Stratton, Reid and Hammond (2004)	Four days of training in clinic in group setting focusing on effective handling of misbehavior in class, promoting positive relationships with difficult students, and strengthening social skills across school contexts. Focus on helping child prevent peer rejection. Two meetings with therapist at school to develop individual behavior plan for child.	Not noted.	Four days coordinated with first, second, third and fourth quarter of parent or child training.	Authors note as a limitation of the study that the sample was primarily Euro-American. Families were from full income range, but majority were two-parent and middle income.	Child behavior for children with oppositional defiant disorder.	Research is basis of hypothesis that combining interventions for parents and children with interventions for teachers will augment positive effects.	Targeted teacher use of effective classroom management strategies for handling misbehavior, promoting positive relationships with difficult students, and strengthening social skills across school settings (class, lunchroom, playground, bus). Topics included promoting social skills through praise and encouragement, proactive teaching, using incentives to motivate children, strategies to decrease disruptive behavior, collaboratively work with parents, preventing peer rejection, age appropriate expect, individual differences.

Table A-3c. Child Social Behavior Studies: Outcomes

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Brigman, Lane, Switzer, Lane, and Lawrence (1999)	Experimental (Random Assignment to Treatment and Control Groups)	(1) Listening comprehension Number 1: The auditory memory and school language and listening subtests of the Metropolitan Readiness Test were combined to make one 27-item listening comprehension test. (2) Listening comprehension Number 2: The story structure subtest of the Metropolitan Readiness Test. (3) ACTeRs Comprehensive Teacher's Rating Scale of behavior, covering attention, social skills, hyperactivity and oppositional behavior. (4) Independent observation of attending behavior: Children were observed by an independent observer (about 21-22 hours in each class) for on-task, attending behavior. The four measures were administered in each of the classes at three timepoints (Sept. Jan., March).	Not addressed.	During the initial workshops as well as the follow-up workshops, teachers and assistants were asked to demonstrate their understanding of the RTL teaching strategies and materials, and all were seen as demonstrating competency (though no data are provided). In addition, there were weekly 30-minute classroom observations followed by a discussion on program implementation, and teachers reported weekly on implementation. These again confirmed implementation (no data presented).	There were significant interactions of Time x Group on three of the four outcomes. Treatment classes showed significant increases on independent observations of attending behavior, story structure (listening comprehension Number 2), and teacher ratings of behavior (ACTeRS behavior rating).

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Table A-3c. Child Social Behavior Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Denham and Burton (1996)	Quasi-Experimental (Post-Intervention Only with Controls for Baseline Group Differences)	Children's outcomes: Preschool Competence Questionnaire (teacher report of social competence) and the Minnesota Preschool Affect Checklist (observational assessment of children's affect and social interaction during natural play). As a measure of treatment fidelity, teachers rated their own effectiveness in delivering the techniques.	Not addressed	Not addressed	The intervention was a significant predictor of the PCQ aggregate scores at posttest. There was a significant interaction of pretest and intervention status (having the intervention and being low on the PCQ at pretest predicted posttest scores). Intervention did not predict observed positive affect. It did predict negative affect, productiveness (involvement in purposeful activity) and peer skill. Intervention by pretest interaction was a significant predictor of these three outcomes.

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Table A-3c. Child Social Behavior Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Domitrovich, Cortes, and Greenberg (2007)	Experimental (Random Assignment to Treatment and Control Groups)	(1) Revised version of the Recognition of Emotion Concepts subtest from the Kusche Emotional Inventory (KEI; Kusche, 1984) to assess children's receptive emotion vocabulary. (2) Assessment of Children's Emotions Scales (ACES; Schultz et al., 2001) to assess children's emotion expression knowledge. (3) Denahm Puppet Interview (DPI; Denham, 1986) to assess children's perspective-taking skills. (4) Day/Night task (Diamond and Taylor, 1996) to measure inhibitory control. (5) An adaptation of Luria's (1996) tapping test used to assess children's inhibitory control. (6) Attention Sustained subtest from the Leiter-Revised Assessment Battery (Roid and Miller, 1997) used to assess children's visual-spatial memory and attention. (7) The problem solving portion of the Challenging Situations Tast (CST; Denham et al., 1994) used to assess children's behavior response to common social problems. (8) Preschool and Kindergarten Behavior Scales (PKBS; Merrell, 1996) used to assess children's social skills and problem behaviors. (9) Parents completed the Head Start Competence Scale (HSCS; Domitrovich et al., 2001) to rate children's social emotional skills.	Not assessed.	Not assessed.	*Direct Child Assessments* - Significant group effects were found on three of the four emotion knowledge measures (KEI, ACES accuracy and anger bias). Children in the intervention group had a larger emotion receptive vocabulary at post-test, were more accurate in identifying feelings, and the intervention reduced children's anger attribution bias. There were no significant differences between intervention and control children on measures of inhibitory control, attention, or problem solving. Effect sizes ranged from .28 (DPI) to .40 (ACES anger bias). *Teacher-Report of Child* - Intervention children were rated at post-test as significantly more cooperative, emotionally aware, and interpersonally skilled than children in the control classrooms. There were no group differences in teachers' ratings of externalizing behaviors. *Parent-Report of Child* - Parents of students in the intervention group rated their children as significantly more socially and emotionally competent than did parents of children in the control group.

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Table A-3c. Child Social Behavior Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Franyo and Hyson (1999)	Experimental (Random Assignment to Treatment and Control Groups)	(1) Background questionnaire (employment position, years of experience in ECE, ages of children in care, ethnicity and education, any prior training on temperament). (2) Parent Attitude Survey Acceptance of Children Scale (ACS): measures acceptance of a child's behavior and feelings and degree to which child is seen as individual in own right. (3) Knowledge about Temperament Survey (KATS, measures knowledge of the existence of individual differences, biological basis of temperament, continuity in temperament, goodness of fit of child and environment, and impact of adult temperament on children. (4) Open-ended response items.	Differences between the pre-workshop and post-workshop scores on the KATS were significantly greater for the workshop group than for the waiting list control group. The same pattern occurred for the delayed post-workshop KATS. However, there were no statistically significant differences between he workshop group and the control group on the ACS. Thus there appeared to be effects on caregiver knowledge but not attitudes of acceptance of children's behavior and feelings.	Not assessed.	Not assessed.

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Table A-3c. Child Social Behavior Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Girolametto, Weitzman and Greenberg (2004)	Experimental (Random Assignment to Treatment and Control Groups)	(1) Brief background questionnaire for caregivers completed at orientation. (2) Speech and Language Assessment Scale (Hadley and Rice, 1993) completed for each of the participating children by child care provider to ensure that the children's speech and language development was progressing typically. (3) Teacher videotaped with four children from classroom (15 minutes in dramatic play area, 15 minutes in block area) with order counterbalanced. Transcription of middle (10 minutes of each). Seven codes collapsed into four subtypes of verbal support strategies. (1) Restricts (mentions rule governing peer interaction); (2) Facilitates communication (rephrases or restates child's utterance to another child; prompts children to talk to each other); (3) Peer referrals (invites children to interact; tells children to help each other) (4) Indirect referrals (praise for engaging peer interaction; alerts peers to situational information). Target child follows adult suggestion or overrides (ignores or rejects). Peer acknowledges initiation or no response (rejects or does not respond).	Not assessed.	No differences found at pre-test on peer interaction codes or other basic descriptors of interaction (e.g., number of conversational utterances). At post-test: caregivers in experimental group talked significantly less but used a significantly higher mean length of utterance. They used a significantly higher overall number of verbal supports (as well as proportion of verbal supports in relation to all utterances), more (# and percent) facilitates communication, peer referrals. Within experimental group at three-month follow-up, four caregivers increased verbal supports, three decreased.	Children in the experimental group used a significantly greater number of uptakes and overrides than children in the control group in response to caregiver verbal support strategies. However the proportion of caregiver verbal supports that resulted in uptakes and overrides did not differ significantly. Number and proportion of uptakes that received an acknowledgment from a peer were examined. Peers in the experimental group used a significantly greater number of acknowledges and no responses compared to peers in control group However no differences when calculated as proportion of children's uptakes. In the experimental group, facilitates communication and peer referral most impact on children. No pattern in control group.

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Table A-3c. Child Social Behavior Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Gowen (1987)	Pre-Post w/o Comparison Group	Pre-workshop observations recorded directive verbalizations to children and total verbal behavior. Caregivers observed three times during playtime following first workshop and follow-up session. Observed two times during playtime and two times during mealtime following second workshop and follow-up session. Four categories of verbal behavior recorded: information sharing, information eliciting verbal directive, and verbal other. Two categories of nonverbal behavior recorded: nonverbal directive and nonverbal other. Assessments at beginning and end of each workshop). At first workshop: reasons child-initiated activities and caregiver-initiated activities fostered learning, learning objectives that could be met during block play, three comments caregivers could make to foster those learning objectives in block play, and how classroom could be arranged to support learning through play. Second workshop: 10 utterances that a caregiver might make: directive or not? Evaluation questionnaire completed anonymously evaluating workshop activities re: usefulness.	There was an increase from before to after Workshop I on mean score on the assessment of knowledge: "caregivers showed an improved understanding of the unique role of child-initiated activities in preschool educational programs…and of ways in which learning objectives can be approached with appropriate caregiver comments during play" (p. 64). Mean performance also improved from pre to post Workshop II. Improved ability to distinguish directive from nondirective language. But this improved knowledge did not translate into improved performance in class for less educated caregivers.	Caregivers achieved target of verbal interactions during more than 50 percent of intervals during observations of playtime. Level of verbal plus nonverbal involvement was very high. Improvement over pre-workshop behavior for verbal involvement. Overall proportion of directive verbalizations after workshops I and II during playtime and mealtime was close to target of 25 percent (for some settings slightly higher). But only about half of the caregivers had met target during both play observations. Caregiver education was related to meeting target.	Not assessed.

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Table A-3c. Child Social Behavior Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Hendrickson, Gardner, Kaiser and Riley (1993)	Pre-Post w/o Comparison Group	Two to three observation sessions per week during group activities. Time sampling for 10 minutes. Teacher support for social interaction (either antecedent or following); social interaction (motor or verbal behavior initiated to another child and responded to within five seconds--positive behaviors only).	Not assessed.	Teacher 1: number of observation intervals with support behavior increased substantially from baseline (0) to first period of coaching (13). Several resulted in return to baseline levels. Increase again during second period of implementation (24) with both short (21) and long term maintenance (21). Similar patterns in teachers 2 and 3 without reversal period. Almost no baseline supportive behavior, then increases with coaching and short and longer term maintenance.	Each of three children showed increases in number of observation intervals with social interaction, with short and longer term maintenance. Number of intervals of child-child social interaction appeared to covary with teacher support behavior for two of the three children.

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Table A-3c. Child Social Behavior Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Lynch, Geller and Schmidt (2004)	Experimental (Random Assignment to Treatment and Control Groups)	Pre- and post -ratings of children's behavior were made by teachers on the Child Behavior Rating Scale-30 (CBRS-3), the Teacher Report of Child Coping, and the Preschool and Kindergarten Behavior Scale (PKBS). Ratings were collected in the fall and spring, approximately seven months apart.	Not assessed	Not assessed. The authors report that they have qualitative data showing improved classroom management and an increased sense of efficacy after teachers are trained and implement the curriculum.	Paired t-tests showed significant positive changes for the intervention group on the CBRS-30 (measuring prosocial skills), the PKBS and two subscales of the Teacher Report of Child Coping. Problem behaviors did not change. The control group reported significantly more problem behaviors at the post-test and no changes in prosocial behaviors. Repeated measures ANOVA showed between group differences in changes on the CBRS, the social independence subscale of the PKBS and the problem behaviors scale of the PKBS.

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Table A-3c. Child Social Behavior Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Raver, Jones, Li-Grining, Metzger, Champion, and Sardin (2008)	Experimental (Random Assignment to Treatment and Control Groups)	(1) The CLASS (La Paro et al., 2004) was used to assess classroom quality using four subscales: positive climate, negative climate, teacher sensitivity, and behavior management. (2) Baseline measures of the CLASS and ECERS-R (Harms et al., 2003) were used to control for variability in sites' baseline classroom quality.	Not assessed.	Overall, treatment classrooms showed statistically significantly higher levels of positive classroom climate, teacher sensitivity, and behavior management (at trend level), and lower levels of negative climate. Specifically, treatment-control group differences were statistically significant for classrooms positive climate in March, controlling for classrooms' baseline level of positive climate, with an effect size of d = 0.89. There was also a treatment effect for negative climate, with intervention classrooms showing less negative climate than control classrooms (d = 0.64). The differences between treatment and control groups on teacher sensitivity were statistically significant only once the covariates were included (d = 0.53). Difference between treatment and control groups on behavior management were only significant at trend level ($p<0.10$, d = 0.52).	Not assessed.

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Table A-3c. Child Social Behavior Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Reynolds and Kelley (1997)	Pre-Post w/o Comparison Group	Daily observation for about 40 minutes noting aggressive and destructive behavior (calculated as rate/hour). Teacher rating of the acceptability of the response cost procedure before and after treatment. Target child indicated whether he liked the response cost system and whether it helped him behave better in school.	Teacher attitude about the acceptability of this treatment approach changed for three of four teachers. The increased in their ratings of the treatment's acceptability.	Not assessed.	Graph shows visually that child aggressive behavior decreased during treatment; increased again during withdrawal, and presentation of results describes the patterns this way. Descriptive statistics are provided but no tests of significance are reported on.

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Table A-3c. Child Social Behavior Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Rhodes and Hennesy (2000)	Pre-Post w/ Comparison Group (Not Randomly Assigned)	(1) Arnett Caregiver Interaction Scale (CIS): positive relationship, punitiveness, permissiveness, and detachment.(2) Social competence rated on five-point Peer Play Scale (PPS) (Honest et al., 1980). Degree of complexity in peer play from parallel play to reciprocal play. (3) Cognitive competence rated on five-point Play with Objects Scale (POS). Rates increasing complexity of play with objects .	Not assessed.	No significant differences between training and comparison group at pre-test. Training group made significant gains on CIS positive relationship while comparison group did not. Training group participants showed a significant reduction in detachment while comparison group showed no change.	Children attending centers of training group caregivers made significant gains in levels of complex social play from pre to post-test, while the comparison group did not make significant gains from pre to post-test. Children attending centers of training group caregivers made significant gains in levels of complex cognitive play from pre- to post-test. The comparison group children did not make significant gains in complex cognitive play. At the post-test, children in the training group had significantly higher scores than those in the comparison group on both measures. [Article reports on main effect of group, main effect of time, and interaction; Summary is results of the follow up analyses of simple effects.]
Schottle and Peltier (1996)	Quasi-Experimental (Post-Intervention Only with Controls for Baseline Group Differences)	Conners' Teacher Rating Scale completed by teacher and an observer rating student behavior pre-and post-intervention. Measures hyperactivity, conduct problems, emotionally indulgent, asocial, anxious-passive, daydream-attention problems and hyperactivity index.	Not assessed.	Not assessed.	In both one-on-one and group approaches, teacher and observer ratings indicated change over time. Students improved from at risk in several categories to being within normal range. However on five of seven categories, greater change was achieved in individual consultation approach.

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Table A-3c. Child Social Behavior Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Webster-Stratton, Reid, and Hammond (2001)	Experimental (Random Assignment to Treatment and Control Groups)	Parenting Positive and Negative Constructs: (1) Negative parenting includes one variable from the Parenting Practices Inventory (PPI) parenting practices interview, independent observations of critical parenting from the Coder Impressions Inventory (CII), and total critical statements from the DPICS-R (Robinson and Eyberg, 1981). (2) Positive parenting includes two variables from the LIFT parenting practices interview (positive parenting and monitoring), one from the parent involvement questionnaire, one CII variable, and one DPICS-R variable. Parent-Teacher Bonding Construct: The INVOLVE-P evaluates the amount and quality of parents' involvement with their children's education at home and at school. The INVOLVE-T assessed teacher bonding with parent and parent involvement with school or teacher. Child Conduct Problems at Home Construct:The construct includes parent report variables from the Eyberg Child Behavior Inventory (ECBI, Robinson et al., 1980) and the total Child Behavior Checklist (CBCL, Acherman and Edelbrock, 1991), and two independent observations of aggression and inappropriate behavior in the home (CII percentage of time childacts inappropriate and DPICS-R total deviance and noncompliance). Child Conduct Problems at School Construct: Three teacher report variables - ADHD rating scale (DuPaul, 1990, Social Competence and Behavior Evaluation (SCBE; LaFreniere et al., 1992) externalizing and reversed social competence scores, and also three independent observations of child behaviors at school (Multiple Option Observation System for Experimental Studies MOOSES; Tapp et al., 2001) child conduct problems, Social Health Profile antisocial behaviors (Werthamer-Larsson et al., 1990), and reversed engagement). Teacher Classroom Management Style and Classroom Atmosphere Construct: MOOSES teacher criticism, teacher praise, classroom atmosphere, and teacher coder impression--harsh discipline, and positive techniques.	Not assessed.	Experimental mothers had significantly lower negative parenting and significantly higher positive parenting than control mothers. Parent-teacher bonding was significantly higher for experimental than control mothers. One year later the experimental effects were maintained for parents who attended more than six groups. After training, intervention teachers showed significantly better classroom management skills than control teachers.	Experimental children showed significantly fewer conduct problems at school than control children. Children of mothers who attended six or more intervention sessions showed significantly fewer conduct problems at home than control children. Children who were the highest risk at baseline (high levels of noncompliant and aggressive behavior) showed more clinically significant reductions in these behaviors than high-risk children in the control group. Clinically significant improvements in children's behaviors in the classroom were defined as a 30 percent decrease in observable deviant and noncompliant behaviors from baseline. One year later, the clinically significant reductions in behavior problems for the highest risk group were maintained.

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Table A-3c. Child Social Behavior Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Webster-Stratton, Reid and Hammond (2004)	Experimental (Random Assignment to Treatment and Control Groups)	(1) Naturalistic home observation; 60 minutes with each parent at each time point using Dyadic Parent-Child Interactive Coding System Revised; (2) 60 minutes of unstructured classroom time at each time point; (3) 60 minutes of structured classroom time at each time point; (4) 30-minute lab observation with same sex peer. Parent Positive and Negative Composite Scores based on observation and self-report. Child Conduct Problems at Home Composite Score based on observation and parent report. Child Conduct Problems at School and With Peers Composite Score based on observation and teacher report. Child Social Competence with Peers Composite based on observation and teacher report. Negative Classroom Management and Atmosphere Composite based on observation. Parent and Teacher Satisfaction with Program post intervention and at one year follow-up.	Not assessed.	There was no contrast of TT alone vs. control. The design permits reporting effects for three groups that involved TT vs. control, and considering additive effects of TT (e.g. whether PT+TT>PT). Short-term effects on the teacher classroom management composite score: The three conditions that received TT (as well as the CT only condition) showed significant treatment effects. Effect size smaller for CT group than groups involving TT. (Suggests that changes in child behavior through CT can have small pos effects on classroom practices). In this instance, TT did function additively with CT.	No overall effect on ANCOVA for child conduct problems at school and w/ peers, but on individual contrasts (planned) each group involving TT differed from control group. Child social competence with peers: no overall effect on ANCOVA, but individual analyses showed effects when TT paired with CT (CT + TT, CT +PT+TT) though CT only also differed. All three treatment groups involving TT, showed "clinically significant" improvements on teacher-reported conduct problems at school and observed aggressive behavior. At follow-up (with new teachers) these groups continued to show "clinically significant" improvement on observation measure but slight decrease in percent showing clinically significant improvement on teacher-report measure. However, TT generally not additive.

Table A-4a. Comprehensive Curricula Studies: Methodology

Study	Research Questions	Research Design	Sample	General Comments
Barnett, Jung, Yarosz, Thomas, Hornbeck, Stechuk, and Burns (2008)	Does the Tools of the Mind (Tools) curriculum produce significantly greater gains in children's social behavior, language, and literacy than a control curriculum? Compared to a control curriculum, does Tools produce significantly greater gains in classroom quality?	One school participated in this study. Teachers were randomly assigned by blocks. They were stratified by groups and then randomly chosen to implement the Tools curriculum. All treatment classes were placed on one floor, and control classes on another. Children with permission were then randomly assigned to either a Tools or control classroom. Children were assessed in the fall (October and November) and spring (late April through early June). Children were tested in Spanish or English.	The school district involved in this study is part of the "Abbott" preschool education program. The study took place in one school. A total of 218 three- and four-year-old children were randomly assigned and participated in either a Tools or control classroom. In this sample, 93 percent of children were Hispanic, and 63 percent spoke English as their primary language.	Fidelity measures were developed to assess extent to which teachers correctly implemented the curriculum. Measures indicated that the curriculum was not fully implemented at the beginning of the year. There were no significant differences between Tools and control children's scores at pre-test.

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Table A-4a. Comprehensive Curricula Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Bierman, Nix, Greenberg, Blair, and Domitrovich (2008)	(1) Did children's executive function (EF) skills at the beginning of the prekindergarten year enhance their development in areas of cognitive and social-emotional school readiness? (2) Did these skills moderate their response to the Head Start REDI intervention? (3) Did the intervention improve children's EF Skills? (4) Did improvements in child EF skills mediate child outcomes in areas of cognitive or social-emotional school readiness?	Using stratified randomization, classes in three counties were divided into groups based on demographic characteristics, location (e.g., central or southeastern PA), and length of school day (e.g., full day, half day, year round). Within groups, centers were randomly assigned to the intervention or control group. Only 4-year-old children participated in the study, although classrooms included both 3- and 4-year-olds. Teachers were trained and implemented the intervention which included curriculum-based lessons, center-based extension activities, and training in "coaching strategies" to support skill development. Pre- and post-intervention child assessments were conducted by trained interviewers. One lead and one assistant teacher in each classroom provided ratings of child behavior. Additionally, at post-test, each child was observed during two 12 minute to 15 minute play sessions on two seperate days. Children were taken in groups of three to play with a toy and were rated by observers.	356 children in 44 Head Start classrooms (17 percent Hispanic, 25 percent African-American, 42 percent European American). Eight-six percent of eligible children participated.	Note that there is not extensive information in this article about the professional development that teachers received or the content of the Head Start REDI program. However, an article under review is referenced for readers to obtain more detailed information.

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Table A-4a. Comprehensive Curricula Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Campbell and Milbourne (2005)	What are the effects of consultation with infant-toddler caregivers who completed First Beginnings, a training course which included five three-hour training classes and completion of an out-of-class project?	Changes in ITERS were compared between rooms (n=70) in which staff (n=123) completed a training course and received on-site consultation and rooms (n=26) in which staff (n=37) completed only the training course. The no consultation group consisted of staff/rooms (n=15 rooms) from one cohort of the training course plus staff/rooms (n=11 rooms) in which consultation was planned but not provided due to refusal of center directors (not unwillingness of staff). There were no pre-post ITERS differences between these 26 rooms, so they were combined into the no consultation comparison group. Participants included 180 caregivers who completed the training (from 114 rooms in 60 child care centers). Post-test ITERS were not collected from 18 of the 114 rooms. In the 96 rooms that completed pre and post test ITERS the mean age of the chidren was 22 months, averge number of chidlren present at the time of the observation was 8.36 and average number of adults was 2.32. A majority of the rooms were located in inner-city neighborhoods and provided care for children from soicioeconomically poor neighborhoods.	There were eight consultants that had a minimum of three years experience; four had Masters degrees, four had B.A. degrees.	Upon completion of the First Beginnings course, infant-toddler caregivers received a $100 stipend and 15 state-approved child care professional development training hours. Consultants received a three-hour training session reviewing the procedures for on-site visits, ways to complete the protocol forms and strategies to use for consultation.
Cassidy, Buell, Pugh-Hoese, and Russel (1995)	Is participation in the Associate Degree Scholarship Program (a component of TEACH) related to improvements on teacher beliefs and practices and overall classroom quality?	Teacher beliefs and practices and overall classroom quality were examined for a group of child care teachers before and after they completed one year of coursework at the teacher's local community college. The teachers received an associates degree scholarship to attend the program (as part of the TEACH Early Childhood program). Comparisons were also made to a matched comparison group. The comparison group was recruited from the same centers as program group teachers whenever possible.	At pretest, 41 teachers participated (21 program participants and 20 comparison) (21 African-American and 20 white). At posttest, 19 remained in the program group and 15 were in the comparison group. Teachers were not eligible as comparisons if they had taken college level course work or if they were in the same room at as the program teacher.	Information was not provided about how the scholarship participants were recruited. TEACH provides a scholarship (amount not specified) and support for release time. After completion, the recipient receives a salary increase or a bonus through their place of employment. The Early Childhood Associate Degree Scholarship was evaluated in this study which is designed for individuals already employed in a child care program who have no college coursework. Small sample size is a concern.

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Table A-4a. Comprehensive Curricula Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Chambers and Slavin (2008)	Does Curiosity Corner implementation produce greater gains in child and classroom outcomes compared to a control curriculum?	This study was part of the PCER report on the Effects of Preschool Curriculum Programs on School Readiness. SFA researchers identified school districts that had SFA and non-SFA elementary schools in the same area. They then recruited preschools based on whether the children would transition into both SFA and non-SFA elementary schools. Preschools were blocked into groups of two or more and then randomly assigned to the treatment or control group. In the control group, teachers used a variety of curricula including Creative Curriculum and Animated Literacy.	The SFA research team recruited preschool programs in three different states (Florida, Kansas, and New Jersey). They also targeted districts with SFA schools with preschool classes to fit their 2 (preschool curriculum type) x 2 (SFA and non SFA kindergarten classrooms) study design. Across the three locations, data were collected from 211 children and 195 parents. The children were 4.7 years old and were primarily African-American (51 percent) and white (28 percent). Ninety-seven percent of the 31 teachers were female and they had an average of 10 years of teaching experience.	SFA researchers found that compared to a control condition, Curiosity Corner implementation did not significantly improve child outcomes. The implementation did have a positive effect on reading and early literacy instruction.
Diamond, Barnett, Thomas, and Munro (2007)	Does the Tools of the Mind Curriculum produce significantly greater gains in children's executive function (EF) skills than a comparison curriculum?	Teachers and assistants were randomly assigned to either the EF-training curriculum: Tools or the District's version of Balances Literacy Curriculum (dBL). Children were randomly assigned to the Tools or dBL curriculum.	The study initially included 18 classrooms, and three more per condition were added the following year. The sample included 147 children (62 in dBL and 85 in Tools) in their second year of preschool who received their respective curriculum for one or two years. One of the dBL classrooms dropped out after year 1.	Little information provided about professional development in this article.

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Table A-4a. Comprehensive Curricula Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Farran and Lipsey (2008)	Do two preschool curricula (Bright Beginnings and Creative Curriculum) affect child and classroom outcomes?	This study was part of the PCER report on the Effects of Preschool Curriculum Programs on School Readiness. Researchers randomly assigned pre school sites to one of three conditions: Bright Beginnings, Creative Curriculum, or Control. Teachers in the two treatment groups received training in their assigned curriculum. A follow-up evaluation was completed a year later.	The sample consisted of 309 children and and 259 parents from 21 full day pre school classrooms in six counties. Children were 4.5 years old at baseline data collection and 52 percent were male. 80 percent were white, 18 percent African-American, and 11 percent Hispanic. All 21 teachers were white and had an average of 11 years of teaching experience. All of the teachers had either a bachelor's or graduate degree.	Researchers found that conducting implementation trainings for Bright Beginnings and Creative Curriculum did not result in improved child or classroom outcomes. A positive impact was found at the classroom level on early literacy instruction and phonological awareness instruction in Bright Beginnings classrooms.
Kontos, Howes, and Galinsky (1996)	Which family child care providers seek and complete training? Does training make a difference to the quality of care provided?	Three communities (San Fernando Valley, Calif.; Dallas, Texas; Charlotte, N.C.) offering Family-to-Family training for family child care providers were included. Data were collected from 130 providers enrolled in the training (68 in Calif, 31 in N.C. and Texas) and 112 providers from the same communities not enrolled in F-to-F training. Pre-post comparisons of business organization, motivation, and dimensions of quality were compared within the training group. A comparison of outcomes was also made between the training group and the comparison group.	Two-hundred and forty-two providers, 130 participating in Family-to-Family family child care training in three communities and 112 regulated providers in those same communities who were not participating in F-to-F training. The training group was slightly younger (37.9 years) than the comparison group (40.5 years) but there were no other significant differences on the demographic characteristics. The majority of providers were white (59 percent in the training group, and 71 percent in the comparison group). 29 percent of the training group and 17 percent of the comparison group was African-American. The remainder was Latino or other ethnicities. Nearly a quarter of both groups had a B.A. degree or higher, while around 50percent had some college or an A.A. degree, and around 25 percent had a high school degree or less.	General findings about which providers seek Family-to-Family training compared to other regulated providers: slightly younger, more likely to plan one activity daily, more likely to view family child care as a stepping stone to other employment, likely to have a smaller ratio (fewer children per adult). They were similar in structure, process, and global quality. Who drops out? Providers using fewer business practices with slightly less experience.

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Table A-4a. Comprehensive Curricula Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Lambert and Abbott-Shim (2008)	Does Creative Curriculum implementation produce greater gains in child and classroom outcomes compared to a control curriculum?	This study was part of the PCER report on the Effects of Preschool Curriculum Programs on School Readiness. Researchers randomly assigned Head Start sites in North Carolina and Georgia to the treatment or control condition. The treatment group classrooms received training in Creative Curriculum and the control group classrooms used teacher-developed, nonspecific curricula.	Researchers recruited full day Head Start programs in North Carolina and Georgia. Data were collected on 190 children and 168 parents. At the time of the fall baseline data collection, children were 4.5 years old and the majority were African-American (85 percent). All 18 teachers participating were female and the majority were African-American (89 percent). The teachers had an average of 12 years of teaching experience and half (50 percent) had an associate's degree.	The Head Start teachers, assistants, and site managers were offered a stipend for participating in the study. Treatment and control classrooms were housed in the same centers, and there may have been a few instances where a treatment group teacher inadvertently shared aspects from Creative Curriculum with a control teacher. Focus groups did not reveal much information about sharing.
Powell and File (2008)	Does implementation of the *Project Approach* Curriculum result in better child outcomes, measures of classroom environment, or measures of classroom instruction than implementation of a teacher-developed generic curriculum?	This study was part of the PCER report on the Effects of Preschool Curriculum Programs on School Readiness. Twelve of the 13 teachers were randomly assigned (one site had two teachers, in this site, both teachers were assigned to the same condition). The treatment group (seven classrooms) received Project Approach. The remaining six classrooms were provided two curricula (Doors to Discovery and Growing with Mathematics). However, teachers in the control classrooms reported using teacher-developed, nonspecific curricula.	Public prekindergarten classrooms were recruited via convenience sampling. A total of 13 teachers from 12 schools and 204 children were included in the sample. Children were an average of 4.6 years old at the time of baseline data colletion. Children were racially diverse (40 percent African-American, 28 percent white, 17 percent Hispanic). The 12 teachers in the sample were all white females. Teaches had an average of 11 years teaching experience with eight years teaching preschool. All of the teachers had at least a bachelor's degree and a current teaching license or certificate.	This study has a small sample size (13 classrooms).

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Table A-4a. Comprehensive Curricula Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Priest and Zoellick (2008)	For classrooms already using Creative Curriculum, does supplementation of Ladders to Literacy produce greater gains in child and classroom outcomes?	This study was part of the PCER report on the Effects of Preschool Curriculum Programs on School Readiness. Head Start classrooms were randomly assigned to the treatment or control condition. The treatment group classrooms received training in Ladders to Literacy. In the control classrooms, Creative Curriculum was implemented as it normally is (i.e., without the Ladders to Literacy add-on.	Researchers recruited Head Start classrooms, less than half of which were full-day programs. Data were collected on 123 children (62 treatment, 61 control) and 20 parents. Children were 4.6 years old at the time of baseline data collection and were ethnically diverse: 39 percent white, 11 percent African-American, 31 percent Hispanic. Most of the 14 participating teachers were female and white, and had an average of 9 years of teaching experience. 29 percent had an associate's degree.	Researchers found that supplementing Creative Curriculum with Ladders to Literacy did not result in improved child outcomes. The only area of significant improvement was early literacy instruction.
Starkey, Klein, Clements, and Sarama (2008)	Does implementation of the *Ready, Set, Leap!* Curriculum result in better child outcomes, measures of classroom environment, or measures of classroom instruction than implementation of the *High Scope* Curriculum?	This study was part of the PCER report on the Effects of Preschool Curriculum Programs on School Readiness. The 39 classrooms participating in this study were matched by teacher experience, school location, score on a state report card and other easily measured characteristics. Based on these matches, blocks of two or more were created. Random assignment to the treatment (*Ready, Set, Leap!*) or control group (*High Scope*) occurred within each of these blocks resulting in a total of 21 treatment and 18 control classrooms. Child assessments occurred in the fall (35 days after program implementation), spring of the Pre-K year, and fall of the Kindergarten year.	Prekindergarten programs in New Jersey whose directors attended a regional pre-kindergarten center meeting and NAEYC certified child care centers were recruited. All centers offered full-day prekindergarten. Thirty-nine classrooms, drawn from a convenience sample of 21 schools, participated in the study. A total of 286 families participated in the study. Children were approximately 4.5 years old upon entering the study. The majority of children were African-American and parents of children in the study were primarily unmarried, with a high school education or less, working full-time. Teachers in this study were primarily African-American with an average of eight years teaching experience, five years experience teaching preschool. The majority of teachers (69 percent) had a bachelor's degree.	Teachers and teacher assistants in both the treatment and control groups received an incentive for participating in the study. Fidelity to curriculum was measured through a triangulation of data from: coaching visits (three times per year), site coordinator ratings (three times per year), and observational coding based on a 90 second time sampling procedure.

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Table A-4a. Comprehensive Curricula Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Thornburg, Mayfield, Morrison, and Scott (2008)	Does implementation of the *Project Construct* Curriculum result in better child outcomes, measures of classroom environment, or measures of classroom instruction than implementation of a teacher-developed generic curriculum?	This study was part of the PCER report on the Effects of Preschool Curriculum Programs on School Readiness. Preschools collected via a convenience sample were organized into blocks of two based on matching by easily identifiable characteristics, such as teacher experience, school location, or score on a state report card. Random assignment occurred within these blocks resulting in 10 control and 11 treatment programs.	A convenience sample of full-day child care centers were recruited through phone calls and follow-up letters. Data were collected from 228 children (212 parents) from 21 preschool centers. Children were an average of 4.7 years old upon entering the study. The majority were white (65 percent) and African-American (25 percent). Of the 23 teachers who participated in this study, the majority were white (70 percent) or African-American (26 percent) with no college education (61 percent) and no teaching credential (78 percent). Teachers had an average of 10 years teaching experience and eight years experience teaching preschool.	Both treatment and control groups (one year post intervention) were offered free training in *Project Construct.* Additionally, the treatment classrooms received supplies and materials.

Table A-4b. Comprehensive Curricula Studies: Features of Professional Development

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Barnett, Jung, Yarosz, Thomas, Hornbeck, Stechuk, and Burns (2008)	Teachers participating in the Tools classrooms received four days of curriculum training before classes began. During the school year, Tools teachers received 30 min. classroom visits about once a week from a Tools trainer to address any problems with the curriculum. Tools teachers also received one half-day workshop and five one-hour lunchtime meetings to discuss the curriculum.	The study took place in New Jersey's high poverty districts. Median family income was $34,935. Seventy percent of children in the district came from homes where English was not the primary language. In this sample, 93 percent of children were Hispanic, and 63 percent spoke English as their primary language.	Teachers participating in the Tools classrooms received four days of curriculum training before classes began. During the school year, Tools teachers received 30min classroom visits about once a week. Tools teachers also received one half-day workshop and five one-hour lunchtime meetings.	The study took place in a high-poverty district. In this sample, 93 percent of children were Hispanic, and 63 percent spoke English as their primary language.	Self-regulation, literacy, and mathematics.	The curriculum is based on both research on the association between self-regulation and children's literacy and math skills, and on the theories of Luria (1966) and Vygotsky (1978) suggesting that self-regulation can be promoted through various activities.	Basic principles include: (1) children construct their own knowledge; (2) development cannot be separated from its social context; (3) learning can lead development; and (4) language plays a central role in mental development. Tools has an emphasis on both broad foundational skills (e.g., self regulation, attention, etc.) and also specific literacy and math prerequisites. The Tools curriculum includes 40 activities designed to promote dramatic play, encourage self-regulatory private speech, and teach the use of external aids to facilitate attention and memory.

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Table A-4b. Comprehensive Curricula Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Bierman, Nix, Greenberg, Blair, and Domitrovich (2008)	Teachers attended four days of training workshops and received weekly mentoring provided by local education consultants. There was no information included in this article about the content of the trainings or mentoring.	Not noted.	The intervention occurred over the course of a year. Teachers participated in four days of training workshops, and received weekly mentoring.	All Head Start programs including an ethnically diverse sample of children (17 percent Hispanic, 25 percent African-American, 42 percent European American).	Language/emergent literacy skill enrichment; Social-emotional skills enrichment	The authors report that little is known about how the developing executive function skills of preschoolers affect and are affected by school readiness interventions. However, the intervention is based on research on executive function skills, early reading skills, and social-emotional outcomes.	The intervention included curriculum-based lessons, center-based extension activities, and training in "coaching strategies" to support skill development. 1) Four language and emergent literacy skills were targeted: (a) vocabulary, (b) syntax, (c) phonological sensitivity, and (d) print knowledge. An interactive reading program was developed to target vocabulary, and encourage story retelling and narrative comprehension. Teachers also played sound games with children, and utilized a set of letter-learning activities in alphabet centers. (2) The PATHS Curriculum (Domitrovich et al., 2007) was used to target four skill domains: (a) prosocial friendship skills, (b) emotional understanding and emotional expression skills, (c) self-control, and (d) problem solving skills. Teachers presented concepts using modeling stories, puppet characters, photographs, and role-play demonstrations. Additionally, "take-home" packets were mailed to parents containing tips and activities.

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Table A-4b. Comprehensive Curricula Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Campbell and Milbourne (2005)	Group training plus on-site consultation. Material was presented through active, hands-on, participatory learning with opportunties to apply information within the class session. Participants completed an out-of-class project to facilitate a strengths-based view of infants with special needs. Three one-hour consultation ssessions were completed on-site. Participants completed a self-assessment (based on ITERS) and indicated whether they would to target the area for improvement. Consultants completed a summary sheet prior to consultation that indicated where ITERS subscale scores were below three. Two outcomes were targeted through consultation. During the first visit the consultant and consultee jointly developed a follow-up plan for each of the outcomes (strategies to use, steps to be completed, who would be responsible, deadlines, etc.). The most commonly used strategies sues included providing or reviewing resources or materials, brainstorming, modeling and discussion. The second and third visits were used to implement the plan.	None described.	Training: five classes lasting three hours over three to four months; Consultation: three one hour on-site visits (one after the first training, one after the second or third, and one before the fifth).	Training and consultation for providers working with low income infants and toddlers.	Infant and toddler development and classroom environment.	No information was provided about the research base for the training course. The training plus consultation model was loosely based on a small set of empirical articles.	Group training content focused on key components of infant-toddler care: including children with special needs, caregiver-child relationships, strategies for promoting development and learning, brain-behavior relationships, inclusion and diversity, working with families and use of community resources.
Cassidy, Buell, Pugh-Hoese, and Russel (1995)	Community college courses.	TEACH includes a scholarship and a salary increase or bonus when a provider completes a credential, certificate, degree.	The evaluation covered 1 year of participation in the community college coursework	The focus of the professional development was on providers who had not previously taken college courses	Early childhood education.	The TEACH program was developed because of associations in the literature linking teacher qualifications and classroom quality	Program recipients were required to enroll in AAS program in Early childhood education or child development at a local community college and complete 12 to 20 credit hours during each year. The average number of courses taken during the year was four. The majority of courses taken related to ECE methods or child-related courses. 75percent of students took two or more methods courses. Overall, 46percent of courses taken were methods, 41percent were child-related and 13percent were general education.

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Table A-4b. Comprehensive Curricula Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Chambers and Slavin (2008)	SFA trainers provided two days of initial training to treatment group teachers. Ongoing support was then provided, including implementation visits where trainers observed teachers' instructional practices and the classroom environment. Each treatment group teacher received three days of follow-up support.	None reported	The treatment group received their initial training in Curiosity Corner at the beginning of the preschool year. Follow-up support sessions were conducted in the fall, winter, and spring of the same year.	When non-SFA schools with preschool programs were not available, Head Start centers were recruited.	language and literacy, cognitive, mathematical, physical, social, creative, and personal development		Curiosity Corner is a comprehensive curriculum developed by the Success for All Foundation (SFA) that includes 38 thematic units designed to promote children's' language and literacy and cognitive, mathematical, social, personal, creative, and physical development
Diamond, Barnett, Thomas, and Munro (2007)	Only information given is that all teachers in the control and intervention classrooms received the same resources and same amounts of teacher training and support.	Not noted.	Preschoolers included in the sample received the dBL or Tools curriculum for one or two years.	Low-income, urban school district- all children came from low-income families (78 percent with yearly income <$25,000).	Executive function (or cognitive control)	The authors note that Tools has been refined over 12 years of research in preschool and kindergarten.	The Tools curriculum includes 40 EF-promoting activities, including self-regulatory private speech, dramatic play, and aids to facilitate memory and attention. Tools teachers spent about 80 percent of their day promoting EF skills. The dBL curriculum was based on balanced literacy and included the same academic content as Tools, but did not address EF.

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Table A-4b. Comprehensive Curricula Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Farran and Lipsey (2008)	Teachers assigned to the two curricula received 2.5 days of curriculum implementation training prior to the beginning of the 2002 through the 2003 school year. They also had access to implementation support throughout the year. Onsite consultation was provided four times throughout the year as well.		2.5 days of curriculum implementation training and four on-site consultations occurring in September, October, November to January, and late February.		Language and literacy development		Bright Beginnings is an integrated curriculum focusing on nine units: 1) language and literacy 2) mathematics 3) social and personal development 4) healthful living 5) scientific thinking 6) social studies 7) creative arts 8) physical development 9) technology. Creative Curriculum addresses four areas of development: 1) social or emotional 2) physical 3) cognitive 4) language development.
Kontos, Howes, and Galinsky (1996)	Workshop training offered at a community college (two sites) and an RandR (one site). No details were provided about the characteristics of the trainers. Home visits were also conducted but no information was given about the purpose or content of the visits or who conducted the visits.	None described.	Varied across sites from 2.5-6 hour sessions totaling 15-25 hours of class time. No information was offered about the number of weeks over which the training was held.	Training was aimed at Family Child Care providers.	Covered business practices and issues expected to improve quality including	The training provided was designed to be more rigorous in breadth and depth than what was offered in other family child care training. There was no background information about whether the training was grounded in research.	Training was developed to address local needs but certain components were required at all sites including business practices; local regulations; health, safety and nutrition; child development and age-appropriate activities; environments to promote learning, guidance and discipline; special needs children; parent-provider relationships; professional development and community resources; diversity issues; and personal and family development.

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Table A-4b. Comprehensive Curricula Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Lambert and Abbott-Shim (2008)	Teachers assigned to receive Creative Curriculum training took part in a four day training session in August 2002. They then received refresher sessions throughout the 2003 and 2004 school year (either half or full day).	None reported	Four days of training occurred from August 2003 to February 2004.	Because it was a Head Start setting, most children were from low-income families.	Social/ emotional, physical, cognitive, and language development.		Creative Curriculum addresses four areas of development: 1) social/emotional 2) physical 3) cognitive 4) language development.
Powell and File (2008)	Training included: 18 hours of introductory training, 12 hours of follow-up training, and 12 hours of individual consultation time provided between October and May. The introductory training topics included: benefits of *Project Approach,* distinctions between projects and themes, criteria for selecting good project topics, examination of three phases of proejcts, and the use of webbing to link curriculum goals to project work. Follow-up training included a site visit to a reaearch participant with high fidelity to *Project Approach* , presentations/critiques of participants' projects, a dicussion focused on barriers/challenges in implementing *Project Approach,* and the generation of anticipatory planning webs. Individual consulting time was mostly used for observation with 20 minutes devoted to individualized consultation.	None mentioned.	Training activities included: 18 hours of introductory training (six hours each day for three days at the beginning of the school year), 12 hours of follow-up training (six hours each day for two days in January), and 12 hours of individual consultation time provided between October and May	None mentioned.	Scientific exploration, spontaneous play, systematic instruction, and project work.	No mention of an empirical-basis for this intervention was provided.	The *Project Approach* Curriculum focuses on in-depth investigations of real-world topics. The curriculum has three components: spontaneous play, systematic instruction, and project work. Structural features of *Project Approach* include: discussion, fieldwork, representation, investigation, and display. According to the curriculum, classrooms should spend at least 45 minutes to 60 minutes engaged in investigation and discovery. Mentoring visits as part of the professional development of this project focused on: clarifications and reminders about the components of *Project Approach,* suggestion and feedback for planning and intervention, and provision of resources to support project work.

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Table A-4b. Comprehensive Curricula Studies: Features of Professional Development —Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Priest and Zoellick (2008)	Since Creative Curriculum was in use in both treatment and control conditions, all teachers received at least one day of Creative Curriculum training from a staff member at Teaching Strategies, Inc. Treatment group teachers also received training in Ladders to Literacy to implement 27 language and literacy activities that covered three domains (print or book awareness, metalinguistic awareness, and oral language).	None reported	The treatment group received their initial training in Ladders to Literacy in September of the preschool year, followed by ongoing Ladders to Literacy training on a monthly basis throughout the school year (October 2003 to April 2004).	Because it was a Head Start setting, most children were from low-income families.	Print and book awareness, metalinguistic awareness, oral language		Ladders to Literacy curriculum is intended for use in inclusive classrooms with children with disabilities and ESL children. It includes more than 50 skill building activities organized into print/book awareness, metalinguistic awareness, and oral language.
Starkey, Klein, Clements, and Sarama (2008)	Treatment group participants received four full days of professional development training. These trainings occurred in September, November, January, and March.	*Ready, Set, Leap!* Curriculum aligns with the goals and research requirements of three entities: National Association for the Education of Young Children (NAEYC), National Head Start Association, Early Reading First initiative.	Four full days of professional development were provided to teachers in the treatment group. These trainings occurred in September, November, January, and March.	None mentioned.	Language and early literacy, mathematics, science, social studies, fine arts, health and safety, personal and social development, physical development, and technology applications	Chapter specifies that the *Ready, Set, Leap* Curriculum is research-based. However, no references to the literature are provided.	*Ready, Set, Leap!* Curriculum topics include: language and early literacy, mathematics, science, social studies, fine arts, health and safety, personal and social development, physical development, and technology applications. The curriculum places emphasis on: literacy or language development, particularly scaffolding; phonological awareness; alphabet knowledge; print awareness; oral language development; reading aloud; and reading comprehension through story discussion. Active engagement through touch, sight, and sound are emphasized and a home component with take home activities and family letters are included.

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Table A-4b. Comprehensive Curricula Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research	Description of Content/Curriculum
Thornburg, Mayfield, Morrison, and Scott (2008)	Training on *Project Construct* consisted of three 12-hour modules, four four-hour on-site consultations in the classroom, and two three-hour follow-up workshops with voluntary attendance. The three module topics were: the young child and learning environment, early literacy and expressive arts, and young children's mathematical and scientific thinking.	None mentioned.	The three 12-hour modules were offered in August, October, and November of the implementation year. Onsite consultations occurred after the teacher completed each module training session.	None mentioned.	Cognitive, representational, sociomoral, and physical	The *Project Construct* Curriculum is based on theory (constructivism). No mention of an empirical basis was made.	*Project Construct* is based on constructivism and was developed by the Missouri Department of Elementary and Secondary Education. This curriculum sets forth 29 goals within a context of four developmental domains: cognitive, representational, sociomoral, and physical.

Table A-4c. Comprehensive Curricula Studies: Outcomes

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Barnett, Jung, Yarosz, Thomas, Hornbeck, Stechuk, and Burns (2008)	Experimental (Random Assignment to Treatment and Control Groups)	Child measures: (1) PPVT-III (Dunn and Dunn, 1997) assessed receptive vocabulary. (2) Woodcock-Johnson - Revised and the Woodcock-Muñoz (WJ-R, Woodcock and Johnson, 1989; WM-R, Woodcock and Muñoz-Sandoval, 1996) assessed cognitive abilites and achievement. The Letter-Word Identification and Applies Problems subtests were administered. (3) Get Ready to Read (Whitehurst and Lonigan, 2001) assessed children's early literacy skills. (4) The Wechsler Preschool Primary scale of Intelligence Animal Pegs subtest (WPPSI) measured children's nonverbal problem solving and visual-motor proficiency. (5) The EOWPVT-Revised assessed expressive vocabulary. (6) The IDEA Oral Language Proficiency Test (OLPT; Ballard and Tighe, 1999) assessed the receptive and expressive language skills of Spanish-speaking children. (7) The teacher form of the Problem Behaviors Scale of the SSRS (Gresham and Elliot, 1990) assessed children's externalizing and internalizing behaviors. Classroom measures: (1) The ECERS-R (Harms et al., 1998) assessed global classroom quality. (2) The Supports for Early Literacy Assessment (SELA; Smith et al., 2001) assessed the quality of the literacy environment. (3) The Preschool Classroom Implementation (PCI) scale (Frede, 1989) assessed the frequence and use of teachers' scaffolding techniques. (4) The CLASS (Pianta et al., 2005) measured emotional climate, classroom management, and instruction.	Not assessed.	On the ECERS-R, SELA, and PCI, Tools classrooms scored higher than control classrooms on total scores, with an effect size of about 2. The Tools classrooms scored significantly higher on three ECERS-R subscales most closely related to curriculum: Language and Reasoning, Activities, and Interactions. Comparisons for individual items on the CLASS showed that Tools classrooms scored higher than control classrooms on productivity.	Using regressions, statistically significant effects of curriculum were found on the SSRS (effect size = .47) and the PPVT-III (es = .22) and OLPT (es = .35). However, when adjusting for multiple comparisons, the ordinary regression estimated effects on the PPVT and OLPT are not longer significant at the .05 level, adjusting for multiple comparisons. Using hierarchical linear modeling to account for the multi level nature of the data, the SSRS remained statistical significant, however the OLPT becomes significant at the .10 level, and the PPVT is no longer significant (p=.101).

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Table A-4c. Comprehensive Curricula Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Bierman, Nix, Greenberg, Blair, and Domitrovich (2008)	Experimental (Random Assignment to Treatment and Control Groups)	*Cognitive performance* :Backward word span task-working memory; Peg tapping task-working memory and inhibitory control; and DCCS-working memory, inhibitory control, and set shifting skills. *Behavioral performance* : Walk-a-line slowly task-behavioral inhibitory control on a motor task; Task orientation-sustain attention. *Langauge and emergent literacy* : Expressive One-Word Picture Vocabulary Test- vocabulary; Blending and Elision Scales of the Test of Preschool Early Literacy (TOPEL)-phonological sensitivity; and the Print Knowledge Scale of the TOPEL-children's familiarity with written text. *Social-emotional regulation* : Social Competence Scale- prosocial behaviors and emotion regulation; Seven items from the Teacher Observation and Child Adaptation-Revises (TOCA-R)-overt aggression; Preschool Social Behavior Scale-Teacher Form-relational aggression.	Not assessed.	Not assessed.	(1) Predicting gains: EF skills at the start of the year predicted significant gains in each of the language/emergent literacy skills and behavioral outcomes. The cognitive performance EF measures were more likely to account for unique variance in the growth of language and emergent literacy skills, while the behavioral performance EF measures were more likely to account for unique variance in social-emotional outcomes. (2) Moderation: The intervention did not moderate the impact of initial EF skills on cognitive performance EF measures, but did act as a moderator for some behavioral EF measures. Specifically, children with lower preintervention skills on the behavioral performance measures of EF showed higher levels of social competence, reduced aggression, and improved knowledge by the end of the year if they were in a HS REDI classroom. The children with higher preintervention skills performed the same regardless of intervention group. (3) Intervention Effects: There were no significant intervention effects on any outcomes except on the DCCS, with children in the intervention classrooms showing significantly greater gains that controls (effect size =- .20), and the task orientation in the same directions (effect size = .28). (4) Mediators: Task orientation was a significant mediator of the intervention effect on phonological sensitivity , as well as observer-rated social competence and observer-rated aggression.

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Table A-4c. Comprehensive Curricula Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Campbell and Milbourne (2005)	Pre-Post w/ Comparison Group (Not Randomly Assigned)	Arnett CIS and ITERS.	Not assessed	Consultation did not have a significant effect on caregiver interactions measured by the CIS. Consultation had no significant effects on ITERS. Twenty-one percent of the consultation rooms showed observable change compared to 5.7 percent of the no consultation rooms (statistical significance was not noted for this comparison). A significant interaction between time (pre or post) and consultation (yes or no) was found, primarily because the no consultation group decreased in average quality over time.	Not assessed.
Cassidy, Buell, Pugh-Hoese, and Russel (1995)	Pre-Post w/ Comparison Group (Not Randomly Assigned)	ECERS, ITERS, Teacher Beliefs Scale (TBS; 36 self-report items on a 1-5 Likert scale assessing the importance of various classroom practices) and the Instrumental Activities Scale (IAS; 34 self-report items on a 1-5 Likert scale which asks about the frequency of provision of various types of classroom activities).	The gain score on the TBS was significant for the scholarship group but not the comparison group (though overall pre-post differences were not significant for the full group)	ECERS and ITERS scores increased significantly for the scholarship group but not the comparison group. Additional analyses comparing "meaningful change" (.5 on the ECERS or ITERS) found that all six study participants who achieved this goal were scholarship recipients.	Not assessed.

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Table A-4c. Comprehensive Curricula Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Chambers and Slavin (2008)	Experimental (Random Assignment to Treatment and Control Groups)	The following child outcomes were assessed: mathematics (Woodcock Johnson [WJ] Applied Problems, Child Math Assessment-Abbreviated [CMA-A], Composite Score, and Shape Composition); reading (Test of Early Reading Ability [TERA], WJ Letter Word Identification, and WJ Spelling); phonological awareness (the Pre School Comprehensive Test of Phonological and Print Processing [Pre-CTOPPP], Elision subtest, Comprehensive Test of Phonologica Processing [CTOPP], Elision subtest); language assessments (Peabody Picture Vocabulary Test [PPVT] and Test of Language Development [TOLD]); and behavioral outcomes (Social Skills Rating system [SSRS] and Pre Scool Learning Behavior Scale [PLBS]). Classroom outcomes assessed were overall classroom environment (Early Childhood Environmental Rating Scale Revised [ECERS-R]), teacher-child relationships (Arnett Detachment, Harshness, Permissiveness, and Positive Interactions scales) and classroom instruction (Teacher Behavioral Rating Scale [TBRS], TBRS Written Expression scale, TBRS Phonological Awareness scale, TBRS Book Reading and Oral Language scales, and TBRS Math Concepts scale).	Not assessed	A positive impact on reading was found at the end of kindergarten. A positive impact was found at the classroom level on early language instruction.	No impacts on child outcomes were found.
Diamond, Barnett, Thomas, and Munro (2007)	Experimental (Random Assignment to Treatment and Control Groups)	(1) Dots task-congruent condition: children had to press on the same side as an image that appeared; Dots task-Incongruent: children had to press on the opposite side of the image, requiring inhibition of the tendency to respond to the side where the image appeared; Dots-Mixed-Incongruent and congruent trials were mixed. (2) Flanker task-children had to focus on a small shape in the middle instead of the large shape surrounding it. For the "Reverse" Flanker, children had to focus on the outside shape, inhibiting attention to the inside.	Not assessed.	Not assessed.	On the Dots-Congruent task, which had minimal EF demands, children in both groups performed similarly, though older children performed better. With the task requiring inhibition (Dot-Incongruent), Tools children significantly outperformed bBL children. Almost twice as many Tools as dBL children achieved >75 percent. On the Flanker task, again requiring inhibition, tools children significantly outperformed dBL children (85 percent compared with 65 percent). The most demanding Dots and Flanker conditions showed the largest effects.

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Table A-4c. Comprehensive Curricula Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Farran and Lipsey (2008)	Experimental (Random Assignment to Treatment and Control Groups)	For both Bright Beginnings and Creative Curriculum, the following child outcomes were assesed: mathematics (Woodcock Johnson [WJ] Applied Problems, Child Math Assessment-Abbreviated [CMA-A], Composite Score, and Shape Composition; reading (Test of Early Reading Ability [TERA], WJ Letter Word Identification, and WJ Spelling); phonological awareness (the Pre School Comprehensive Test of Phonological and Print Processing [Pre-CTOPPP], Elision subtest, Comprehensive Test of Phonologica Processing [CTOPP], Elision subtest); language assessments (Peabody Picture Vocabulary Test [PPVT] and Test of Language Development [TOLD]); and behavioral outcomes (Social Skills Rating system [SSRS] and Pre Scool Learning Behavior Scale [PLBS]). Classroom outcomes assessed were overall classroom environment (Early Childhood Environmental Rating Scale Revised [ECERS-R]), teacher-child relationships (Arnett Detachment, Harshness, Permissiveness, and Positive Interactions scales) and classroom instruction (Teacher Behavioral Rating Scale [TBRS], TBRS Written Expression scale, TBRS Phonological Awareness scale, TBRS Book Reading and Oral Language scales, and TBRS Math Concepts scale)	Not assessed.	Analyses showed significant improvements in early literacy and phonological awareness instruction in the Bright Beginnings classrooms. There were no statistically significant differences between teachers in Creative Curriculum and control classrooms.	Children whose teachers received Bright Beginnings and Creative curriculum training did not fare significantly better than children in control classrooms on any child outcome measure.
Kontos, Howes, and Galinsky (1996)	Pre-Post w/ Comparison Group (Not Randomly Assigned)	Demographics (age, education, ethnicity, marital status, and income); organization of family child care; business practices; motivation; work commitment; Arnett CIS; Howes Adult Involvement Scale; structural quality indicators (group size, ratio, experience, and number of workshops, courses or conferences), and FDCRS.	Training was associated with improvements in business practice (reporting child care income on taxes).	No improvements were reported on sensitivity, harshness, detachment, and involvement with children. Global quality improved in two of the three sites. The authors then define observable pre-post change as moving from a lower to higher level and increasing by one point (in a three category variable: inadequate, adequate, and good) or maintaining good quality. Nineteen percent of providers made an observable improvement, 73 percent made no observable change and 8percent got worse.	Not assessed.

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Table A-4c. Comprehensive Curricula Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Lambert and Abbott-Shim (2008)	Experimental (Random Assignment to Treatment and Control Groups)	The following child outcomes were assessed: mathematics (Woodcock Johnson [WJ] Applied Problems, Child Math Assessment-Abbreviated [CMA-A], Composite Score, and Shape Composition); reading (Test of Early Reading Ability [TERA], WJ Letter Word Identification, and WJ Spelling); phonological awareness (the Pre School Comprehensive Test of Phonological and Print Processing [Pre-CTOPPP], Elision subtest, Comprehensive Test of Phonologica Processing [CTOPP], Elision subtest); language assessments (Peabody Picture Vocabulary Test [PPVT] and Test of Language Development [TOLD]); and behavioral outcomes (Social Skills Rating system [SSRS] and Pre Scool Learning Behavior Scale [PLBS]). Classroom outcomes assessed were overall classroom environment (Early Childhood Environmental Rating Scale Revised [ECERS-R]), teacher-child relationships (Arnett Detachment, Harshness, Permissiveness, and Positive Interactions scales) and classroom instruction (Teacher Behavioral Rating Scale [TBRS], TBRS Written Expression scale, TBRS Phonological Awareness scale, TBRS Book Reading and Oral Language scales, and TBRS Math Concepts scale)	Not assessed.	Analyses showed significant improvements at the classroom level on overall classroom quality, teacher-child relationships, early literacy instruction, and early language instruction.	No impacts on child outcomes were found.
Powell and File (2008)	Experimental (Random Assignment to Treatment and Control Groups)	*Mathematics* : Woodcock Johnson Applied Problems, Child Math Assessment Abbreviated Composite Score and Shape Composition; *Reading:* Test of Early Reading Ability (TERA), Woodcock Johnson Letter Word Identification, Woodcock Johnson Spelling. *Phonological awareness* : Preschool Comprehensive Phonological and Print Processing (Pre-CTOPPP), Elision subtest, Comprehensive Test of Phonological Processing Kindergarten (CTOPP), Elision subtest.*Language Assessments:* Peabody Picture Vocabulary Test (PPVT), Test of Language Development (TOLD)- Grammatic Understanding Subtest.*Behavioral Assessments* : Social Skills Rating System (SSRS)- Social Skills and Problem Behaviors scales, Preschool Learning Behaviors (PLBS) *Overall Classroom Environment* : Early Childhood Rating Scale-Revised (ECERS-R).*Teacher-Child Relationships* : Arnett Detachment, Harshness, Permissiveness, Positive Interactions. *Classroom Instruction* : Teacher Behavior Rating Scale (TBRS) Print and Letter Knowledge, Written Expression, Phonological Awareness, Book Reading and Oral Language, and Math Concepts scales	Not assessed.	No significant differences between the control and treatment groups were found on overall classroom environment, teacher-child interactions, or classroom instruction.	The only statistically significant differences between children in the control and treatment groups were on the spring kindergarten assessment of the in behavior assessments with the treatment group exhibiting more problem behaviors (d=.49), displaying weaker social skills (d=-.44) and fewer learning behaviors (d=.-.42). There were no significant differences on any of the reading, math, phonological awareness, or language when comparing the treatment and control groups.

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Table A-4c. Comprehensive Curricula Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Priest and Zoellick (2008)	Experimental (Random Assignment to Treatment and Control Groups)	The following child outcomes were assessed: mathematics (Woodcock Johnson [WJ] Applied Problems, Child Math Assessment-Abbreviated [CMA-A], Composite Score, and Shape Composition); reading (Test of Early Reading Ability [TERA], WJ Letter Word Identification, and WJ Spelling); phonological awareness (the Pre School Comprehensive Test of Phonological and Print Processing [Pre-CTOPPP], Elision subtest, Comprehensive Test of Phonologica Processing [CTOPP], Elision subtest); language assessments (Peabody Picture Vocabulary Test [PPVT] and Test of Language Development [TOLD]); and behavioral outcomes (Social Skills Rating system [SSRS] and Pre Scool Learning Behavior Scale [PLBS]). Classroom outcomes assessed were overall classroom environment (Early Childhood Environmental Rating Scale Revised [ECERS-R]), teacher-child relationships (Arnett Detachment, Harshness, Permissiveness, and Positive Interactions scales) and classroom instruction (Teacher Behavioral Rating Scale [TBRS], TBRS Written Expression scale, TBRS Phonological Awareness scale, TBRS Book Reading and Oral Language scales, and TBRS Math Concepts scale)	Not assessed	A positive impact was found at the classroom level on early literacy instruction. There were no other significant improvements after the Ladders to Literacy supplementation.	No impacts on child outcomes were found.
Starkey, Klein, Clements, and Sarama (2008)	Experimental (Random Assignment to Treatment and Control Groups)	*Mathematics* : Woodcock Johnson Applied Problems, Child Math Assessment Abbreviated Composite Score and Shape Composition; *Reading:* Test of Early Reading Ability (TERA), Woodcock Johnson Letter Word Identification, Woodcock Johnson Spelling. *Phonological awareness:* Preschool Comprehensive Phonological and Print Processing (Pre-CTOPPP), Elision subtest, Comprehensive Test of Phonological Processing Kindergarten (CTOPP), Elision subtest.*Language Assessments* : Peabody Picture Vocabulary Test (PPVT), Test of Language Development (TOLD)- Grammatic Understanding Subtest.*Behavioral Assessments* : Social Skills Rating System (SSRS)- Social Skills and Problem Behaviors scales, Preschool Learning Behaviors (PLBS) *Overall Classroom Environment* : Early Childhood Rating Scale-Revised (ECERS-R).*Teacher-Child Relationships* : Arnett Detachment, Harshness, Permissiveness, Positive Interactions. *Classroom Instruction* : Teacher Behavior Rating Scale (TBRS) Print and Letter Knowledge, Written Expression, Phonological Awareness, Book Reading and Oral Language, and Math Concepts scales	Not assessed.	No significant differences between the control and treatment groups were found on overall classroom environment, teacher-child interactions, or classroom instruction.	The only statistically significant differences in math assessments between children in the control and treatment groups were on the fall assessment of the Shape Composition scale of the CMA-A assessment-treatment group outperforming control (d=.25), and on the CMA-A Composite Score in the spring- control group outperforming the treatment (d=-.24). There were no significant differences on any of the reading, phonological awareness, language, or behavior assessments when comparing the treatment and control groups.

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Table A-4c. Comprehensive Curricula Studies: Outcomes—Continued

Study	Rigor of PD Evaluation	Outcome Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practice	Child Outcomes
Thornburg, Mayfield, Morrison, and Scott (2008)	Experimental (Random Assignment to Treatment and Control Groups)	*Mathematics* : Woodcock Johnson Applied Problems, Child Math Assessment Abbreviated Composite Score and Shape Composition; *Reading* : Test of Early Reading Ability (TERA), Woodcock Johnson Letter Word Identification, Woodcock Johnson Spelling. *Phonological awareness:* Preschool Comprehensive Phonological and Print Processing (Pre-CTOPPP), Elision subtest, Comprehensive Test of Phonological Processing Kindergarten (CTOPP), Elision subtest.*Language Assessments* : Peabody Picture Vocabulary Test (PPVT), Test of Language Development (TOLD)- Grammatic Understanding Subtest.*Behavioral Assessments* : Social Skills Rating System (SSRS)- Social Skills and Problem Behaviors scales, Preschool Learning Behaviors (PLBS) *Overall Classroom Environmen* t: Early Childhood Rating Scale-Revised (ECERS-R).*Teacher-Child Relationships* : Arnett Detachment, Harshness, Permissiveness, Positive Interactions. *Classroom Instruction* : Teacher Behavior Rating Scale (TBRS) Print and Letter Knowledge, Written Expression, Phonological Awareness, Book Reading and Oral Language, and Math Concepts scales	Not assessed.	No significant differences between the control and treatment groups were found on overall classroom environment, teacher-child interactions, or classroom instruction.	The only statistically significant differences in math assessments between children in the control and treatment groups were on the spring pre-kindergarten assessment of the Shape Composition scale of the CMA-A assessment- control group outperforming treatment (d=.-.42). There were no significant differences on any of the reading, phonological awareness, language, or behavior assessments when comparing the treatment and control groups.

Table A-5a. General Approaches Studies: Methodology

Study	Research Questions	Research Design	Sample	General Comments
Arnett (1989)	Does the Tools of the Mind (Tools) curriculum produce significantly greater gains in children's social behavior, language, and literacy than a control curriculum? Compared to a control curriculum, does Tools produce significantly greater gains in classroom quality?	One school participated in this study. Teachers were randomly assigned by blocks. They were stratified by groups and then randomly chosen to implement the Tools curriculum. All treatment classes were placed on one floor, and control classes on another. Children with permission were then randomly assigned to either a Tools or control classroom. Children were assessed in the fall (October and November) and spring (late April through early June). Children were tested in Spanish or English.	The school district involved in this study is part of the "Abbott" preschool education program. The study took place in one school. A total of 218 3- and 4-year-old children were randomly assigned and participated in either a Tools or control classroom. In this sample, 93 percent of children were Hispanic, and 63 percent spoke English as their primary language.	Fidelity measures were developed to assess extent to which teachers correctly implemented the curriculum. Measures indicated that the curriculum was not fully implemented at the beginning of the year. There were no significant differences between Tools and control children's scores at pre-test.
Campbell and Milbourne (2005)	(1) Did children's executive function (EF) skills at the beginning of the prekindergarten year enhance their development in areas of cognitive and social-emotional school readiness? (2) Did these skills moderate their response to the Head Start REDI intervention? (3) Did the intervention improve children's EF Skills? (4) Did improvements in child EF skills mediate child outcomes in areas of cognitive or social-emotional school readiness?	Using stratified randomization, classes in three counties were divided into groups based on demographic characteristics, location (e.g., central or southeastern Penn.), and length of school day (e.g., full day, half day, year round). Within groups, centers were randomly assigned to the intervention or control group. Only 4-year-old children participated in the study, although classrooms included both 3- and 4-year-olds. Teachers were trained and implemented the intervention which included curriculum-based lessons, center-based extension activities, and training in "coaching strategies" to support skill development. Pre- and post-intervention child assessments were conducted by trained interviewers. One lead and one assistant teacher in each classroom provided ratings of child behavior. Additionally, at post-test, each child was observed during two 12 to 15 minute play sessions on two seperate days. Children were taken in groups of three to play with a toy and were rated by observers.	Three-hundred and fifty-six children in 44 Head Start classrooms (17 percent Hispanic, 25 percent African-American, 42 percent European American). Eight-six percent of eligible children participated.	Note that there is not extensive information in this article about the professional development that teachers received or the content of the Head Start REDI program. However, an article under review is referenced for readers to obtain more detailed information.

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Table A-5a. General Approaches Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Cassidy, Buell, Pugh-Hoese, and Russell (1995)	Does Curiosity Corner implementation produce greater gains in child and classroom outcomes compared to a control curriculum?	This study was part of the PCER report on the Effects of Preschool Curriculum Programs on School Readiness. SFA researchers identified school districts that had SFA and non-SFA elementary schools in the same area. They then recruited preschools based on whether the children would transition into both SFA and non-SFA elementary schools. Preschools were blocked into groups of two or more and then randomly assigned to the treatment or control group. In the control group, teachers used a variety of curricula including Creative Curriculum and Animated Literacy.	The SFA research team recruited preschool programs in three different states (Florida, Kansas, and New Jersey). They also targeted districts with SFA schools with preschool classes to fit their two (preschool curriculum type) two-by-two (SFA and non SFA kindergarten classrooms) study design. Across the three locations, data were collected from 211 children and 195 parents. The children were 4.7 years old and were primarily African-American (51 percent) and white (28 percent). 97 percent of the 31 teachers were female and they had an average of 10 years of teaching experience.	SFA researchers found that compared to a control condition, Curiosity Corner implementation did not significantly improve child outcomes. The implementation did have a positive effect on reading and early literacy instruction.
Fantuzzo, Childs, Hampton, Ginsburg-Block, Coolahan and Debnam (1997)	Does the Tools of the Mind Curriculum produce significantly greater gains in children's executive function (EF) skills than a comparison curriculum?	Teachers and assistants were randomly assigned to either the EF-training curriculum: Tools or the District's version of Balances Literacy Curriculum (dBL). Children were randomly assigned to the Tools or dBL curriculum.	The study initially included 18 classrooms, and three more per condition were added the following year. The sample included 147 children (62 in dBL and 85 in Tools) in their second year of preschool who received their respective curriculum for one or two years. One of the dBL classrooms dropped out after year 1.	Little information provided about professional development in this article.

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Table A-5a. General Approaches Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Fantuzzo, Childs, Stevenson, Coolahan, Ginsburg, Gay, Debnam, and Watson (1996)	Do two preschool curricula (Bright Beginnings and Creative Curriculum) affect child and classroom outcomes?	This study was part of the PCER report on the Effects of Preschool Curriculum Programs on School Readiness. Researchers randomly assigned pre school sites to one of three conditions: Bright Beginnings, Creative Curriculum, or Control. Teachers in the two treatment groups received training in their assigned curriculum. A follow-up evaluation was completed a year later.	The sample consisted of 309 children and and 259 parents from 21 full day preschool classrooms in six counties. Children were 4.5 years old at baseline data collection and 52 percent were male, 80 percent were white, 18 percent African-American, and 11 percent Hispanic. All 21 teachers were white and had an average of 11 years of teaching experience. All of the teachers had either a bachelor's or graduate degree.	Researchers found that conducting implementation trainings for Bright Beginnings and Creative Curriculum did not result in improved child or classroom outcomes. A positive impact was found at the classroom level on early literacy instruction and phonological awareness instruction in Bright Beginnings classrooms.
Fiene (2002)	Does Creative Curriculum implementation produce greater gains in child and classroom outcomes compared to a control curriculum?	This study was part of the PCER report on the Effects of Preschool Curriculum Programs on School Readiness. Researchers randomly assigned Head Start sites in North Carolina and Georgia to the treatment or control condition. The treatment group classrooms received training in Creative Curriculum and the control group classrooms used teacher-developed, nonspecific curricula.	Researchers recruited full day Head Start programs in North Carolina and Georgia. Data were collected on 190 children and 168 parents. At the time of the fall baseline data collection, children were 4.5 years old and the majority were African-American (85 percent). All 18 teachers participating were female and the majority were African-American (89 percent). The teachers had an average of 12 years of teaching experience and half (50 percent) had an associate's degree.	The Head Start teachers, assistants, and site managers were offered a stipend for participating in the study. Treatment and control classrooms were housed in the same centers, and there may have been a few instances where a treatment group teacher inadvertently shared aspects from Creative Curriculum with a control teacher. Focus groups did not reveal much information about sharing.

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Table A-5a. General Approaches Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Kontos, Howes, and Galinsky (1996)	Does implementation of the *Project Approach* Curriculum result in better child outcomes, measures of classroom environment, or measures of classroom instruction than implementation of a teacher-developed generic curriculum?	This study was part of the PCER report on the Effects of Preschool Curriculum Programs on School Readiness. Twelve of the 13 teachers were randomly assigned (one site had two teachers, in this site, both teachers were assigned to the same condition). The treatment group (seven classrooms) received Project Approach. The remaining six classrooms were provided two curricula (Doors to Discovery and Growing with Mathematics). However, teachers in the control classrooms reported using teacher-developed, nonspecific curricula.	Public pre-kindergarten classrooms were recruited via convenience sampling. A total of 13 teachers from 12 schools and 204 children were included in the sample. Children were an average of 4.6 years old at the time of baseline data colletion. Children were racially diverse (40% African-American, 28 percent white, 17 percent Hispanic). The 12 teachers in the sample were all white females. Teaches had an average of 11 years teaching experience with eight years teaching preschool. All of the teachers had at least a bachelor's degree and a current teaching license or certificate.	This study has a small sample size (13 classrooms).
Palsha and Wesley (1998)	For classrooms already using Creative Curriculum, does supplementation of Ladders to Literacy produce greater gains in child and classroom outcomes?	This study was part of the PCER report on the Effects of Preschool Curriculum Programs on School Readiness. Head Start classrooms were randomly assigned to the treatment or control condition. The treatment group classrooms received training in Ladders to Literacy. In the control classrooms, Creative Curriculum was implemented as it normally is (i.e., without the Ladders to Literacy add-on.	Researchers recruited Head Start classrooms, less than half of which were full-day programs. Data were collected on 123 children (62 treatment, 61 control) and 20 parents. Children were 4.6 years old at the time of baseline data collection and were ethnically diverse: 39 percent white, 11 percent African-American, 31 percent Hispanic. Most of the 14 participating teachers were female and white, and had an average of nine years of teaching experience. Twenty-nine percent had an associate's degree.	Researchers found that supplementing Creative Curriculum with Ladders to Literacy did not result in improved child outcomes. The only area of significant improvement was early literacy instruction.

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Table A-5a. General Approaches Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Pianta, Mashburn, Downer, Hamre, and Justice (2008)	To what extent does participation in the MyTeachingPartner (MTP) Consultation or Web-only conditions differentially associate with changes in the observed quality of teachers' interactions with children over the course of the school year? Which of these intervention conditions is more effective in a particular set of classrooms, namely those with a majority of children from high-poverty families and with low skill levels, and with teachers who made greater use of the web-based video exemplars?	Random assignment of teachers was conducted at the district level. Based on the distribution of numbers of classrooms per district, districts were classified into large, medium, and small, then assigned randomly by size to condition. All teachers received access to web-based versions of MTP lesson plans in language and literacy and a Web-version of PATHS (Promoting Alternative Thinking Strategies) curriculum in social competence. Teachers were asked to use these materials during the week. One group of teachers (n=52) received access to video-clip exemplars of high quality interactions. The other group (n=61) received MTP Consultation support. Teachers videotaped their implementation of an instructional activity in language or literacy or social competence, mailed the tape to their assigned consultant, who edited the tape into one to two minute segments that were paired with written feeback.	One-hundred and thirteen pre-kindergarten teachers, 61 in the Consultation group and 52 in the Web-only group. Teachers in the comparison represented 24 school districts statewide. Nintey-five percent of teachers were women. The majority of teachers reported their race/ethnicity as Caucasian (72 percent), 24 percent reported African-American, and 4 percent reported multi-racial. 66 percent of teachers had a B.A. degree and 35percent had advanced degrees, while 85 percent were specifically certified to teach 4-year-olds. Teachers had an average of 16 years of classroom experience, with High Scope and Creative Curriculum being the most common. Sixty-six teachers from 15 districts assigned to control condition (only child outcome data collected)	Article has detailed information about recruitment of participants. The state where the study was conducted not mentioned in article.
Wesley (1994)	Does implementation of the *Ready, Set, Leap!* Curriculum result in better child outcomes, measures of classroom environment, or measures of classroom instruction than implementation of the *High Scope* Curriculum?	This study was part of the PCER report on the Effects of Preschool Curriculum Programs on School Readiness. The 39 classrooms participating in this study were matched by teacher experience, school location, score on a state report card and other easily measured characteristics. Based on these matches, blocks of two or more were created. Random assignment to the treatment (*Ready, Set, Leap!*) or control group (*High Scope*) occurred within each of these blocks resulting in a total of 21 treatment and 18 control classrooms. Child assessments occurred in the fall (35 days after program implementation), spring of the Pre-K year, and fall of the Kindergarten year.	Prekindergarten programs in New Jersey whose directors attended a regional pre-kindergarten center meeting and NAEYC certified child care centers were recruited. All centers offered full-day prekindergarten. Thirty-nine classrooms, drawn from a convenience sample of 21 schools, participated in the study. A total of 286 families participated in the study. Children were approximately 4.5 years old upon entering the study. The majority of children were African-American and parents of children in the study were primarily unmarried, with a high school education or less, working full-time. Teachers in this study were primarily African-American with an average of eight years teaching experience, five years experience teaching preschool. The majority of teachers (69 percent) had a bachelor's degree.	Teachers and teacher assistants in both the treatment and control groups received an incentive for participating in the study. Fidelity to curriculum was measured through a triangulation of data from: coaching visits (three times per year), site coordinator ratings (three times per year), and observational coding based on a 90 second time sampling procedure.

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Table A-5a. General Approaches Studies: Methodology—Continued

Study	Research Questions	Research Design	Sample	General Comments
Whitaker et al. (2007)	Does implementation of the *Project Construct* Curriculum result in better child outcomes, measures of classroom environment, or measures of classroom instruction than implementation of a teacher-developed generic curriculum?	This study was part of the PCER report on the Effects of Preschool Curriculum Programs on School Readiness. Preschools collected via a convenience sample were organized into blocks of two based on matching by easily identifiable characteristics, such as teacher experience, school location, or score on a state report card. Random assignment occurred within these blocks resulting in 10 control and 11 treatment programs.	A convenience sample of full-day child care centers were recruited through phone calls and follow-up letters. Data were collected from 228 children (212 parents) from 21 preschool centers. Children were an average of 4.7 years old upon entering the study. The majority were white (65 percent) and African-American (25 percent). Of the 23 teachers who participated in this study, the majority were white (70 percent) or African-American (26 percent) with no college education (61 percent) and no teaching credential (78 percent). Teachers had an average of 10 years teaching experience and eight years experience teaching preschool.	Both treatment and control groups (one year post intervention) were offered free training in *Project Construct.* Additionally, the treatment classrooms received supplies and materials.

Table A-5b. General Approaches Studies: Features of Professional Development

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research
Arnett (1989)	A four course training program was developed by the Bermuda College. The program included courses in Communication and Child Development in the first year, and courses in Child Care and Preschool Activities during the second year. Following these courses, participants in the training program took place in a two-week practicum in which they worked alongside a caregiver previously trained in the Bermuda College program, or a more highly trained caregiver.	None described.	The four courses in the Bermuda College training program were semester-long. The practicum occurred after the completion of these courses.	Training was aimed at Child Care providers	Communication, child development, child care, preschool activities	The author notes that there was little previous research on the effects of differing training levels on child care providers' interactions with and attitudes toward the children in their care.
Campbell and Milbourne (2005)	Group training plus on-site consultation. Material was presented through active, hands-on, participatory learning with opportunities to apply information within the class session. Participants completed an out-of-class project to facilitate a strengths-based view of infants with special needs. Three one-hour consultation sessions were completed on-site. Participants completed a self-assessment (based on ITERS) and indicated whether they would to target the area for improvement. Consultants completed a summary sheet prior to consultation that indicated where ITERS subscale scores were below 3. Two outcomes were targeted through consultation. During the first visit the consultant and consultee jointly developed a follow-up plan for each of the outcomes (strategies to use, steps to be completed, who would be responsible, deadlines, etc.). The most commonly used strategies included providing or reviewing resources or materials, brainstorming, modeling and discussion. The second and third visits were used to implement the plan.	None described.	Training: five classes lasting three hours over three to four months; Consultation: Three one hour on-site visits (one after the first training, one after the second or third, and one before the fifth).	Training and consultation for providers working with low income infants and toddlers.	Infant and toddler development and classroom environment.	No information was provided about the research base for the training course. The training plus consultation model was loosely based on a small set of empirical articles.

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Table A-5b. General Approaches Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research
Cassidy, Buell, Pugh-Hoese, and Russell (1995)	Community college courses.	TEACH includes a scholarship and a salary increase or bonus when a provider completes a credential, certificate, degree.	The evaluation covered one year of participation in the community college course work	The focus of the professional development was on providers who had not previously taken college courses	Early childhood education.	The TEACH program was developed because of associations in the literature linking teacher qualifications and classroom quality
Fantuzzo, Childs, Hampton, Ginsburg-Block, Coolahan and Debnam (1997)	Collaborative Training between parents and teachers occurred both on-site and in off-site sessions at a Teacher Center. The focus of Collaborative Training is on (a) empowerment through mutual parent and teacher trainees collaboration, (b) the use of experiential, hands-on learning activities and (c) the use of indigenous parent and teacher exemplars to provide instruction and coaching at the Teacher Center as well as in the trainee's natural classroom environment. Parent-teacher teams from the same Head Start center attend training and work alongside an exemplary teacher-parent volunteer team. Thirty-three percent of CT training - exemplar led instruction and discussion; sixty-seven percent - participatory hands on activities. Workshop Training: Parents and teachers had separate experiences led by external experts and addressed the same overall objectives at the CT training. Over 75 percent was lectures and discussion. Some role plays were used but did not use field based observation or guided practice as in the CT group.	None reported.	Teaching Center training occurred in five sessions held over a 10-week period. Three sessions were half-days, and two sessions were full-days.	Providers and teachers served a diverse group of low-income children participating in Head Start.	Parent involvement and interactions with children.	This evaluation was designed specifically to improve upon a model of training that had been evaluated using an experimental design.

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Table A-5b. General Approaches Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research
Fantuzzo, Childs, Stevenson, Coolahan, Ginsburg, Gay, Debnam, and Watson (1996)	Collaborative Training between parents and teachers occurred both on-site and in off-site sessions at a Teacher Center. The Workshop Training occurred in the off-site Teacher Center	None reported	Classroom Training (CW): Training occurred in six sessions over a 12 week period (five half day sessions and one full day). Workshop Training (WT): Teachers had four full-day inservice sessions in which they attended one to two workshops per day; parents had community meetings at local centers over several two to three hour sessions.	Providers and teachers served a diverse group of low-income children participating in Head Start.	Parent involvement and interactions with children.	Curriculum is based on principles of social learning theory but only a handful of empirical studies are cited.
Fiene (2002)	On-site mentoring.	None described.	The mentoring occurred over a period of four months, but no details are provided about the number of visits conducted or the duration of each visit.	The focus of the intervention was on providers serving infants and toddlers.	Environment.	Not adequately described to know.

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Table A-5b. General Approaches Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research
Kontos, Howes, and Galinsky (1996)	Workshop training offered at a community college (two sites) and an RandR (one site). No details were provided about the characteristics of the trainers. Home visits were also conducted but no information was given about the purpose or content of the visits or who conducted the visits.	None described.	Varied across sites from 2.5-6 hour sessions totaling 15-25 hours of class time. No information was offered about the number of weeks over which the training was held.	Training was aimed at Family Child Care providers.	Covered business practices and issues expected to improve quality including	The training provided was designed to be more rigorous in breadth and depth than what was offered in other family child care training. There was no background information about whether the training was grounded in research.
Palsha and Wesley (1998)	Two-day in-service training for consultants; On-site consultation for consultees following a specified service process.	None reported, except that, as in Wesley 1994, a team approach was utilized to help create a shared knowledge that would help sustain changes.	Consultants made 10 to 14 visits to sites, each lasting one-to-four hours, over a period of 6-12 months.	Nineteen percent of the children were children with special needs.	Assessment and improvement of the child care environment.	The consultation model was developed using "best practice" recommendations from the literature on consultation. The assessment tools used (ITERS, ECERS and FDCRS) have been established as a valid assessment of quality that relates to children's outcomes.

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Table A-5b. General Approaches Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research
Pianta, Mashburn, Downer, Hamre, and Justice (2008)	Teachers received access to web-based versions of MTP lesson plans in language and literacy and a Web-version of PATHS curriculum in social competence. Teachers received a laptop computer to access Web sites. Web-only group received one to two minute video clips that accompany text from the CLASS (Classroom Assessment Sorting System) manual. Consultation group were assigned to a consultant for the year. Teachers sent videotapes of their activities to consultants who edited the tapes into small segments that corresponds to written feedback posted on a private website for teachers' viewing. Teachers and consultants then met on-line in a video chat to discuss feedback.	District coordinators wanted all teachers in their program to receive the same professional development.	Teachers were asked to implement an MTP-Language and Literacy activity for at least 10 min. a day, and a PATHS activity once per week. Teacher reports on frequency of use of materials varied. All teachers submitted digital videos of implementation of instructional activities every two weeks from September-June. Web only group accessed website at own choice. Consultation group feedback cycle lasted two weeks.	Focus of professional development was on teachers in state-funded pre-k program. The pre-K program is targeted to serve an "at-risk" population	Improve teacher-child interactions. Teachers given language, literacy, and social competence teaching materials	This PD model based on literature about quality teacher-child interactions in pre-k classrooms and from literature on early literacy instruction. Model also draws from literature on adult learning and the argument that coaching, mentoring, and consultation approaches to professional development are more effective.
Wesley (1994)	On-site consultation following a specified service process.	The authors note that administrators from four programs actively participated in the consultation, but this was not a requirement of the consultation. In other sites, programs were asked to include all staff who had direct impact on one another in the classroom. This "team" approach is used to solidify the new learning and prevent "backsliding" to old ways.	Consultation was delivered in 12 on-site visits (on average; no range was provided). No details were provided about the length of each visit. Programs were visited every two weeks, so a conservative estimate of the duration of consultation is six months (24 weeks).	Classrooms serving infants and toddlers with special needs were the focus of the project.	Assessment and improvement of the child care environment.	The consultation model was developed using "best practice" recommendations from the literature on consultation. The assessment tool used (ITERS) has been established as a valid assessment of quality that relates to child outcomes.

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Table A-5b. General Approaches Studies: Features of Professional Development—Continued

Study	Mode of Professional Development Delivery	PD Linkages with Infrastructure	Temporal Aspects of Professional Development	Participant Outreach	Content Area	PD Content Grounded in Research
Whitaker et al. (2007)	Varying levels of internet materials and print materials were provided to teachers as well as the chance to have video discussions with teaching consultants for the program.	There is no information about the link between the PD in this study and school/center administrative support.	Teachers were given a computer as part of the program and also received various levels of access to the main MTP Web site. The study was meant to gauge the teachers' involvement and initiative in using the website and services provided, therefore the possible involvement varied (that is, a teacher could have chosen not to access the website or materials at all or she could have accessed materials and training on a daily basis. Bi-weekly discussion groups were held for the "consultancy group" over the course of the year.	Intervention focused on teachers in pre-kindergarten classroom settings	A support program for teachers - teachers were offered the MTP Curriculum for Language and Literacy, Banking Time, and the PATHS curriculum - all meant to improve teachers skills in language, literacy, and social relationships.	The resources were combined in a total package that was tested and refined in a previous study by Kinzie et al., 2005

Table A-5c. General Approaches Studies: Outcomes

Study	Description of Content/Curriculum	Rigor of PD Evaluation	Outcme Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practive	Child Outcomes
Arnett (1989)	The Communication course included instruction in behavior management, fostering self-esteem, and talking to children on a developmentally appropriate level. The Child Development course was an introductory course covering stages and milestones of development. The course in Child Care provided health and nutrition information. The Preschool Activities course dealt with how to construct a pre-school curriculum.	Quasi-Experimental (no random assignment)	To assess differences in childrearing attitudes, the Parental Modernity Scale was administered. A 26-item Caregiver Interaction Scale was also used.	Not assessed.	For childrearing attitudes, a clear pattern was found toward less authoritarian attitudes as level of training increased. Caregivers who had completed half or all of the Bermuda College training program were found to be less authoritarian than those with no training. For observed behavior, there was a pattern toward a higher rating on the Positive Interaction factor of the Caregiver Interaction Scale as the amount of training increased. Also, those who had completed all or half of the training were rated lower on the Detachment factor than those with no training.	Not assessed.
Campbell and Milbourne (2005)	Group training content focused on key components of infant-toddler care: including children with special needs, caregiver-child relationships, strategies for promoting development and learning, brain-behavior relationships, inclusion and diversity, working with families and use of community resources.	Pre-Post w/ Comparison Group (Not Randomly Assigned)	Arnett CIS and ITERS.	Not assessed	Consultation did not have a significant effect on caregiver interactions measured by the CIS. Consultation had no significant effects on ITERS. Twenty-one percent of the consultation rooms showed observable change compared to 5.7 percent of the no consultation rooms (statistical significance was not noted for this comparison). A significant interaction between time (pre or post) and consultation (yes or no) was found, primarily because the no consultation group decreased in average quality over time.	Not assessed.

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Table A-5c. General Approaches Studies: Outcomes—Continued

Study	Description of Content/Curriculum	Rigor of PD Evaluation	Outcme Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practive	Child Outcomes
Cassidy, Buell, Pugh-Hoese, and Russell (1995)	Program recipients were required to enroll in A.A.S. program in Early childhood education or child development at a local community college and complete 12 to 20 credit hours during each year. The average number of courses taken during the year was four. The majority of courses taken related to ECE methods or child-related courses. 75 percent of students took two or more methods courses. Overall, 46 percent of courses taken were methods, 41 percent were child-related and 13 percent were general education.	Pre-Post w/ Comparison Group (Not Randomly Assigned)	ECERS, ITERS, Teacher Beliefs Scale (TBS; 36 self-report items on a 1 to 5 Likert scale assessing the importance of various classroom practices) and the Instrumental Activities Scale (IAS; 34 self-report items on a 1 to 5 Likert scale which asks about the frequency of provision of various types of classroom activities).	The gain score on the TBS was significant for the scholarship group but not the comparison group (though overall pre-post differences were not significant for the full group)	ECERS and ITERS scores increased significantly for the scholarship group but not the comparison group. Additional analyses comparing "meaningful change" (.5 on the ECERS or ITERS) found that all six study participants who achieved this goal were scholarship recipients.	Not assessed.
Fantuzzo, Childs, Hampton, Ginsburg-Block, Coolahan and Debnam (1997)	The field-based curriculum supported the early childhood curriculum used at the Teacher Center, provided more hands-on learning and focused on helping parents understand and practice developmentally appropriate techniques.	Experimental (Random Assignment to Treatment and Control Groups)	Teacher-Teacher Collaboration Scale: six-items that participants rate on a four-point Likert scale (alpha=.82). Teachers report on their seeking and sharing of teaching ideas, materials, resources and advice, the amount of interaction occurring between classrooms and the level of cohesiveness among teaching teams. Interaction Coding System: Coding of adult-adult interactions completed for a 10-minute sample of a group activity selected by parents and teaching staff. Interactions during 15-second intervals were coded continuously for each adult in the classroom. Codes qualified the nature of interaction: directive vs. nondirective and positive vs. negative; codes also qualified each adult's role in the interaction (initiates vs. responds). Interrater reliability was high.	Not assessed	CT teachers and parents reported more satisfaction with the training than those in the WT group. Teachers in the CT group reported greater teacher-teacher collaboration and higher levels of collaboration with parent volunteers than teachers in the CT groups. Parents in the CT group reported higher levels of collaboration with teachers, and articipa-ted more in classroom activities, than parents in the WT group. Parents and teachers in the CT group made more non-directive and directive initiations than adults in the WT group. Teachers and parents in the CT group displayed more instruction, praise and supportive touch with children than teachers and parents in the WT group. Parents in the CT group also displayed more verbal exchanges and responses to child initiations than parents in the WT group (there were no CT or WT differences on these categories for teachers). Teachers in both groups showed higher levels of adult-child positive interactions than parents. Teachers in the CT group showed the highest level of positive instruction and praise.	Not assessed.

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Table A-5c. General Approaches Studies: Outcomes—Continued

Study	Description of Content/Curriculum	Rigor of PD Evaluation	Outcme Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practive	Child Outcomes
Fantuzzo, Childs, Stevenson, Coolahan, Ginsburg, Gay, Debnam, and Watson (1996)	In the Collaborative Training approach (a) training methods emphasized experiential hands-on learning, (b) instruction and coaching were provided by indigenous exemplars and (c) parent and teacher trainees participated in training together. Exemplary teacher parent teams were videotaped in various daily activities. During training, participants viewed the tapes and identified practices they wanted to adopt and then practiced the new methods. They were taped in their own classroom settings and received feedback from co-participants and exemplars. In Workshop Training, teachers and parent received separate training experiences led by outside experts giving lectures, presenting materials and leading discussions. Some role plays were used but did not use field based observation or guided practice as in the CT group.	Experimental (Random Assignment to Treatment and Control Groups)	Active Involvement in Training Scale: 15-item dichotomous scale on which parents and teachers rate the training experience; Training Satisfaction Scale: 11-item four-point Likert scales completed by teachers and parents; Teacher-Parent collaboration scale: 18 items on a four-point scale rating teacher-parent relationship, teachers' perception of the value of including parents in the classroom, how teachers structure parent involvement, level of center support for parent involvement. Parent Affirmation Scale: 15 items, dichotomous, assesses parents' perceptions of their classroom experiences. Parent Role in the Classroom: nine items on a four-point Likert scale. Questions reflect the degree to which parent volunteers feel that their classroom role and authority are clear, and congruent with their knowledge and skill level. Adult Child Interaction Coding System: two independent coders coded 20 minutes during a group classroom learning activity for (1) positive initiations to children (2) positive responses to children's initiations, (3) positive participation in group activities, and (4) negative verbalization.	Not assessed	Teachers and parents in the CT group reported higher levels of active involvement in the training and greater satisfaction than teachers and parents in the WT group. Teachers in the CT group reported higher levels of collaborative classroom activity, while parents reported higher levels of teacher support and affirmation. CT and WT Parents did not differ in reports of their perceived role in the classroom. On adult-child interactions, there were no differences between CT and WT on participation in group activity and three of the four positive initiation categories (physical gestures, instruction, and verbal exchanges). WT parents and teachers together made more responses to child initiations than CT parents and children. CT teachers were observed to praise more than WT teachers.	Not assessed.
Fiene (2002)	The mentoring model used a problem solving approach. Mentor first developed relationship with the mentee then began making suggestions. Few details about the mentoring process were described.	Experimental (Random Assignment to Treatment and Control Groups)	ITERS, Arnett CIS, the Knowledge of Infant Development (KIDI) and the Bloom Scales of Organizational Climate.	No pre-post difference on the KIDI.	No pre-post difference on the ITERS, the CIS, or the Bloom. Follow up tests are inappropriate but show that Routines and Learning Activities from the ITERS and sensitivity from the CIS were increased.	Not assessed.

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Table A-5c. General Approaches Studies: Outcomes—Continued

Study	Description of Content/Curriculum	Rigor of PD Evaluation	Outcme Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practive	Child Outcomes
Kontos, Howes, and Galinsky (1996)	Training was developed to address local needs but certain components were required at all sites including business practices; local regulations; health, safety and nutrition; child development and age-appropriate activities; environments to promote learning, guidance and discipline; special needs children; parent-provider relationships; professional development and community resources; diversity issues; and personal and family development.	Pre-Post w/ Comparison Group (Not Randomly Assigned)	Demographics (age, education, ethnicity, marital status, and income); organization of family child care; business practices; motivation; work commitment; Arnett CIS; Howes Adult Involvement Scale; structural quality indicators (group size, ratio, experience, and number of workshops, courses or conferences), and FDCRS.	Training was associated with improvements in business practice (reporting child care income on taxes).	No improvements were reported on sensitivity, harshness, detachment, and involvement with children. Global quality improved in two of the three sites. The authors then define observable pre-post change as moving from a lower to higher level and increasing by one point (in a three category variable: inadequate, adequate, and good) or maintaining good quality. Nineteen percent of providers made an observable improvement, 73 percent made no observable change and 8 percent got worse.	Not assessed.
Palsha and Wesley (1998)	A model of on-site consultation that uses the environmental rating scales as a description of needs that can serve as a springboard for consultation (by providing a framework for quality against which current practices could be compared. The model emphasizes collaboration to identify strategies for change. Consultants promote change by enabling consultees to improve their practice.	Pre-Post w/o Comparison Group	ITERS, FDCRS, and ECERS were completed before and after the consultation as well as six months later.	Not assessed	ITERS: pre-post comparison (n=7), significant differences on mean and on three of seven subscales; follow-up (n=3), significant differences on mean and seven of seven subscales. ECERS: pre-post comparison (n=14), significant differences on mean and seven of seven subscales; follow-up (n=10), significant differences on mean and seven of seven subscales. FDCRS: pre-post comparison (n=4), no statistically significant differences on mean or subscales; follow-up (n=3) no significant differences on mean or subscales (except of one category, space and furnishings).	Not assessed.

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Table A-5c. General Approaches Studies: Outcomes—Continued

Study	Description of Content/Curriculum	Rigor of PD Evaluation	Outcme Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practive	Child Outcomes
Pianta, Mashburn, Downer, Hamre, and Justice (2008)	MyTeachingPartner Web-based lesson plans in language and literacy. A Web-version of the Preschool PATHS-Promoting Alternative Thinking Strategies curriculum in social competence. Video exemplars of high-quality teacher-child interaction tied to CLASS dimensions (Emotional Support, Classroom Organization, Instructional Climate) Consultants trained in teaching young children and was trained to reliability on the CLASS.	Experimental design (Random assignment to one of two forms of interaction-focused professional development support).	Observers' ratings of teacher-child interactions on domains (Emotional Climate, Classroom Organization, Instructional Support) described on a seven-point rating scale on a minimum of four occasions across the school year.	None assessed.	Teachers in the Consultation condition had more positive growth compared to teachers in Web-only condition for each of the seven dimensions of teacher-child interactions. For Teacher Sensitivity, Instructional Learning Formats, and Language Modeling, the rates of change were significantly different between Consultation and Web-only teachers. Consultation condition teachers showed greater improvement in aspects of interaction involving reading,responding to student cues, using a variety of instructional formats, and stimulating language development. Teachers in high-poverty classrooms who received Consultation had greater increases in quality of teacher-child interactions.	Preliminary analyses indicate significant gains for child outcomes in literacy and language for children in classrooms receiving consultation (report in preparation at time of press).
Wesley (1994)	Repeated on-site visits were used to enhance the relationship between consultant and consultee (to show a commitment to change, to experience routines first hand, to understand the concerns, needs and resources). The joint assessment of the program was implemented so that consultees could gain skills to diagnose their own needs and to avoid the perception that the consultant was there to monitor or to be the expert.	Pre-Post w/o Comparison Group	ITERS was completed by a third party evaluator (i.e., not the consultant or consultee who were also using ITERS) before and after consultation. Satisfaction of consultees with the consultation process was assessed using likert scale ratings (1 to 5, unsatisfactory to excellent).	Not assessed.	A test of pre-post ITERS scores revealed significant differences on six of seven subscales: Furnishings and Display, Personal Care Routines, Listening and Talking, Learning Activities, Interaction, and Program Structure. No pre-post differences were found on the Adult Needs subscale. Exact mean scores were not provided but a review of figure 3 shows that all subscale scores were below 4 prior to consultation. After consultation, scores were at 5 or above on Furnishings and Display and Listening and Talking.	Not assessed.

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Table A-5c. General Approaches Studies: Outcomes—Continued

Study	Description of Content/Curriculum	Rigor of PD Evaluation	Outcme Measures	Outcomes in Educator Knowledge	Outcomes in Educator Practive	Child Outcomes
Whitaker et al. (2007)	Access to a Web site which offered these three curricula/resources: MTP curriculum for language and literacy development, a 36-week set of child-driven activities that focus on language and literacy development, Banking time: a set of techniques designed to build positive, supportive relationships between a teacher and her students, PATHS curriculum, thirty-six week set of activities designed to promote skills for developing positive social relationships.	Quasi-Experimental (Post-Intervention Only with Controls for Baseline Group Differences)	Teachers completed post evaluation surveys and also participated in focus groups. Additionally, usage of the MTP website was monitored through Web server logs throughout the year to determine teachers frequency of visits to the program website as well as duration of visits.	Not assessed	Not assessed.	Not assessed.