

SECTION 2, CHAPTER 5

**IMPROVING QUALITY AND IMPACT
THROUGH WORKFORCE DEVELOPMENT
AND IMPLEMENTATION SYSTEMS**

Robert C. Pianta, Ph.D., University of Virginia

Bridget K. Hamre, Ph.D., Teachstone



INTRODUCTION

It is evident that the benefits of publicly funded early education and care programs, while significant, are not sufficiently large to close the notable gaps in children’s learning and development at the start of school. Most efforts to increase program benefits have focused on workforce development, whether through traditional teacher preparation in higher education or through professional development (PD) for practicing teachers. Overall, workforce development has demonstrated mixed benefits, on average, for teachers or children (Fukkink & Lont, 2007; Snyder, Hemmeter, Meeker, Kinder, Pasia, & McCloughlin, 2012). But studies also report examples of proven-effective, workforce-focused PD interventions with significant positive impacts on teacher and student performance (e.g., Neuman & Cunningham, 2009; Landry, Swank, & Anthony, 2011; Pianta, Hamre, Downer, et al., 2017). This chapter addresses the gap between proven-effective PD and efforts to deliver PD that has a widespread impact on the workforce and children. Overall, PD is hampered by, among other things, varying standards across the states; less-than-effective coaches; and gaps between how implementation science says PD should work and how it is put to work in practice. When PD is intentional and integrated, it is more likely to be effective and can provide a better unified, quality experience for children across varied settings and teachers. Areas for improvement include ensuring that PD has a clear focus and targets specific outcomes; supporting the PD workforce; providing course-based PD; and using certified PD providers.

A FRAGMENTED SYSTEM, VARIED WORKFORCE, INEFFECTIVE APPROACHES

Early education and care encompasses many programs under a variety of names and auspices for children who have not yet entered kindergarten. They include state-funded pre-K, community preschools, Head Start, and family- and community-based child care. Many children are enrolled in more than one such program at any given time, and most are exposed to multiple forms of programming at different ages. The result is great variation and fragmentation for children, families, programs, and the workforce, which is reflected not only in children’s exposure to multiple programs, but also in the needs of a workforce whose educational qualifications range from high school equivalents to advanced degrees. Providers often see their programs as existing in silos at the same time that their different approaches and resources constitute a whole experience for children, potentially hampering effective child development. We suspect that effective PD, implemented well across the early education system, could create more continuity and value for children, educators, and families. It may be that a more consistent, systemic focus on a few organizing principles that make for effective teaching and PD—child-centric, teacher-child interactions, intentionality, personalization, teacher-parent interaction—could make the education experience more effective across all the settings a young child may traverse.

Many children are enrolled in more than one such program at any given time, and most are exposed to multiple forms of programming at different ages.

As just one example of fragmentation, consider that children can expect a stunning level of variation from year to year and setting to setting in even the most basic qualifications of the early education and care workforce. Although 95% of kindergarten teachers have a bachelor's degree, preschool teachers vary widely in their level of training. On average, they receive less training and education than do their elementary school counterparts (Early et al., 2007; Ryan & Whitebook, 2012). Even among teachers in state-funded pre-K programs, minimum requirements can range from a Child Development Associate (CDA) certificate to an associate degree to a bachelor's degree (Barnett et al., 2016). Furthermore, some states require that the two- or four-year degree be in early childhood education (ECE) or child development, whereas others do not specify a field of study. Thus, even in state-funded pre-K programs and kindergarten, which are fairly well regulated, the preparation and qualifications deemed necessary for the workforce vary substantially. Head Start has national standards for program structure, operation, and teacher credentials but does not require all teachers to have college degrees. In 2007, Head Start increased its educational standards for teachers and educational coordinators, such that a minimum of 50% of lead teachers would have at least a bachelor's degree by 2013, a goal that was attained at considerable expense in time, effort, and funds.

For children enrolled in less-regulated family- or center-based child care, exposure to credentialed or degreed staff is even lower (National Registry Alliance, 2013; Ryan & Whitebook, 2012). The National Association for Regulatory Administration's 2008 child care licensing study (NCCITA & NARA, 2010) was one of the most comprehensive examinations of the child care workforce. Data from 49 states and the District of Columbia showed that in the vast majority of states (42), child care-center directors are required to have only some occupational–vocational training, some higher education credit hours in ECE, or a CDA credential. Only one state required that directors hold a bachelor's degree. Similarly, for individuals considered as teachers in licensed child care centers, 40 states required some combination of a high-school degree and experience. Only 10 states required a vocational program, certificate, or CDA, and 13 had no requisite educational qualification for child care teachers—a pattern of low-level qualifications and compensation that remains the case today (Whitebook, Phillips, & Howes, 2014).

Clearly, states (and the field in general) have not settled on a set of minimum qualifications for adults serving as teachers of young children, whether they work in private child care, Head Start, or public pre-K. To the extent that these settings are expected to contribute to children's learning and development, then characterizing these adults as teachers and explicitly outlining qualifications and competencies aligned to that role would be a first step. Moreover, there is little agreement on the performance standards that should be applied to this role or on how to measure those standards, and the preparation and PD experiences that should align with such performance standards are woefully out of synchrony.

Unsurprisingly, given the uncertainty regarding basic qualifications, the variation in the nature and quality of training, and the low compensation for the early education and care workforce (Whitebook et al., 2014)—which

discourages higher education—it’s difficult to provide effective training and PD. Given the increased costs associated with additional training and degrees, it becomes even more important to justify the costs by showing that those experiences impact students’ learning and achievement. We know too little about the knowledge and competencies that representative members of the workforce display and how such knowledge and competencies map to the needs and outcomes of the children they serve, or the focus and impact of curricula or PD programs. And we have good evidence that the early education and care workforce experiences high levels of stress and workplace demands that undermine the quality of the care it provides (Whitaker, Dearth-Wesley, & Gooze, 2014). Moreover, PD and workforce training in early education and care is not often tailored to the individual professional’s needs, or to curricula or programs being implemented; instead, it is fairly generic, loosely coupled to practice, and marginally effective. Overall, the early education and care workforce operates on razor-thin margins of support, whether it be in the form of compensation, regulation, or PD.

GAPS IN KNOWLEDGE, TOOLS, AND IMPLEMENTATION

The disconnect between the needs of the early childhood workforce and scaled implementation of effective PD is a tremendous impediment to improving young children’s learning. This is true even when a number of early childhood workforce PD models in controlled evaluations have demonstrated benefits for teachers and for children (e.g.,

The disconnect between the needs of the early childhood workforce and scaled implementation of effective PD is a tremendous impediment to improving young children’s learning.

Bierman, Nix, Greenberg, Blair, & Domitrovich, 2008; Hamre, Pianta, Burchinal, & Downer, 2012; Raver et al., 2008). One would think that these models, once made available or disseminated, would be adopted and would yield expected benefits, at least according to the logic of research, development, and dissemination that underlies most education science (Pianta & Hofkens, 2018). Yet, even though federal and state funding has poured into initiatives emphasizing support for the teaching workforce—including for Head Start quality improvement and teacher education, for the Race to the Top-Early

Learning Challenge, and for Quality Rating and Improvement Systems—few benefits have been detected for children or for teachers’ skills (Pianta & Hofkens, 2018).

Recognizing the need and value for PD, policymakers have made significant investments in the workforce, which is a first step. But that investment does not focus enough on proven-effective PD models. Unfortunately, teachers rarely experience PD that reflects features of specificity and alignment to practice. In fact, a recent survey that was representative of the 1 million teachers in center-based programs for children aged 0 to 5 years indicates that the predominant form of PD is a one-hour workshop only tangentially connected to teachers’ everyday practice and known to be ineffective (McCormick Center for Early Childhood Leadership, 2016; Zaslow, Tout, Halle, Whittaker, & Lavelle, 2010).

We reflect on this conundrum from the perspective of having worked for more than a decade to develop, evaluate, implement, and scale tools for assessing and improving quality in early education and care through workforce development. Collectively, our activities have included: training observers to acceptable standards of agreement; supporting large-scale implementation of classroom observations; developing and evaluating coaching, coursework, and workshop-style PD; and working with states and local systems' own initiatives that draw from an assortment of tools. This work has ranged from the early stages of research and development to implementation at scale.

In these efforts, we have witnessed stunning variation in state and local needs, workforce strengths, goals for program improvement or child learning, and the skill and knowledge profiles of educators (Barnett et al., 2015). We have also noted the manner in which this variation—at all levels and in all forms—intersects with the goals of standardization, consistency, and fidelity that are paramount in developing, evaluating, and using educational programs and tools to produce the effects for which they are designed and intended. Most of the time, the conditions that render a PD model or tool “proven effective” are misaligned with the realities of local programs and staffs, which constrains the extent to which even the best-developed and easiest-to-use tool fits local needs or goals and can be implemented locally with consistency and potency.

Implementation science can offer a framework for knitting together the potential of proven-effective training and PD with the everyday realities of classroom practice, program capacity, and surrounding systems. This is because implementation science, with its focus on identifying and engineering the conditions that influence and explain strong and weak implementation, can create the kind of systemic and aligned programs of professional training and development that foster improvements in classrooms and impacts on children.

We see tremendous potential for progress. At no other time has the field been as poised to enable sustained, positive change. Multiple stakeholders now recognize that high-impact implementation through redesigned workforce development is the key to making good on investments in access made over many decades. We understand that classroom processes are the key mechanisms through which workforce development transmits benefits to children. Effective tools (curricula, assessments, coaching models) are available. We know more now about workforce needs than we did 10 years ago. And research on the elements of effective PD provides a steady stream of largely consistent findings. Yet, although research has generated considerable new knowledge and a wide range of tools for classroom use, successful translation and use of that knowledge is spotty and weak. The essential gaps, regardless of whether we have evidence-supported tools and curricula, reside in systems for using, applying, and implementing knowledge.

A STARTING POINT: FEATURES OF PD THAT IMPROVE TEACHING AND LEARNING

Reports have clearly described the features of PD that relate to improved practice and student learning (Zaslow et al., 2010). When targeted, practice-aligned PD supports are available to teachers, student skill gains can be considerable—at times on the order of half a standard deviation and higher in some subgroups. Recent meta-analyses of PD for early childhood educators have shown positive effects at the classroom, educator, and child levels (Markussen-Brown, Juhl, Piasta, Bleses, Hojen, & Justice, 2017). For example, in the social-emotional domain, PD that focuses directly on child care providers' interactions with children leads to higher-quality classroom environments, adult-child interactions, and child behaviors (Werner, Linting, Vermeer, & Van IJzendoorn, 2016). In language and literacy, PD improved teaching and children's phonological awareness and alphabet knowledge (Markussen-Brown et al., 2017). Larger effects are typically reported more for proximal outcomes (e.g., classroom- or teacher-level) than for distal outcomes (e.g., children's learning), a finding that is common in the PD literature more broadly.

► Focus on teacher skills and relevant knowledge

A starting point for identifying, implementing, and eventually scaling effective PD is to consider the PD target and the system in which it will be implemented. As Burchinal (this volume) suggests, classroom observation of teacher practice is often viewed as a source of information on the focus or target of PD, as is teachers' knowledge of children's development or of a curriculum. To the extent that such practices or knowledge reflect features of quality that are linked to children's learning, there is a stronger basis for selection as a focus for PD.

Several examples demonstrate the systematic use of validated tools to observe teachers' practice as a focus for PD. For example, Hemmeter, Fox, & Snyder (2013) have used the Teaching Pyramid Observation Tool (TPOT) (Fox, Hemmeter, & Snyder, 2014) to guide their coaching work, which focuses on teachers' support for children's social and emotional skills. The TPOT measures a set of practices, identified in research on classrooms, which are known to promote positive behavior among young children. From the standpoint of linked PD, coaches who use the Practice-Based Coaching approach to intervention conduct TPOT observations to define targets for their work with teachers. Several studies have shown that linking TPOT observations to coaching on specific TPOT-identified and described behaviors leads to changes in teachers' practice (Hemmeter, Fox, & Snyder, 2013; Hemmeter, Hardy, Schnitz, Adams, & Kinder, 2015). Moreover, this approach has been shown to improve children's teacher-reported and -observed social skills, which is the model's desired outcome.

In another example of scaled-up PD linked to targeted observations, Landry, Anthony, Swank, and Monseque-Bailey (2009) built many of their effective coursework and coaching approaches explicitly from the CIRCLE TBRS (Landry, Crawford, Gunnewig, & Swank, 2002), an observational measure articulating 50 specific teaching behaviors that have been linked to children's development and learning in the social-emotional and literacy domains.

PD models designed around the Classroom Assessment Scoring System (CLASS) (Pianta, La Paro, & Hamre, 2008) include a college course and a video-based coaching model that have demonstrated positive impacts on teaching practice and, in some studies, on student outcomes (Downer et al., 2011; Pianta et al., 2017; Pianta, Mashburn, Downer, Hamre, & Justice, 2008). Hamre et al. (2012) demonstrated that the course improved the quality of teachers' interactions with children and their observation skills, an effect that remained detectable a year later (Downer et al., 2011). Experimental evaluations of MyTeachingPartner (MTP) coaching showed improvements in pre-K teachers' interactions with students, effects that doubled in high-poverty classrooms. When teachers received MTP coaching, children made greater gains in receptive vocabulary, task orientation, and prosocial assertiveness. A second evaluation of MTP, using local coaches with 450 pre-K teachers at 15 sites, showed that coaching improved nearly every CLASS dimension (and particularly instructional support), with effect sizes averaging .5 to .75 standard deviations (Downer et al., 2011), and produced overall gains in children's self-regulation skills and classroom-level language behavior (Pianta et al., 2017). In classrooms where children differed little in age, benefits were detected for children's literacy and language development skills as well (Ansari & Pianta, 2018). Notably, there was some evidence of a dose-response relation between the amount and target of MTP coaching and the level and dimension of gain in teachers' quality of interaction (Pianta et al., 2014).

In the area of teaching practices that support children's development in mathematics, Clements and colleagues (Baroody, Clements, & Sarama, 2019) have repeatedly demonstrated an impact on teachers and children from observing teachers' practice, both generally and while implementing a curriculum, and the potency of providing them with feedback, modeling, and coaching support within an integrated curricular and PD package (Clements et al., 2018). And in science education, Piasta, Logan, Pelatti, Capps, and Petrill (2015) report a similar pattern of findings linking observation with PD to drive improvements in practice.

Many PD programs with demonstrated impacts have used other methods to identify teaching practices to focus on (e.g., Piasta et al., 2012; Williford et al., 2017). As just one example, Barton, Fuller, & Schnitz (2016) developed a performance feedback model for pre-service teachers that targeted seven teacher practices for supporting children in inclusive settings. Those practices were derived from careful analysis of the empirical literature and became a focal point for feedback on candidates' emerging competencies.

It may seem obvious that PD should focus on evidence-based teaching practices, but experience and the limited available data suggest that much PD for teachers does not do so. In one review of 256 published studies of ECE PD, only 25% had explicitly focused on teaching practices (Snyder et al., 2012). And the vast majority of practice-focused PD targets more generalized teaching practices, early literacy, and/or social-emotional teaching (Schachter, 2015).

A meta-analysis of language and literacy PD packages found that including any coaching component resulted in significantly better teacher practice ($d = .68$ with coaching, $d = .22$ without coaching; Markussen-Brown et al., 2017). In another meta-analysis, Werner et al. (2016) found that programs including individualized follow-up for teachers had significantly larger effect sizes on teacher outcomes than did programs without that type of follow-up. But most early childhood teachers lack access to coaches or follow-up. Based on data from the National Survey of Early Care and Education (Tout, Halle, Datta, & Snow, 2015), only 36% of preschool teachers reported that they had received any coaching, mentoring, or consultation in the past year.

PD research has also examined teachers' knowledge of practice-relevant information. A few studies have systematically tested the effects of a specific course that aims to enhance knowledge of children's skill development, or of curriculum and practice relevant to implementation, with some promising results (Dickinson & Caswell, 2007; Howes, Galinsky, & Kontos, 1998; Kontos et al., 1996; Neuman & Cunningham, 2009). Neuman & Cunningham (2009) demonstrated that a course focused on knowledge and practices related to fostering young children's language and literacy development impacted the observed practices of child-care providers. Examining a course focused on teachers' knowledge of the dimensions of teacher-student interaction and their skills in identifying different features of interaction, Hamre et al. (2012) found positive impacts on teachers' classroom interactions that approached the effects of coaching. And Clements and colleagues (Clements et al., 2018) recently reported that exposing teachers to information on children's learning trajectories can improve practices in mathematics instruction. In sum, the evidence clearly shows that when PD provides selective and practice-relevant information, teacher and child outcomes can improve.

► **Ensure sufficient intensity and duration**

Intensity and a greater duration of PD consistently leads to improvements in teachers' practice (Garet, Porter, Desimone, Birman, & Suk Yoon, 2001; Markussen-Brown et al., 2017). Markussen-Brown and colleagues (2017) reported a wide range of intensity among the studies they included in their meta-analysis of PD, from six to 450 total hours; they found greater changes in teaching practice among PD programs with greater intensity. Unfortunately, we do not know exactly how much PD is enough, though it is likely that the answer depends greatly on the desired outcome. Smaller elements of practice can change as a result of relatively moderate-intensity PD. For example, Promoting Early Literacy in Licensed Care (PELLC) was designed to be a modest effort in terms of dosage and cost (Gerde, Duke, Moses, Spybrook, & Shedd, 2014), with a course consisting of five sessions, each lasting two hours, for a total of 10 hours of PD. Evaluation of the PELLC course found significant effects on providers' literacy knowledge and practices, but no evidence of impacts on children's literacy outcomes.

Some compelling studies have systematically varied intensity and duration in ways that provide causal evidence. Landry, Swank, Anthony, and Assel (2011) had teachers participate in nine online workshops and receive in-person mentoring twice a month across the year. Some teachers received the intervention for one year, and others for two years. The researchers found that one year of the intervention had significant effects on teachers' language and literacy instructional practices. A second year of coaching produced no additional impact on teaching practice but had larger impacts on children's learning. It takes some time for teachers to change their practice (Pianta et al., 2014), and it may be that children in teachers' classrooms during the first year of PD would not have enough exposure to the improvements in practice to show demonstrable impact. Systematically varying dosage in research studies could help refine our understanding of how much PD is needed to support specific types of practice changes, and this could be a focus for implementation research.

In sum, ample evidence from rigorous experimental studies shows that PD focused on teacher practices or relevant knowledge can improve the quality of teachers' skill and, to a lesser extent, children's learning. We have curricula, methods of practice, and tools that can predictably improve teachers' knowledge and skill, and a number of them also show evidence of further benefits for children's learning. At the same time, there is fairly broad agreement that PD for ECE teachers as typically implemented by states and school systems throughout the country is not all that effective. The opportunity to deploy PD investments for greater impact holds tremendous promise for improving the benefits of programs for children.

SYSTEMS SUPPORTING HIGH-FIDELITY IMPLEMENTATION AND SCALE-UP OF EFFECTIVE PD

To improve the quality and impact of programs at scale through workforce development, we must explicitly specify the enabling architecture—the incentives, standards, training and implementation protocols, quality control procedures, and certifications that shape the actions of various people in the system (teachers, purveyors, programs) to produce high effort and focused participation. All too often, these components of a workforce development system are misaligned with one another, with the needs of the workforce, and with the support structures needed to deliver the types of proven-effective PD described here.

Most of the time, PD requirements are established by state licensing regulations that structure educators' career development (Whitebook, Bellin, Lee, & Sakai, 2005). These regulations are typically generic—for example, the number of PD hours teachers need to complete for licensure renewal. Rarely do regulations specify the target, content, quality, or impact of PD. Most administrators lament relying on "hours accumulated" as the metric for linking PD to an incentive structure because it almost guarantees a lack of focus or alignment to teachers' skill needs or specific areas for curricular or classroom improvements. In this sense, PD is untethered from individual needs for training or local program plans. Even teachers themselves report significant failure in the PD system. When the

McCormick Center for Early Childhood Leadership (2016) surveyed over 500 teachers working across program types (75% with a BA or higher), fewer than half of respondents (43%) believed that their PD opportunities “were very helpful in strengthening their level of professional competence” (pp. 1-2). If many millions of dollars are spent on PD each year (to say nothing of the costs related to paying teachers for hours spent in PD, or the opportunity costs of attending PD that has no impact), and if PD presumably plays a critically important role in advancing the benefits of early care and education, then why are things so broken?

The primary gaps in workforce development involve mechanisms to explicitly integrate knowledge, tools, workforce needs, and incentive structures in a program improvement and workforce development system that enables rigorous and potent implementation of proven-effective approaches and systematic use of data for improvement. Without steady and close integration of two activities—mapping proven-effective PD models into a system for scaling with fidelity—most teachers will attend serial one-time workshops at considerable personal and public cost. These activities and the time teachers spend will have little to no chance of benefitting them or their students.

Let’s look at one example of this interface between a PD model and a scaling system. In a recent implementation of a new QRIS, the state of Louisiana chose to use CLASS as the metric for quality, and hence the sole target for improvement through PD (enabled by incentives). Louisiana then identified a small set of PD models that, in controlled evaluations, had been shown to improve CLASS scores. The state then created systems of incentives aligned to increase teachers’ and programs’ selection of those models—for example, legislation linked tax credits for providers to their engagement with these effective PD models. In addition, higher education programs that prepare teachers with bachelor’s degrees for the state pre-K program would soon need to align their content and assessments to the QRIS targets. Moreover, this move to scale also included procedures for ensuring reliable collection of CLASS scores, training for PD providers, and other enabling features, such as evaluation and quality control analyses. Thus, the approach was both systemic and systematic.

In this illustration, models of PD that had been proven effective in rigorous studies were integrated in a scaling system that drew on the QRIS and tax-credit system as a way to encourage and enable use at a wider scale. The Louisiana example is perhaps a template for scaling up that integrates and aligns systems of large-scale implementation with PD models that have proven potential for impact. Most notably, the Louisiana model reflects an overall strategy and explicit design for a system of inputs to teachers and the enabling infrastructure.

CONDITIONS FOR IMPLEMENTATION WITH IMPACT

We have described promising findings that suggest PD can reliably and confidently produce benefits for teachers and children, as well as the parallel challenges of promoting such proven-effective PD at scale. Next, we identify several conditions that are key to closing the gaps between PD that has been proven effective under local or controlled conditions to implementation with benefits at scale.

► Use a clear and focused PD program or model

Zaslow and colleagues (2010) have described the features of effective PD programs, which include a focus on: a) students' skill targets and developmental progressions (e.g., developmental progressions in decoding skills); b) improving teachers' skillful use of instructional and social interactions to promote student engagement and learning (e.g., feedback or conversation); and c) fostering teachers' skills and knowledge to effectively implement curricula and appropriately engage children with content (e.g., delivering an effective and engaging activity on teaching cardinality). These features all emphasize a defined and relevant set of knowledge and practices as enacted by teachers. In recent meta-analyses of PD in ECE (e.g., Markussen-Brown et al., 2017), most of the effective PD models were based on evidence linking focal practices to specific child outcomes. Some effective PD models also focus on teacher knowledge, which, if tightly linked to practice, can make positive changes to teachers' daily work in the classroom. As we note, a number of bundled curricula and PD supports have shown a proven impact on student learning; similarly, we have some examples of PD focused on general teacher practices with known relations to student outcomes. These are the starting places for decisions and investments aimed at scale.

The alignment of PD, curricula, assessment, and other enabling supports creates a sort of operating system for a program, an important factor in success. Most recently, Connors, Pacchiano, Manos, & Horsley (2018) described how the Ounce of Prevention Fund fosters leadership development among program directors. Its approach is heavily organized around performance indicators and feedback mechanisms embedded in directors' and supervisors' workflow. This is an example of integrating measurement and supports to improve identified professional competencies within systems of implementation and workflow management—an approach that is rare in educators' PD and training.

► Provide necessary supports for the PD workforce

PD's success depends in large part on the people who train and coach teachers. This means hiring, training, and supporting the PD workforce. But little research has examined these elements of program delivery, and many evidence-based PD models fail to provide much detail about them. Among evidence-based PD models that do provide such detail, this workforce typically consists of experienced ECE teachers, often with master's degrees, who have relatively extensive training and ongoing support in the particular PD model (McCollum, Hemmeter, & Hsieh,

2011; Piasta et al., 2012; Powell, Diamond, Burchinal, & Koehler, 2010). Lloyd & Modlin (2012), reporting on how they delivered three coaching models in Head Start programs, suggest that successful coaches have three major attributes: knowledge of the coaching model, general coaching and consultation skills, and knowledge of early childhood development and teaching. The Ounce of Prevention leadership initiative's job-embedded training systems, described above, constitute an example of how systems (technology, measurement, management) can also support PD providers.

In most cases, evidence-based models include fairly intensive initial training as well as weekly supervision of coaches (Isner et al., 2011). This is rarely the case in the field. For example, within the scope of Head Start's large-scale initiative on mentor-coaching, most Head Start coaches report having had some training and supervision, but very little of it was specific to coaching (Howard et al., 2013). Only 16% of the coaches described receiving any specific training related to coaching. By contrast, in the MTP evaluations, coaches participated in a weeklong training session focused on CLASS, the MTP coaching model, and use of the MTP website to support teachers; all coaches became reliable on the CLASS instrument. Coaches received ongoing help from dedicated coach-support staff, including booster training, weekly phone calls to individual coaches, and group coaching calls. Group and individual calls every two weeks give coaches a forum for sharing successes and challenges of the job.

Coaching, particularly when it follows standardized and structured models, can be highly effective for improving teachers' practices in the classroom, even in larger-scale implementations (Bierman et al., 2008; Cunningham, Zibulsky, & Callahan, 2009; Dickinson & Caswell, 2007). But coaching requires sufficient attention to supervision, adherence to standardized protocols, and use of a model that makes teachers and coaches feel effective and motivated to participate. Yet Isner et al. (2011), in their study of coaching as a part of QRIS, report that very few programs used any formal manual or set of materials to guide coaches' daily practice.

► **Harness higher education as a workforce development and PD delivery system that delivers results**

Despite the potential for coursework or degrees in higher education to improve teacher impacts, there is no consistently identifiable link between the two. And yet, as we describe above, there are numerous examples of courses that have led to improvements in practice. What supports are needed so that these exemplars of impact and success can be used at greater scale?

As one example, a series of follow-up investigations related to the course based on CLASS examined the supports needed to deliver the course in 15 sections, with sufficient fidelity to support impacts on teacher practice (LoCasale-Crouch et al., 2011). The list was long. Two course coordinators provided training and implementation support to 14 instructors. Course instructors were trained to achieve reliability on CLASS and on course content and implementation, to ensure consistent delivery. Before teaching each unit, instructors and course coordinators

met online to review upcoming activities, including PowerPoint slides, the instructor's manual, readings, in-class activities, homework assignments, and exams. Instructors completed a written assignment related to each unit, showing evidence that they understood and were comfortable with the material. Course coordinators held weekly individual support calls and periodic group calls with course instructors that were focused on clarifying content, implementation, and sharing successes and challenges in teaching the course. On five occasions, course instructors videotaped themselves teaching the planned lesson and received written feedback that was discussed in detail during the weekly call. As the course went on, the instructors improved and became more consistent in observed implementation.

Although the amount of support was considerable, it should also be noted that these supports were highly targeted and delivered using distal means across 15 sections at 10 different institutions. Under these conditions, 14 instructors delivered a common course with high degrees of skill, fidelity, and implementation quality, all leading to significant impact on teachers' practices in the classroom (Downer et al., 2011; Hamre et al., in press; LoCasale-Crouch et al., 2011). Embedded in a system of appropriate focus, structure, and support, course-based PD can be implemented with high fidelity at scale.

► **Use data to target and improve PD**

Although some programs collect child-outcome data and use it to support individualized approaches to instruction, fewer of them use these data at the program level to drive PD. Programs tend to lack refined indicators of teacher knowledge or competencies to use such data to tailor workforce development initiatives to individuals' profiles of knowledge and skill. Programs also often struggle to ask the right questions of their data, whether related to child outcomes or the workforce, and they often lack expertise in the technical skills required to efficiently collect, maintain, analyze, and interpret data (Crawford, Tucker, Van Horne, & Landry, 2016).

However, data can not only help to focus PD but can also track its implementation and success. Lloyd & Modlin (2012) describe a simple but effective method for supporting the coaching delivered as a part of the Head Start CARES project. They use brief online surveys, logs, and fidelity reports to help support technical assistance and management in their monitoring of coaching implementation. Similar systems are provided with the scaled-up version of MTP (Early et al., 2017). Even the simplest information, such as logs of the frequency of contacts between teachers and coaches, can be powerful ways to improve the intensity of coaching if they are used to monitor coaches' efforts and provide feedback. To the extent that PD is delivered online, the web interface and backend can provide useful data for enabling strong implementation supports for teachers, course instructors, and coaches (LoCasale et al., 2016). As states build systems of PD support online and link them to various forms of credentialing (including micro-credentialing), the result can be more fully integrated alignment of teachers' PD needs and goals, PD inputs to teachers, supports for effective delivery (by coaches, instructors, or web systems), and structures that codify and encourage teachers' participation and progress.

► Link workforce development systems and incentive structures

Most states, school districts, and Head Start programs require only that teachers complete a certain number of clock hours of PD each year, ranging from over 100 to 15 or fewer (Barnett et al., 2016). All states give programs flexibility in how these hours are allocated, reducing the likelihood that those hours (or any effective PD approach) will drive program improvements. One way states have tried to tighten the link between PD hours and impact is to require teachers, directors, and/or coaches to articulate clear PD plans and then evaluate those plans (Rous, Grove, Cox, Townley, & Crumpton, 2008). State workforce registry systems are typically limited to tracking members of the ECE workforce (often volunteer participants), their credentials, and the PD they have attended (Ryan & Whitebook, 2012). However, registry systems are being developed that codify individual teachers' records of acquired PD (National Registry Alliance, 2013a) and perhaps even the competencies they attain, which will mean greater capability to identify and encourage effective PD as well to tie those experiences to accrued competence and certifications.

► Certify PD providers

The skills and impact of those who provide PD support to teachers and programs vary widely (Soliday-Hong, Walters, & Mintz, 2011), and there are very few systems for documenting their expertise and effectiveness. Although almost half of the states have developed tracking systems for PD providers (Institute of Medicine and National Research Council, 2015), none have effectiveness metrics or standard certifications and training. Some have moved beyond tracking to comprehensive training and certification requirements for providers. For example, anyone who receives funding from the state of Pennsylvania to offer training has to participate in the Pennsylvania Quality Assurance System, which includes online coursework and a review of professional development activities (Hong et al.).

In some states, PD providers must register and complete training (National Registry Alliance, 2013b), but these systems are typically voluntary and their requirements are not particularly stringent. Clearly, PD providers and coaches need more intensive training and certification programs. Examples on which to build include the University of Colorado Early Childhood Coaching Certificate program, a three-course series that focuses on developing specific coaching and organizational change skills. Yet, despite some promising developments, such programs are the exception; PD staff hired by preschool programs rarely have robust and ongoing training.

CONCLUSION

If we wish to narrow intransigent gaps in children’s experiences and outcomes, research points to a clear need for systems of program design, implementation, and improvement that span the period from birth through preschool and up to third grade.

We cannot improve quality and impact in the U.S. early education and care sector simply through renewed appreciation for workforce development. Rather, if we wish to narrow intransigent gaps in children’s experiences and outcomes, research points to a clear need for systems of program design, implementation, and improvement that span the period from birth through preschool and up to third

grade. These systems must not only select and disseminate proven-effective models of professional development, they also must meet the conditions, such as incentives, data, and certification regimes, that allow PD models to be scaled with fidelity. With increased use of technology to deliver PD online as well as continuing refinement of PD models to deliver relevant knowledge and training of practice-focused skills, a future of individualized PD pathways, stackable credentials, state registries, and even increased compensation may not be far off.

References

- Ansari, A., & Pianta, R. (2018). Classroom age composition and the early learning of preschoolers. *Journal of Educational Research*, 112(2), 234-242. doi: 10.1080/00220671.2018. 1514356
- Barnett, W. S., Friedman-Krauss, A. H., Gomez, R. E., Horowitz, M., Weisenfeld, G. G., Clarke Brown, K., & Squires, J. H. (2016). *The State of Preschool 2015: State Preschool Yearbook*. New Brunswick, NJ: National Institute for Early Education Research.
- Baroody, A. J., Clements, D. H., & Sarama, J. (2019). Teaching and learning mathematics in early childhood programs. In C. Brown, M. B. McMullen, & N. File (Eds.), *Handbook of Early Childhood Care and Education* (1st ed., pp. 329-353). Hoboken, NJ: Wiley Blackwell Publishing.
- Barton, E. E., Fuller, E. A., & Schnitz, A. (2016). The use of email to coach preservice early childhood teachers. *Topics in Early Childhood Special Education*, 36(2), 78-90. doi: 10.1177/0271121415612728
- Berkel, C., Mauricio, A., Schoenfelder, E., & Sandler, I.N. (2011). Putting the pieces together: An integrated model of program implementation. *Prevention Science*, 12(1), 23-33. doi: 10.1007/s11121-010-0186-1
- Bierman, K.L., Nix, R.L., Greenberg, M.T., Blair, C., & Domitrovich, C. (2008). Executive functions and school readiness intervention: Impact, moderation, and mediation in Head Start REDI program. *Development and Psychopathology*, 20, 821-843. doi: 10.1017/S0954579408000394
- Birman, B.F., Desimone, L., Porter, A.C., & Garet, M.S. (2000). Designing professional development that works. *Educational Leadership*, 57(8), 28-33.
- Borko, H. (2004). Professional development and teacher learning: Mapping the terrain. *Educational Researcher*, 33(8), 3-15. doi: 10.3102/0013189X033008003
- Chen, J.Q., & McCray, J. (2012). The what, how, and why of effective teacher professional development in early mathematics education. *NHSA Dialog*, 15(1), 113-121.
- Cochran-Smith, M., & Zeichner, K.M. (2005). *Studying teacher education: The report of the AERA panel on research and teacher education*. Washington, DC: AERA.
- Connors, M.C., Pacchiano, D.M., Manos, E., & Horsley, H.L. (2018, March). *Building the infrastructure: Leveraging research partnerships to improve and scale an instructional leadership professional development program*. Paper presented at Society for Research on Educational Effectiveness Spring 2018 Conference, Washington, DC.
- Crawford, A., Zucker, T., Van Horne, B., & Landry, S. (2016). Integrating professional development content and formative assessment with the coaching process: The Texas School Ready model. *Theory into Practice*, 56(1), 55-65.
- Cunningham, A.E., Zibulsky, J., & Callahan, M. (2009). Starting small: Building preschool teacher knowledge that supports early literacy development. *Reading and Writing*, 22(4), 487-510. doi: 10.1007/s11145-009-9164-z
- Dane, A.V., & Schneider, B.H. (1998). Program integrity in primary and early secondary prevention: Are implementation effects out of control? *Clinical Psychology Review*, 18(1), 23-45. doi: 10.1016/S0272-7358(97)00043-3
- Desimone, L. M., & Garet, M. S. (2015). Best practices in teachers' professional development in the United States. *Psychology, Society and Education*, 7(3), 252-263.
- Dickinson, D., & Caswell, L. (2007). Building support for language and early literacy in preschool classrooms through in-service professional development: Effects of the Literacy Environment Enrichment Program (LEEP). *Early Childhood Research Quarterly*, 22, 243-260. doi: 10.1016/j.ecresq.2007.03.001

CHAPTER 5 IMPROVING QUALITY AND IMPACT THROUGH WORKFORCE DEVELOPMENT AND IMPLEMENTATION SYSTEMS

- Domitrovich, C.E., Gest, S.D., Gill, S., Bierman, K.L., Welsh, J.A., & Jones, D. (2009). Fostering high quality teaching with an enriched curriculum and professional development support: The Head Start REDI program. *American Educational Research Journal*, 46(2), 567-597. doi: 10.3102/0002831208328089
- Donohue, C., Fox, S., & Torrence, D. (2007). Early childhood educators as elearners: Engaging approaches to teaching and learning online. *Young Children*, 34-40.
- Downer, J.T., Pianta, R.C., Fan, X., Hamre, B.K., Mashburn, A., & Justice, L. (2011). Effects of web-mediated teacher professional development on the language and literacy skills of children enrolled in prekindergarten programs. *NHSA Dialog: Research-to-Practice Journal for the Early Childhood Field*, 14(4), 189-212.
- Downer, J.T., Pianta, R.C., Burchinal, M., Field, S., Hamre, B.K., LoCasale-Crouch, J., ... Scott-Little, C. (2011). *Coaching and coursework focused on teacher-child interactions during language/literacy instruction: Effects on teacher beliefs, knowledge, skills, and practice*. Manuscript in preparation.
- Early, D.M., Maxwell, K.L., Ponder, B.D., & Pan, Y. (2017). Improving teacher-child interactions: A randomized control trial of Making the Most of Classroom Interactions and My Teaching Partner professional development models. *Early Childhood Research Quarterly*, 38, 57-70. doi: 10.1016/j.ecresq.2016.08.005
- Early, D.M., Maxwell, K.L., Burchinal, M., Alva, S., Bender, R.H., Bryant, D., ... Zill, N. (2007). Teachers' education, classroom quality, and young children's academic skills: Results from seven studies of preschool programs. *Child Development*, 78(2), 558-580. doi: 10.1111/j.1467-8624.2007.01014.x
- Fox, L., Hemmeter, M.L., & Snyder, P.S. (2014). *Teaching Pyramid Observation Tool for Preschool Classrooms (TPOT), Research Edition*. Baltimore, MD: Paul H. Brookes.
- Fukkink, R.G., & Lont, A. (2007). Does training matter? A meta-analysis and review of caregiver training studies. *Early Childhood Research Quarterly*, 22, 294-311. doi: 10.1016/j.ecresq.2007.04.005
- Garet, M.S., Porter, A.C., Desimone, L., Birman, B.F., & Suk Yoon, K. (2001). What makes professional development effective? Results from a national sample of teachers. *American Educational Research Journal*, 38(4), 915-945.
- Gerde, H.K., Duke, N.K., Moses, A.M., Spybrook, J., & Shedd, M.K. (2014). How much for whom? Lessons from an efficacy study of modest professional development for child care providers. *Early Education and Development*, 25, 421-441. doi: 10.1080/10409289.2013.788424
- Hamre, B.K., Pianta, R.C., Burchinal, M., Field, S., LoCasale-Crouch, J., Downer, J.T., ... & Scott-Little, C. (2012). A course on effective teacher-child interactions: Effects on teacher beliefs, knowledge, and observed practice. *American Educational Research Journal*, 49(1), 88-123. doi: 10.3102/0002831211434596
- Hamre, B. K., Pianta, R. C., Mashburn, A. J., & Downer, J. T. (2012). Promoting young children's social competence through the preschool PATHS curriculum and MyTeachingPartner professional development resources. *Early Education and Development*, 23(6), 809-832.
- Hamre, B.K., Downer, J.T., Jamil, F.M., & Pianta, R. (2012). Enhancing teachers' intentional use of effective interactions with children: Designing and testing professional development interventions. In R. Pianta (Ed.), *Handbook of early childhood education* (507-532). New York, NY: Guilford Press.
- Hamre, B.K., Pianta, R. C., Burchinal, M., DeCoster, J., & Downer, J. (2015, March). *Variation in impacts of MyTeachingPartner coaching model on preschool children's development*. Paper presented at the Biennial Meeting of the Society for Research in Child Development, Philadelphia, PA.
- Hamre, B.K., Pianta, R.C., Burchinal, M., & Downer, J.T. (in press). A course on supporting early language and literacy development through effective teacher-child interactions: Effects on teacher beliefs, knowledge and practice. *American Educational Research Journal*.

Hemmeter, M.L., Fox, L., & Snyder, P. (2013). A tiered model for promoting social-emotional competence and addressing challenging behavior. In V. Buysse & E. Peisner-Feinberg (Eds.), *Handbook of response to intervention in early childhood* (85-101). Baltimore, MD: Paul H. Brookes.

Hemmeter, M.L., Hardy, J.K., Schnitz, A.G., Adams, J.M., & Kinder, K.A. (2015). Effects of training and coaching with performance feedback on teachers' use of pyramid model practices. *Topics in Early Childhood Special Education, 35*(3), 144-156. doi: 10.1177/0271121415594924

Howard, E.C., Rankin, V.E., Fishman, M., Hawkinson, L.E., McGroder, S.M., Helsel, F.K., et al. (2013). *The Descriptive Study of the Head Start Early Learning Mentor Coach Initiative*. OPRE Report #2014-5a; Washington, DC: U.S. Department of Health and Human Services, Administration for Children and Families, Office of Planning, Research and Evaluation.

Howes, C., Galinsky, E., & Kontos, S. (1998). Child care caregiver sensitivity and attachment. *Social Development, 7*(1), 25-36. doi: 10.1111/1467-9507.00048

Institute of Medicine (IOM) and National Research Council (NRC). 2015. *Transforming the workforce for children birth through age 8: A unifying foundation*. Washington, DC: National Academies Press.

Isner, T., Tout, K., Zaslow, M., Soli, M., Quinn, K., Rothenberg, L., & Burkhauser, M. (2011). *Coaching in early care and education programs and Quality Rating and Improvement Systems (QRIS): Identifying promising features*. Report produced for the Children's Services Council of Palm Beach County. Washington, DC: Child Trends.

Kontos, S., Howes, C., & Galinsky, E. (1996). Does training make a difference to quality in family child care? *Early Childhood Research Quarterly, 11*(4), 427-445. doi: 10.1016/S0885-2006(96)90016-2

Kraft, M.A., Blazar, D., & Hogan, D. (2016). The effect of teaching coaching on instruction and achievement: A meta-analysis of the causal evidence. Working paper, Brown University, Providence, RI.

Landry, S.H., Anthony, J.L., Swank, P.R., & Monseque-Bailey, P. (2009). Effectiveness of comprehensive professional development for teachers of at-risk preschoolers. *Journal of Educational Psychology, 101*(2), 448-465. doi 10.1037/a0016746

Landry, S.H., Crawford, A., Gunnewig, S., & Swank, P.R. (2002). *Teacher Behavior Rating Scale*. Unpublished research instrument, University of Texas Health Science Center at Houston, Center for Improving the Readiness of Children for Learning and Education.

Landry, S.H., Swank, P.R., Anthony, J.L., & Assel, M.A. (2011). An experimental study evaluating professional develop activities within a state funded pre-kindergarten program. *Reading and Writing, 24*(8), 971-1010. doi: 10.1007/s11145-010-9243-1

Lloyd, C.M., & Modlin, E.L. (2012). *Coaching as a Key Component in Teachers' Professional Development: Improving Classroom Practices in Head Start Settings*. OPRE Report 2012-4, Washington, DC: Office of Planning, Research and Evaluation, Administration for Children and Families, U.S. Department of Health and Human Services.

LoCasale-Crouch, J., Hamre, B., Roberts, A., & Neesen, K. (2016). If You Build It, Will They Come? Predictors of Teachers' Participation in and Satisfaction with the Effective Classroom Interactions Online Courses. *The International Review of Research in Open and Distributed Learning, 17*(1).

LoCasale-Crouch, J., Kraft-Sayre, M., Pianta, R., Hamre, B., Downer, J., Leach, A., ... Scott-Little, C. (2011). Implementing an early childhood professional development course across 10 sites and 15 sections: Lessons learned. *NHSA Dialog, 14*(4), 275-292.

Markussen-Brown, J., Juhl, C.B., Piasta, S.B., Bleses, D., Hojen, A., & Justice, L.M. (2017). The effects of language- and literacy-focused professional development on early educators and children: A best-evidence meta-analysis. *Early Childhood Research Quarterly, 38*, 97-115. doi: 10.1016/j.ecresq.2016.07.002

CHAPTER 5 IMPROVING QUALITY AND IMPACT THROUGH WORKFORCE DEVELOPMENT AND IMPLEMENTATION SYSTEMS

- Mashburn, A. J., Pianta, R. C., Hamre, B. K., Downer, J. T., Barbarin, O., Bryant, D., ... & Howes, C. (2008). Measures of classroom quality in pre-kindergarten and children's development of academic, language and social skills. *Child Development, 79*(3), 732-749. doi: 10.1111/j.1467-8624.2008.01154.x
- Mashburn, A.J., Downer, J.T., Hamre, B.K., Justice, L.M., & Pianta, R.C. (2010). Consultation for teachers and children's language and literacy development during pre-kindergarten. *Applied Developmental Science, 14*, 179–196. doi: 10.1080/10888691.2010.516187
- McCollum, J.A., Hemmeter, M.L., & Hsieh, W-Y. (2011). Coaching teachers for emergent literacy instruction using performance-based feedback. *Topics in Early Childhood Special Education, 33*(1), 28-37. doi: 10.1177/0271121411431003
- McCormick Center for Early Childhood Leadership. (2016). *Quality standards drive professional development opportunities*. Wheeling, IL: National-Louis University, McCormick Center for Early Childhood Leadership. Retrieved from <http://mccormickcenter.nl.edu/wp-content/uploads/2016/11/RN-Fall-2016-final.pdf>
- Mendive, S., Weiland, C., Yoshikawa, H., & Snow, C. (2016). Opening the black box: Intervention fidelity in a randomized trial of a preschool teacher professional development program. *Journal of Educational Psychology, 108*(1), 130-145. doi: 10.1037/edu0000047
- National Child Care Information and Technical Assistance Center (NCCITA) and the National Association for Regulatory Administration (NARA). (2010). *The 2008 child care licensing study*. Lexington, KY: National Association for Regulatory Administration.
- National Registry Alliance. (2013a). *State of registries survey 2012: A survey of the nation's early childhood and school-age registries*. Washington, DC: National Registry Alliance.
- National Registry Alliance. (2013b). *2012 state of the nation's training and trainer registries and approval systems*. Washington, DC: National Registry Alliance.
- Neuman, S.B., & Cunningham, L. (2009). The impact of professional development and coaching on early language and literacy instructional practices. *American Educational Research Journal, 46*(2), 532-566. doi: 10.3102/0002831208328088
- Pianta, R. C., DeCoster, J., Cabell, S.Q., Burchinal, M., Hamre, B.K., Downer, J.T., & Howes, C. (2014). Dose-response relations between preschool teachers' exposure to components of professional development and increases in quality of their interactions with children. *Early Childhood Research Quarterly, 29*(4), 499-508. doi: 10.1016/j.ecresq.2014.06.001
- Pianta, R.C., Hamre, B.K., Downer, J.T., Burchinal, M., Williford, A., LoCasale-Crouch, J., ... & Scott-Little, C. (2017). Early childhood professional development: Coaching and coursework effects on indicators of children's school readiness. *Early Education and Development, 28*(8). doi: 10.1080/10409289.2017.1319783
- Pianta, R.C., Hamre, B.K., & Hadden, S. (2012) Scaling-up effective professional development. In C. Howes, B. Hamre & R. Pianta (Eds.), *Effective early childhood professional development: Improving teacher practice and child outcomes*. Baltimore, MD: Paul H. Brookes.
- Pianta, R. C., & Hofkens, T. (2018). The Bush-Obama agenda for education research and innovation: Major investment, mixed returns. In F. M. Hess, & M. Q. McShane (Eds.), *Bush-Obama school reform* (87-106). Cambridge, MA: Harvard Education Press.
- Pianta, R.C., La Paro, K.M., & Hamre, B. (2008). *The classroom assessment scoring system, Pre-K version*. Baltimore, MD: Paul H. Brookes.
- Piasta, S.B., Justice, L.M., Cabell, S.Q., Wiggins, A.K., Turnbull, K.P., & Curenton, S.M. (2012). Impact of professional development on preschool teachers' conversational responsivity and children's linguistic productivity and complexity. *Early Childhood Research Quarterly, 27*, 387-400. doi: 10.1016/j.ecresq.2012.01.001

- Piasta, S.B., Logan, J.A., Pelatti, C.Y., Capps, J.L., & Petrill, S.A. (2015). Professional development for early childhood educators: Efforts to improve math and science learning opportunities in early childhood classrooms. *Journal of educational psychology*, 107(2), 407-422.
- Powell, D. R., Diamond, K. E., Burchinal, M. R., & Koehler, M. J. (2010). Effects of an early literacy professional development intervention on head start teachers and children. *Journal of Educational Psychology*, 102(2), 299-312. doi: 10.1037/a0017763
- Raver, C.C., Jones, A.S., Li-Grining, C.P., Metzger, M., Smallwood, K., & Sardin, L. (2008). Improving preschool classroom processes: Preliminary findings from a randomized trial implemented in head start settings. *Early Childhood Research Quarterly*, 23(1), 10-26. doi: 10.1016/j.ecresq.2007.09.001
- Resnicow, K., Davis, M., Smith, M., Lazarus-Yaroch, A., Baranowski, T., Baranowski, J., ... Wang, T. (1998). How best to measure implementation of school health curricula: A comparison of three measures. *Health Education Research*, 13(2), 239-250. doi: 10.1093/her/13.2.239
- Rous, B., Grove, J., Cox, M., Townley, K., & Crumpton, G. (2008). *The impact of the Kentucky professional development framework on child care, head start and public preschool classroom quality and child outcomes*. Lexington, KY: University of Kentucky, Human Development Institute.
- Ryan, S., & Whitebook, M. (2012). More than teachers: The early care and education workforce. In R.C. Pianta (Ed.), *Handbook of early childhood education* (92-110). New York, NY: Guilford Press.
- Schachter, R.E. (2015). An analytic study of the professional development research in early childhood education. *Early Education and Development*, 26(8), 1057-1085.
- Scott-Little, C., La Paro, K. M., Thomason, A. C., Pianta, R. C., Hamre, B., Downer, J., . . . Howes, C. (2011). Implementation of a course focused on language and literacy within teacher-child interactions: Instructor and student perspectives across three institutions of higher education. *Journal of Early Childhood Teacher Education*, 32(3), 200-224.
- Snyder, P., Hemmeter, M.L., Artman Meeker, K., Kinder, K., Pasia, C., & McLaughlin, T. (2012). Characterizing key features of the early childhood professional development literature. *Infants and Young Children*, 25(3), 188-212. doi: 10.1097/IYC.0b013e31825a1ebf
- Soliday-Hong, S. L., Walters, T., & Mintz, T. (2011). Professional development systems for early childhood educators within a state and federal policy context. In C. Howes, & R. C. Pianta (Eds.), *Foundations for teaching excellence: Connecting early childhood quality rating, professional development, and competency systems in states* (117-132). Baltimore, MD: Paul H. Brookes.
- Taggart, V.S., Bush, P.J., Zuckerman, A.E., & Theiss, P.K. (1990). A process evaluation of the District of Columbia "Know Your Body" project. *Journal of School Health*, 60(2), 60-66. doi: 10.1111/j.1746-1561.1990.tb05907.x
- Tout, K., Halle, T.G., Datta, A.R., & Snow, K. (2015, June). *A National Portrait of Quality in Centers: Recent Findings from the National Survey of Early Care and Education*. NAEYC Professional Development Institute, New Orleans, LA.
- U.S. Department of Education and U.S. Department of Health and Human Services. (2014). *The Race to the Top - Early Learning Challenge Year Two Progress Report*. Washington, DC.
- Werner, C.D., Linting, M., Vermeer, H. J., & Van IJzendoorn, M.H. (2016). Do intervention programs in child care promote the quality of caregiver-child interactions? A meta-analysis of randomized controlled trials. *Prevention Science*, 17(2), 259-273.
- Whalen, S., Horsley, H., Parkinson, K., & Pacchiano, D. (2016). A development evaluation study of a professional development initiative to strengthen organizational conditions in early education settings. *Journal of Applied Research on Children: Informing Policy for Children at Risk*, 7(2), Article 9.
- Whitebook, M., Bellm, D., Lee, Y., & Sakai, L. (2005). *Time to revamp and expand: Early childhood teacher preparation programs in California's institutions of higher education*. Berkeley, CA: Center for the Study of Child Care Employment.

CHAPTER 5 IMPROVING QUALITY AND IMPACT THROUGH WORKFORCE DEVELOPMENT AND IMPLEMENTATION SYSTEMS

Whitebook, M., Phillips, D., & Howes, C. (2014). *Worthy work, STILL unlivable wages: The early childhood workforce 25 years after the National Child Care Staffing Study*. Berkeley, CA: Center for the Study of Child Care Employment, University of California, Berkeley.

Williford, A.P., Carter, L.M., Maier, M.F., Hamre, B.K., Cash, A., Pianta, R.C., & Downer, J.T. (2017). Teacher engagement in core components of an effective, early childhood professional development course: Links to changes in teacher-child interactions. *Journal of Early Childhood Teacher Education*, 38(1), 102-118. doi: 10.1080/10901027.2016.1269028

Yoshikawa, H., Weiland, C., Brooks-Gunn, J., Burchinal, M., Espinosa, L., Gormley, W., ... & Zaslow, M. (2013). *Investing in our future: The evidence base on preschool education*. Washington, DC: Society for Research in Child Development and the Foundation for Child Development.

Zaslow, M., Tout, K., Halle, T., Whittaker, J. V., & Lavelle, B. (2010). *Toward the identification of features of effective professional development for early childhood educators: Literature review*. Washington, DC: U.S. Department of Education, Office of Planning, Evaluation, and Social Development.