Early Childhood Personnel Center

Evidenced Based Practice in Early Childhood Intervention: Preservice and In-service Education to Improve Outcomes for Infants and Young Children with Disabilities*
A Literature Review

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IDEAs that Work
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1. Introduction

This country is currently experiencing an unprecedented expansion of government-sponsored early learning programs for infants, toddlers and preschool age children (Allen & Kelly, 2015b; Kagan & Kauerz, 2012b; National Governor's Association, 2010; Shonkoff, 2010; U.S. Department of Education, 2015; World Health Organization, 2012). Research identifying the conditions necessary to support optimal brain development during the early years of life (see Sameroff, 2010; Shonkoff, 2010; Yoshikawa et al., 2013) has created an urgency to begin or expand federal early childhood (EC) initiatives such as Head Start, home visiting programs, Early Learning Challenge grants and Preschool Expansion grants (Gomez, Kagan, & Fox, 2015). In addition, early childhood intervention (ECI) programs for children with disabilities continue to grow at a rapid rate as more children are identified as eligible for services under the Individuals with Disabilities Education Improvement Act (IDEA): Part C for infants and toddlers or Part B (619) for preschoolers (Brown & Woods, 2011).

In 2013 approximately 2,231,802, three and four-year-old children were reported as being enrolled in state preK, Head Start or preschool special education programs across the country (Barnett, Carolan, Squires, Brown, & Horowitz, 2015). These children represent a diversity of backgrounds, family structures, abilities, developmental risks and disabilities. Of these, 750,131 young children with disabilities were enrolled in preschool special education under IDEA, with an additional 333,982 infants and toddlers also receiving intervention services under Part C of IDEA (U.S. Department of Education Office of Special Education and Rehabilitative Services Office of Special Education Programs, 2014). These children qualify for IDEA because their development has been compromised in some way (biological risk, environmental risk,

established risk or a combination), resulting in a documented discrepancy between the what they are able to do, and what is expected for their chronological age (Bruder, 2010). In order to remedy the developmental discrepancies experienced by eligible children, IDEA provides an array of intervention services that are individualized, monitored for effectiveness, and delivered within a variety of settings where infants, young children and families spend their time (e.g. homes, public schools, child care, community programs and Head Start classrooms etc.). The unifying factor for these services is that they are individually designed, delineated and implemented through an assessment and planning process that is conducted by a team of specialists who must meet the highest personnel standard for their professional discipline in the state in which they are providing services. This is at least a bachelor's degree, and usually a graduate degree (http://www.ecpcta.org/personnel_standards/).

As EC programs continue to grow and serve larger numbers of diverse infants, young children and families, attention has focused on the qualifications, knowledge, and skills of the workforce who staff these programs (Allen & Kelly, 2015a). For preschool age children under IDEA (Part B 619), this includes special educators and related service personnel; infants and toddlers (Part C) have many of the same categories of service providers with a major distinction from Part B being the absence of a required special educator. For example, personnel categories for both programs include audiologists; deaf and hard of hearing specialists; EC educators; EC special educators (ECSE); family therapists; infant mental health specialists; nurses; occupational therapists; orientation and mobility specialists; paraprofessionals; physical therapists; psychologists; registered dietitians; social workers; speech and language pathologists; and vision specialists. States can also determine additional personnel categories that can provide services under IDEA, and these have included service coordinators, board-certified behavior analysts;

unique to infants, toddlers and preschoolers. While a team approach to service delivery under an Individualized Education Plan (IEP) for preschoolers, or Individualized Family Service Plan (IFSP) for infants and toddlers is implicit for both the preschool and infant-toddler program under IDEA, Part C explicitly states that the role of the early interventionist is to participate on a team to develop the IFSP and to train the family and others in the provision of early intervention services.

It has been reported that approximately 41,203 teachers and 46,138 para-educators are providing preschool special education services under IDEA (U.S. Department of Education Office of Special Education and Rehabilitative Services Office of Special Education Programs, 2014). While there are no personnel data collected about those providing services under Part C of IDEA, a sample state such as CT (population of birth to 3 year olds = 110,000) employed 1100 practitioners to serve approximately 5034 eligible infants and toddlers in 2013-2014 (www.birth23.org/aboutb23/AnnualData.html). While numbers of related service personnel under Part B of IDEA are available (U.S. Department of Education Office of Special Education & Rehabilitative Services Office of Special Education Programs, 2014), there is no breakdown of types of personnel by age served (e.g. preschoolers). One estimate on speech and language pathologists suggests that approximately 71,000 provide service to children under age 5 (Prelock & Deppe, 2015). In addition to the numbers of personnel serving children under the IDEA, the US Bureau of Labor Statistics reports that there were 438,000 preschool teaching jobs in 2012 and 1,312,700 child care jobs to provide care to children from birth to age 5. The qualifications for these teachers vary by state, though 30 states require at least a bachelor's degree for those teaching in a state funded program, 45 states require specialized training for teachers in pre-K, and 43 states require 15 hours of in-service a year (Barnett et al., 2015). It is very likely that these early care and education teachers have taught at least one child who would qualify for IDEA

services and many more who demonstrate one or more risk conditions. The distinction between those children who qualify under a state's eligibility criteria for IDEA and those children who do not varies, both within and across state EC programs.

This heterogeneous composition of children attending EC programs has emphasized the need for an increasingly versatile and competent workforce that can address a range of children's abilities and needs. Unfortunately, recent examinations of the status of the EC workforce have identified a number of issues that have impacted the quality and effectiveness of EC practices, services, and programs (cf. Allen & Kelly, 2015b; Boe, 2014; Bruder, 2010; Bruder, Mogro-Wilson, Stayton, & Dietrich, 2009; Gomez et al., 2015; Woods & Snyder, 2009; Zaslow, 2009). These include: shortages of personnel; inequities in wages and compensation for personnel across EC programs; shortages of preservice EC programs of study, coursework and practicum opportunities; limited funding for EC continuing education; the absence of integrated and comprehensive personnel development systems that meet national personnel standards and adult learning guidelines; and limited experimental evidence about the effects of preservice preparation and/or in-service continuing education on EC improvements in program quality and child and family learning. While the issues seem daunting, they must be addressed as we continue to build integrated and effective comprehensive state and local systems of EC education for all infants, young children, and families. This charge has most recently been reinforced by the Institute of Medicine (IOM) and National Research Council (NRC) (Allen & Kelly, 2015b).

The purpose of this monograph is to provide an overview of the evidence that is informing and guiding personnel preparation (preservice) and continuing education (in-service) practices for those providing early intervention (children aged 0-3) or preschool special education (children aged 3-5) to eligible infants and young children and their families under the

IDEA. The term professional development (PD) will be used in addition to preservice and in-service, primarily when used by authors' whose work is cited. The term early childhood intervention (ECI) will be used to refer to the system of specialized services and interventions provided to a child as delineated on his/her IFSP or IEP. These services and interventions are delivered in a variety of places, including inclusive early childhood community settings such as child care and other toddler and preschool programs that meet the IDEA requirements of least restrictive settings or natural environments, as listed on a child's IFSP/IEP which is developed in collaboration with family members and delivered by personnel who meet state requirements to provide services under IDEA.

The focus of this monograph does not negate the acknowledgement of the multitude of other personnel that constitute the EC workforce and are also involved in planning, implementing and evaluating prescribed curriculum adaptations or specific interventions within the general education curriculum for an eligible infant, toddler, or preschool child under IDEA. Indeed, the focus on personnel development in early childhood has embraced a cross-sector focus (see Allen & Kelly, 2015a); however, the scope of this monograph precludes a widespread examination of EC personnel development practices across the range of personnel categories, including those from related services under IDEA. It should also be acknowledged that the evidence that supports professional development methods and strategies for those providing ECI services under IDEA have been generated, in part, within the field of EC education (Zaslow, Tout, Halle, Whittaker, & Lavelle, 2010), special education (Sindelar, McCray, Brownell, & Lignugaris/Kraft, 2014), general education (Darling-Hammond & McLaughlin, 1995; Guskey, 2014), and adult education (Knowles, 1980). The exclusion of critical work from these fields is not intentional but reflective of the structure of this monograph.

The monograph will first provide a historical perspective of the foundations of ECI personnel practice: legislation; theoretical and conceptual frameworks; and pedagogy. The monograph will then present evidence used to guide ECI preservice and in-service practices that result in positive change with infants, young children, and families. A summary will be followed by recommendations to support the growth of evidence-based ECI personnel practices.

Most importantly, the monograph is written with the perspective that the ultimate goal of any personnel intervention is to improve students' learning by enhancing teachers' use of evidenced-based approaches to instruction (Diamond & Powell, 2011, p. 76). This has been represented in the literature as both a conceptual framework and theory of change (see Desimone, 2011; Dunst, 2015; Snyder, Denney, Pasia, Rakap, & Crowe, 2011) and is illustrated in Figure 1.

2. Historical Foundations of Personnel Practices

2.1 Legislation

The first piece of legislation and funding to train special education teachers was signed in 1958 by President Eisenhower as P.L. 85–926 to provide financial support to colleges and universities to train leadership personnel to teach children with mental retardation. This was immediately followed by the Training of Professional Personnel Act of 1959 (P.L. 86-158) which provided funding for program administrators and teachers of children with mental retardation, and Teachers of the Deaf Act of 1961 (P.L. 87-276). In 1963 Congress expanded P.L.85–926 to include grants to train college teachers and researchers in a broader array of disabilities. This was followed by the creation of the Bureau for the Education of the Handicapped within the U.S. Department of Health, Education and Welfare (HEW) by the ESEA amendments of 1966, which also provided funding to state education agencies to develop comprehensive systems of personnel development (CSPD) to assist school districts to identify and disseminate promising practices for the education of students with disabilities, including preschoolers. By 1968, the

federal government had supported the training for more than 30,000 special education teachers and related specialists (U.S. Department of Education, 2004).

While these pieces of legislation allowed for the funding of preparation of teachers of preschool age children, it was the Handicapped Children's Early Education Act of 1968 (HCEEP) (P.L. 90-538) which addressed personnel development activities for teachers of infants and young children with disabilities through its grants process. This program focused on the establishment of effective model demonstration programs for children birth to 8 with any type of disability and their families, and in its later years in-service models to support personnel needs. Over 700 projects were funded in a 30 year period (Bailey, 2000). This funding also supported the scaling up of exemplary models through hundreds of outreach projects that trained personnel to implement the model components with fidelity across additional program sites (Black et al., 1984). The demonstration and outreach projects shared a common goal of facilitating the developmental trajectory of children who were experiencing delays in development. As such, the network focused on developing a national system of effective practices, program models and competent personnel in ECI. Other HCEEP initiatives included research institutes and a national technical assistance project (Hebbeler, Spiker, & Kahn, 2012). Unfortunately, the program authority expired in 1997, shortly after the name of this program was changed to the Early Education Program for Children with Disabilities (EEPCD).

The first Education of the Handicapped Act (EHA) (P.L. 91-229) was passed by Congress in 1969 as a component of amendments to ESEA (P.L.91-230) and it contained funding for special education teacher training. When amendments to the EHA, P.L.94-142 passed into law in 1975, all school age children with disabilities became entitled to a free appropriate public education in their least restrictive environment (LRE) under the direction of

an IEP. States also received incentive funds to enroll preschool age children in public school programs, and to train teachers and other related services personnel through a CSPD. The CSPD had prescribed components which included a CSPD committee, ongoing assessments of personnel shortages and training needs, preservice programs, in-service activities, the dissemination of promising practices, and evaluation.

The rights of young children under 5 with disabilities became solidified when P.L. 99-457 passed in 1986 and preschool age children age 3-5 were given all rights under the EHA. States were encouraged to apply for funding to initiate plans to extend EHA to eligible children age birth to 3. Services for eligible infants and toddlers became an entitlement through the amendments of 1991 (P.L. 102-119), shortly after the name of the EHA was changed to IDEA. These services were designed to be family centered, and delivered in natural environments (NE); which were defined as the home, or in places in which same age children who did not have disabilities participate (e.g. child care; community programs). Both LRE and NE created the need for personnel who could serve such eligible children in tandem with families and other providers of early childhood services and with typically developing children.

Amendments for IDEA in 2004 (P.L.108-446) deferred to and adopted many of the provisions for general education students passed in 2001 as P.L. 107-110, the Amendments to the ESEA (referred to as the No Child Left Behind Act or NCLB). For example, the IDEA amendments required that special education services be based on scientifically based research findings as defined under NCLB: research that involves the application of rigorous, systematic, and objective procedures to obtain reliable and valid knowledge relevant to education activities.

The 2004 amendments of IDEA also added Part E to establish the National Center for Special Education Research (NCSER) within the Institute of Education Sciences (IES). The NCSER's mission was to sponsor research to expand knowledge and understanding of the needs

of infants, toddlers, and children with disabilities in order to improve their developmental, educational, and transitional outcomes, sponsor research to improve and support the implementation of IDEA, and evaluate the implementation and effectiveness of IDEA (36th Annual Report to Congress on the Implementation of IDEA, 2014, p 201). Studies under both the educational research program or the special educational research program under IES follow the same conceptual progression beginning with development studies that use an iterative participatory approach to develop interventions, to research that studies the efficacy of an intervention under ideal conditions, and to trials that examine the impact of scaled up efficacy studies implemented in authentic settings under routine conditions. While studies can be funded without progressing through this sequence, the progression unfolds over 13 years if the research focus was funded continuously. Other IES competitions include exploratory research, secondary data analysis, and measurement, as well as training and research programs for doctoral, postdoctoral, and early career professionals. IES also funds The National Center for Research on Early Childhood Education. During the fiscal year of 2013, 18 research grants were funded under NCSER, representing 5% of those that were submitted. Five of these awards were in the area of ECI, and three explicitly include the training of teachers.

While IDEA has always contained provisions for both preservice and in-service learning for those in ECI through the award of discretionary grants to Institutions of Higher Education (IHE) and state systems of special education and early intervention, the development of statewide comprehensive systems of personnel development (CSPD) is no longer required in Part B. The current statute contains provisions under Part D for competitive grants to be awarded to IH's for preservice training that addresses scientifically based knowledge and skills. In-service funds are available for states to increase and improve the knowledge and skills of special education and regular education teachers, principals, and para-educators to plan, develop,

and implement effective and appropriate IEPs and the use of effective instructional strategies, methods, and skills.

All IDEA training funds are awarded under the PD guidelines established under NCLB: PD is high quality, sustained, intensive and content focuses to advance teacher understanding of effective scientifically based instructional strategies; it is aligned with state academic and student performance standards; it provides follow-up training to teachers to ensure that knowledge and skills are applied in the classroom; and is developed with extensive participation of teachers, principals, parents, and administrators of schools. Most important is the requirement that PD is continuously evaluated for impact on teacher effectiveness and student achievement.

2.2 Theories and Frameworks for Personnel Practice

Adult Learning

Guidance on adult learning and teacher PD was produced by the Commission on Behavioral and Social Sciences and Education of the National Research Council (NRC) after a 2-year study conducted by the Committee on Developments in the Science of Learning (Bransford, Brown, & Cocking, 1999). The findings of the study produced recommendations for effective adult learning activities, and a second book produced by the study applied the findings to education (see Bransford, Brown, Cocking, Donovan, & Pellegrino, 2000). In particular, the use of inquiry, experimentation, and research to guide learning was emphasized, along with job embedded PD that was sustained, intensive, and supported by modeling, coaching, feedback, and problem solving around student-specific needs.

2.2.1 Adult Learning Applied to Educators. Malcolm Knowles, commonly known as the father of adult learning, defined an adult educator as one who has responsibility for helping adults to learn, and as such, has a mission to meet the needs and goals of the individual, the needs and goals of institutions and the needs and goals of society (Knowles, 1980, p. 27). Knowles felt

that these tasks should be guided by theory, which he defined as a comprehensive, coherent, and internally consistent system of ideas about a set of phenomena (Knowles, 1973, p. 6). To define a theory specific to adult learners, Knowles reviewed the evolution of both child and adult learning theories to distinguish the two by their age related learning needs (Knowles, 1962, 1973). His analysis culminated in the formalization of andragogy, a term used to describe the teaching of adults (Knowles, 1973, 1980, 1984a). Knowles differentiated adult learning from pedagogy (the teaching of children) in a number of ways; most notably by stressing the adults' need to be involved in managing their own learning by planning, implementing and evaluating it. Other assumptions that formed the basis of Knowles' theoretical framework included an adult's need for immediacy of application and problem solving, and the need for a rationale for why they needed to learn (Knowles, 1984b, p. 12). These assumptions led Knowles to stress the importance of the adult educator to the learning process, and his guidelines are on Table 1.

These adult learning principles were applied to schools and PD for teachers by Wood and Thompson (1980). They recommended participant control over the learning process, with a focus on job related tasks that were real and important to teachers and opportunities to practice the skills they were learning. Additionally, they suggest that teachers should be encouraged to work in small groups and learn from each other by sharing feedback in areas needing improvement (p 337). Lastly, they suggested that PD in schools should provide choices and alternatives to accommodate different learning styles among teachers.

Joyce and Showers (Joyce & Showers, 1980) reviewed over 200 studies on PD and categorized them according to their impact on the student learning. The result was a framework to guide teacher learning. The features of their framework included:

1. Description of the theory underlying the target skill
2. Model or demonstration of the skill

3. Practicing the skill in simulated and classroom settings
4. Feedback on the performance of the skills
5. Coaching for application: hands-on, in-classroom assistance with the transfer of learning, skills and strategies to the classroom (Joyce & Showers, 1980, p. 380).

The authors' concluded that student change occurred only after the last feature was accomplished.

A series of investigations to identify practices that facilitate learning transfer resulted in the peer coaching model (Showers, 1984). Peer coaches supported each other through the change process, practiced and used the skills they learned, and collected data about the implementation process and the effects of a new teaching skill on students (Showers & Joyce, 1996, pp. 10-11). A unique component of this coaching model was the absence of verbal feedback within the coaching dyad. Research suggested that feedback was not related to the effectiveness of the model and was costly to teach and monitor teachers' implementation of appropriate feedback (Joyce & Showers, 1995). This coaching model also differed in other ways from others, as the one teaching with students was designated as the coach, and the one observing the teacher was the recipient of the coaching. Most importantly, effective coaching required teachers to implement all coaching components: regular meetings to plan instruction and learning activities, observations of each other while teaching students, and joint reflect on students' learning (Joyce & Showers, 2002). This latter component led to the conclusion that teaching was cognitive in nature and that the behaviors of teachers were driven by their thoughts about the effects of their teaching on student outcomes.

Tom Guskey contributed to the literature on PD through his work on evaluation and measurement of outcomes attributed to staff development activities. His initial work focused on teachers' beliefs and attitudes and their relationship to student outcomes. Through an analysis of studies (Crandell, 1983; Guskey, 1982, 1984), he proposed that teachers' attitudes toward the

value of a practice changed after they saw positive student effects as a result of using the practice. These beliefs led to increased self-efficacy and problem solving which resulted in teachers assuming more responsibility for improving student learning. Guskey concluded the most important function of staff development was student improvement (Guskey, 1986, 1990).

To measure the variables that contributed to student improvement, Guskey suggested a framework to evaluate PD that focused on the formal and informal interactions of the training content, the training context (climate and culture), and training quality. This framework included a progression that began with trainees' reaction to new knowledge and skills, which influenced the trainees' use of new knowledge and skills, and resulted in student learning outcomes (Guskey, 2000, 2002). A recent variation suggests a complete reversal of the components of the framework; that is, a reverse of the sequence of PD evaluation targets, which reverses the sequence in which PD is planned and implemented. The achievement of student outcomes would determine the organizational supports and educator knowledge and skills needed to affect the outcomes, which would then determine teacher learning activities (Guskey, 2014, p. 11).

Desimone (2009) proposed a conceptual framework for PD based on core features of effectiveness identified in the previous literature, including her own survey results from teachers participating in a national PD initiative (Garet, Porter, Desimone, Birman, & Yoon, 2001). The features include: 1) content consisting of what students should learn; 2) active and participatory learning by the teacher; 3) PD coherence to other professional development, teachers' knowledge and beliefs and school policy; 3) duration being at least 20 hours of time dispersed over a semester; and, 5) collective participation of teachers from the same school and grade level. The interactions among these features formed the foundation of the conceptual framework she proposed to support and analyze teacher and student outcomes. In particular, as teachers experienced effective PD, they improved their knowledge and skills, and changed their beliefs

and attitudes, which resulted in improved instruction and student learning. Most importantly, she recommended using the outcomes of past studies to guide future inquiry into how to best effect student learning through PD (Desimone, 2009, p. 192).

A more complex theory of change for the evaluation of PD was proposed by Wayne et al. (2008). using findings from research: effective PD is intensive, sustained, job-embedded, and focused on relevant subject matter(Garet et al., 2001; Yoon, Duncan, Lee, Scarloss, & Shapley, 2007). His interest was on the identification and analysis of the PD variables that were most responsible for student improvement. To do this he proposed a dual theory of change to direct to allow examination of the relationship between the effectiveness of the PD activities used to teach an instructional practice and change teacher behavior (theory of teacher change), and the effectiveness of the instructional practice to improve student outcomes (theory of instruction).

2.2.2 Frameworks for EC and ECI. While many of these adult learning theories and frameworks have explicitly guided the implementation and evaluation of PD in ECI (see Bruder & Nikitas, 1992; Dunst, 2015; Snyder, Denney, et al., 2011), there have also been PD frameworks developed specifically for EC (Gomez et al., 2015; Kagan & Kauerz, 2012a; Kagan, Kauerz, & Tarrant, 2008; Zaslow, 2009) and ECI (see Striffler & Fire, 1999; Trohanis, 1994; Winton, 1990; Winton & McCollum, 1997; Winton, McCollum, & Catlett, 2008). For example, Zazlow et al. (2010) conducted a review of the PD literature in EC for the USDoED, and concluded with the identification of core features of EC PD. These included features similar to others identified in other education frameworks (e.g., Desimone, 2011), with the addition of the ongoing assessment of child progress to inform and monitor the effects of the PD.

The National Professional Development Center on Inclusion used an iterative process to define a definition and framework for EC PD (Buysse, Winton, & Rous, 2009). They define PD as

facilitated teaching and learning experiences that are transactional and designed to support the acquisition of professional knowledge, skills, and dispositions as well as the application of this knowledge and practice (p. 3). Key components of their framework include: (1) the characteristics and contexts of the learners and children and families they serve; (2) the content of PD which refers to what professionals should know and be able to do as defined by professional competency standards and credentials; and (3) the learning experience or the methods used to support self-directed experiential learning that is highly relevant to practice. These authors describe a number of assumptions that guided the development of this framework, and they propose its use to structure PD across sectors of the EC community. The framework also includes factors that were identified as contributing to effective PD. These include access and incentives for the workforce to participate in PD and having organizational structures, policies, and resources in place to support the PD. Lastly, evaluation is described as an integral component of the framework.

Most recently, the Institute of Medicine, National Research Council proposed a professional learning framework for EC through their report on the early care and education workforce (Allen & Kelly, 2015b). Each of the 13 recommendations contained in the report is supported by a thorough analysis of need, as well as strategies to remedy the need. Among the multiple layers of this report are recommendations for quality ongoing learning for those in the EC workforce. These recommendations form a conceptual framework to guide PD in EC, and they are comprised of the following features: 1) active learning; 2) deep knowledge of the content and process of teaching, including specific pedagogical and conceptual knowledge; 3) addresses common actions and problems of practice; 4) facilitates the active implementation of learning content and supports discussion of the learners' experiences through peer study groups or other networks; 5) uses coaching embedded in the practice settings with coaches who are knowledgeable about instructional practices as well as have competencies in effective coaching;

6) sustained and intensive, rather than standalone; 7) interconnected and consistent in content and approach across activities and promote peer communication and collaboration; 8) part of portfolios that build on the entire range of learning activities and training mechanisms, cover the full scope of knowledge and competencies that need to be supported, and are linked to incentives and career advancement; 9) provide a balance of joint professional learning activities that are relevant across professional roles, settings, and ages with those that provide deep specificity for particular roles and specializations; and, 10) reflect the science of adult learning and recognizes the importance of the multiple, comprehensive domains of knowledge and learning that are important for adults (Allen & Kelly, 2015a, p. 13).

As stated the field of ECI has also developed adult learning and training frameworks for those who work with infants and young children with disabilities. As an example, Walker McCollum (1982) proposed a framework to guide the training of ECSE teachers using three core elements: 1) the content or objectives of what the trainees are expected to learn, do and feel at the completion of the program, 2) the sequence of training activities designed to teach the content, and 3) the evaluation of whether the activities resulted in the trainees meeting the training objectives. She also stressed that there should be a match between the three elements. She further defined the training content to include a variety of learning levels beginning at simple awareness through comprehensive knowledge and application of skills.

In describing this training framework, Walker McCollum cited the work on in-service conducted by Harris and his colleagues (Harris, Bessent, & McIntyre, 1969) which informed the implementation of her framework. She identified a hierarchy of training activities and linked these levels to different levels of trainee impact. The hierarchy for learning activities began with lectures, proceeding to demonstration, role-play, and guided practice. Trainee impact ranged from awareness to knowledge acquisition to skill development and, lastly, to attitude change. It

was recommended the more complex the learning, the more the learner must practice the required behaviors across a variety of situations (Walker McCollum, 1982, p. 53). Lastly, Walker McCollum proposed that training must address the learner's motivation to learn new skills, the adoption of behaviors by the learner to meet these skills, and ways for the learner to self-evaluate the acquisition of these skills. This would allow trainees to experience an individualized application of these skills.

In-service was defined by Pat Trohanis (1994) as an ongoing and systematic enterprise that consists of diverse educational and training activities to support improvement, capacity building, and change and that is focused on the accomplishment of organization and individual goals (p 312). In-service education must (a) be integrated into the organization of the local early childhood program; (b) designed in a systematic, continuous and purposeful manner; (c) treat participants as adults who are self-directed, are interested in improvement, have a wealth of experience, and the capacity to grow and change. He provided a conceptual framework for in-service education that reflected six fundamental features: (1) be an integral part of the early intervention or preschool program; (2) respect and treat people as adults; (3) be participant oriented by involving people in many aspects of the in-service education; (4) employ an ongoing planning approach directed toward maintaining quality work and facilitating change or improvement; (5) foster individual and organization readiness and commitment to learning, changing, and growing; and (6) offer a conducive learning environment and high quality pathways to learning. Each feature consisted of several interrelated activities.

Striffler and Fire (1999) proposed a model for planning and implementing a state-level comprehensive system of personnel development comprised of 12 interconnected key elements linked to the service system. The foundation of the model is the state's vision for the early

intervention system (Element 1), which directs and links the entire system. The service system standards (Element 2) provide a foundation for the implementation of the vision. The creation of roles and responsibilities, indicators, and job descriptions (Element 3) determines and clarifies the precise role of early intervention specialists in providing services. Roles are informed by the vision and service system standards, and are individualized to the particular characteristics of service settings. Measureable indicators of early intervention practices provide observational criteria to assess job performance. And job descriptions provide a summary of the roles and indicators with explicit descriptions of expectations for the job. Striffler and Fire recommend that personnel standards (Element 4) be developed based on the roles and indicators of early intervention specialists and consistent with the mission and program standards of all early intervention agencies. Recruitment and retention efforts (Element 5) are guided by the previous elements and are to reflect the specific job. Competencies (Element 6) guide training efforts and further clarify the knowledge, skills and attitudes required to perform a job. Personnel needs assessments (Element 7) are based on roles, indicators and competencies and are used to gage the need for and effectiveness of educational and training opportunities. Personnel development strategies (Element 8) are related to the identified needs for additional training, and are individualized to address the specific and expanding roles personnel perform. Supervision, mentoring, and evaluation of personnel (Element 9) are functionally grounded on specific roles, indicators, and competencies. A recognition process (i.e., credentialing, certification) (Element 10) validates appropriate practice and competence of individual practitioners. An infrastructure (Element 11) is required to sustain a system of personal development and ongoing training initiatives. And lastly, the implementation of a service delivery system (Element 12) occurs when all elements are integrated.

More recently, Dunst and Trivette (2009a) proposed an adult learning framework for ECI after completing a meta-analysis and research syntheses of adult learning strategies. The research synthesis identified active learner involvement as being key to the mastery of new knowledge and skills, along with bidirectional instructor/learner interactions (see Trivette, Dunst, Hamby, & O'Herin, 2009). The resulting framework was termed the Participatory Adult Learning Strategy (PALS), and it was composed of four learning phases: (1) introduction of knowledge and skills, (2) application of knowledge and skills, (3) informed understanding of the learning process using knowledge and skills, and (4) repetition of the learning process. Instructor practices that were identified as being most effective in each phase are on Table 2.

This framework also included the incremental presentation of new information to learners in order to facilitate the integration of new learning into the learner's existing knowledge base. Other recommendations included the use of multiple opportunities to foster learning and observations to evaluate the learner's knowledge and skills as measured to a performance standard. In addition, Dunst and his colleagues emphasized the importance of adhering to each PALS feature to assure effectiveness, including the measurement of fidelity to the features of the teaching of intervention practices to the adults and the subsequent delivery of the intervention practice by the adults to the target children (Dunst, Trivette, & Raab, 2013).

Dunst enhanced the PALS framework through a metasynthesis of PD studies that documented changes in student and child learning as a result of PD (Dunst, Bruder, & Hamby, 2015). The metasynthesis found changes in child and family outcomes occurred only when specific features of PD were used. These features are consistent with other PD frameworks in adult learning, and have been recommended for the conceptualization, design, and implementation of high-quality PD in ECI (Dunst, 2015). These featured include:

1. The explicit explanations and illustrations of content or practice to be learned

2. Active and authentic job-embedded opportunities to learn the new practice
3. Performance feedback on the implementation of the practice
4. Opportunities for reflective understanding and self-monitoring of the practice implementation
5. Ongoing follow-up supports
6. Sufficient duration and intensity of training to provide multiple opportunities to become proficient in the use of a practice

The analysis of studies found that the more practices that were implemented, the more effective the training as measured by both trainee and student outcomes. Lastly, PD activities were described as implementation practices, and the instructional skills that professionals learned to use as intervention practices (Dunst, 2015, p. 211).

2.2.3 Implementation Frameworks and Personnel Practice. ECI Personnel are also responsible for the implementation of effective and evidenced-based student/child/family practices into program and system applications to improve service delivery on a larger scale. One of the original frameworks proposed to accomplish this consisted of a three-level framework to scale up intervention research findings into effective service delivery models (see also Paine & Bellamy, 1982; Paine, Bellamy, & Wilcox, 1984). The framework resulted from a study of implementation features found across successfully scaled up EBP innovations into effective service delivery models in human services programs for children, youth, and adults with special needs. These features included assistance in program adoptions and adaptations and ongoing training and support to enable staff to meet performance standards linked to positive client outcomes. This latter feature was necessary to maintain the integrity and consistency of the intervention features of the model and prevent program drift across sites. Explicit performance criteria was delineated at each level of implementation to insure the reliability of evidence across

sites, populations in need of the service, and individuals implementing the services (see Figure 2). The success of this process was attributed to the adherence to operational definitions, measurable outcomes, and well-documented interventions that could be replicated with fidelity. The implementation process was illustrated with examples of effective service models that were scaled up across agencies, age groups, and service sectors. These included teacher PD (Carnine & Engelmann, 1984), ECI (Cochran & Shearer, 1984), and community and school interventions (e.g., Blase, Fixsen, & Phillips, 1984; Walker, Hops, & Greenwood, 1984).

The authors also include one early childhood model to describe this process: the Portage Model for Home Teaching (Cochran & Shearer, 1984). The Portage Model was an outreach project for the original Portage Home Visiting Project which was developed with funding by the HCEEP program in 1969 to (1) provide educational services to preschool handicapped children and their parents; (2) develop a practical, cost efficient and replicable program delivery system; and (3) involve parents as the mediators of their child's intervention (page 104). Over 250 sites all over the world implemented the model, and the authors attribute their success to the specific process, training, materials and criteria that they used in the adoption process and the reliance on measures of child change.

Similar to the Portage Project outreach, there were hundreds of outreach projects funded by the EEPCD that also demonstrated a scaling up process similar to what was described by Paine et al. (1984). In particular, the outreach emphasis was on the replication process of an effective service delivery model. Though no random control trials for efficacy were required for validation of an HCEEP model demonstration, data on effectiveness across young children, families and/or the practitioner's effects on young children and families had to be provided before a set of procedures for scaling up the project would be approved for funding. Outreach projects also had to

include a specific set of activities to disseminate the model program service delivery through various products and training.

The process of scaling up EBP into effective service delivery models has been refined, improved, and referred to as implementation science (IS) (Halle, Metz, & Martinez-Beck, 2013). Scaling up has been defined as the process by which interventions are implemented on a small scale, validated and then implemented more broadly in real world conditions (Odom, 2009) while IS has been defined as a specified set of activities designed to put into practice an activity or program of known dimensions. Inherent in the process is the identification of operationalized and effective groups of practices which in totality meet a service need. Once a model is established, scaling up and sustainability is the goal (see Dunst, Trivette, Masiello, & McInerney, 2006; Sugai, Horner, Fixsen, & Blase, 2010; Wayne et al., 2008). Sustainability is dependent on a detailed process which begins with identifying the valued outcome, then identifying and modifying practices and finally implementing the practices, all the while performing progress monitoring, data based decision making and building capacity (McIntosh, Filter, Bennett, Ryan, & Sugai, 2010). Implementation science must be purposeful and documented in sufficient detail to promote scaling up or program replication. Effective examples of this process use an incremental process of system change that differentiates the role of program implementers into teams based on function (cf. Sugai et al., 2010).

The State Implementation and Scaling Up of Evidenced Based Practices Center (SISEP) articulated a precise process to operationalize the steps and components of scaling up (Fixsen, Naoom, Blase, Friedman, & Wallace, 2005). Successful scaling up typically involved both horizontal and vertical activities (CORE, 2005; Menter, Kaaria, Johnson, & Ashby, 2004). Vertical scaling-up, or the depth of going-to scale, referred to changes that have effected at all levels of a system (e.g., state level, program level, and person level) contributing to the adoption

and sustained use of targeted practices. Horizontal scaling-up, or the *breadth* of going-to-scale, referred to the spread in the use of targeted practices by end users that has typically accomplished by replications of replications, which have the effect of recreating the adoption and sustained use of targeted practices (Simmons & Shiffman, 2006). Critical to both levels of activities were criteria for defining the program to be scaled up. Fixsen et al. (2013) later defined four such criteria to frame this process: 1) clear description of the program; 2) clear description of the essential functions; 3) operational definitions of the essential functions; 4) a practical assessment of the performance of practitioners who are using the program. Each criteria contain additional descriptors to further define this framework. Halle et al. (2013) further adapted and illustrated this framework in early childhood education (ECE) by adding a fifth dimension to an implementation framework: evidence that the program is effective when used as intended.

Recently, there has been a growing interest and multiple examples of the process and strategies used to implement a systemic improvement through implementation science (Cook & Odom, 2013; Halle et al., 2013; Klingner, Boardman, & McMaster, 2013; Odom, Cox, Brock, & the National Professional Development Center on Autism Spectrum Disorders, 2013). Meyers, Durlak and Wandersman (2012) synthesized information from 25 different implementation frameworks currently in use. This review focused on literature relating to the specific procedures and strategies (i.e., the "how-to") of implementation with a focus on practices that achieved the innovation's "desired outcomes." The implementation frameworks included in the review had to (a) include actions and strategies used to implement innovations in new settings and (b) be in a published or unpublished report in English by June 2011. Strategies to locate relevant reports included database searches with multiple search terms, journal hand searches of relevant journals and inspection of reference lists of each relevant report. Study selection followed the PRISMA preferred reporting items for systematic reviews and meta-analysis with 1,945 reports initially

screened, leading to a detailed inspection of 152 reports and a final inclusion of 25 frameworks for the synthesis. The overall findings suggested that the implementation process involves a coordinated series of related elements. The authors identified 14 distinct steps that were further divided into four temporal phases. The phases began with the initial consideration regarding the goodness-of-fit between the innovation and host setting. A vast majority of the reviewed frameworks included steps to foster a supportive climate for implementation with secure buy-in from key leaders and front-line staff, including the following strategies: (1) engage key opinion leaders and decision-makers in the implementation process with a shared perception that the innovation is necessary and beneficial; (2) align the innovation with the host setting's broader mission and values; (3) reduce barriers, identify incentives and disincentives for innovation use; and (4) identify champions for the innovation. The second phase focused on the creation of an organized structure to oversee the implementation, including a clear plan and timeline for implementation the identification of who will perform each task. Phase three involves the provision of support for an ongoing infrastructure once implementation begins and it includes: (1) the provision of ongoing technical assistance to front-line providers; (2) monitoring ongoing implementation; and (3) the creation of feedback mechanisms to inform all involved parties of the status of implementation process. The final phase uses the information gathered in the first three phases of implementation to conduct an analysis of the implementation to reflect on the successes and needs of the host site for continued practice implementation.

Most recently Metz and colleagues (Metz, Naoom, Halle, & Bartley, 2015) proposed an integrated stage-based implementation science framework for specific EC programs and systems. This framework was based upon the implementation science research conducted by Fixsen et al. (2005) and acknowledges the synthesis that was conducted by Meyers (2012). This framework is comprised of four distinct stages and three core implementation

elements within each of these stages. She emphasizes that this framework is focused on implementation and systems change which can be expected to take 2 to 4 years. The four stages begin with exploration followed by installation, followed by initial implementation, and finally full implementation of the full program or system. The three core elements embedded within each of the four stages are implementation teams, data-based decision making for progress monitoring and improvement, and sustainable infrastructure for capacity building. She stated that the implementation teams should have core competencies across a number of areas which includes the innovation or approach, the infrastructure, these cycles of implementation, and general knowledge and application of systems change. She illustrates this implementation process through the development of a professional development program process in North Carolina. Other early childhood programs are also applying this framework (cf, Halle et al., 2013; Hill & Olds, 2013; Sarama & Clements, 2013; Yazejian, Bryant, & Kennel, 2013).

Dunst, et al. (2013) provided an addition to the work in IS and ECI by describing the role of fidelity or treatment fidelity. Fidelity refers to the implementation of a practice or group of practices as they were intended to be used to achieve specified outcomes. The authors reinforce Fixsen's et al. (2005) assertion that the adoption of EBP is dependent on implementation practices used by trainers and others to facilitate the use of intervention practices by practitioners to create predetermined outcomes of interest. For example, the adoption and use of intervention practices by practitioners or parents are the outcomes of implementation practices, and the improvements in a child's learning and development are the outcomes of the intervention practices (p 87). Fidelity to the prescribed procedures for both practices is necessary to assure positive child outcomes as illustrated through a description of an in-service study with Head Start teachers and the fidelity measures to assess both implementation and intervention.

2.3 Pedagogy in ECI

Pedagogy has been defined as the theory and practice of teaching: the function or work of a teacher. Pedagogy in ECI refers to the knowledge and skills a practitioner needs to know and do in order to facilitate learning in infants and young children with disabilities and their families. The theory and practices of ECI pedagogy have evolved over the past 50 years of service provision, research about the behavioral and learning needs of infants and young children and their families, and the growing evidence base to support both the content and the practices that make up the work of the EC interventionist.

The federal U.S. Department of Education (DOE) has also helped define the pedagogy of ECI personnel preparation through funding priorities under IDEA. For example, one of the first federally-funded early intervention personnel preparation programs was described in the literature by Geik, Gilkerson and Sponseller in 1982. The program was a graduate competency-based training program focused on five essential roles the authors identified for those that worked with infants: infant specialist; facilitator/consultant; parent educator; team collaborator; and program developer. Each role had assigned competencies, and these were implemented and measured through coursework and intensive practicum experiences.

McCollum (1987), who also directed a preservice project funded by the DOE, identified 23 roles associated with practitioners working with infants and young children in ECI. She then surveyed ECI practitioners about their roles according to the age level they served. One hundred and fifty-five teachers who served preschoolers and 180 early interventionists serving infants and toddlers completed the questionnaire. The teachers who worked with preschool age children provided services in center-based public school classrooms. Those serving infants and toddlers were employed by private agencies and to a lesser extent public agencies. A majority of the preschool teachers had master's degrees as did 36 percent of those serving infants and toddlers.

The respondents were asked to rate each of the 23 roles in regard to how much time they spent in each, as well as its importance for inclusion in a preservice program. Comparisons were then made between the two groups of practitioners. For example, the largest amount of time that preschool teachers spent was in group and individual learning activities. Those working with infants and toddlers spent their largest portion of time working with individual children and working with families. Statistical comparisons identified five areas in which teachers of three to five year old spend more time than those with infants and toddlers: organizing the learning environment, planning learning activities, implementing group activities, collecting and analyzing progress data, and working with para professionals and volunteers. The infant toddler interventionists identified nine areas in which they differed from preschool teachers. Four of these related to families including teaching parents to work with their children and identifying family member's needs, others related to collaboration and coordination between professionals. There were no differences in roles such as teaching and learning, assessment, developing individual programs and implementing learning activities with individual children. In regard to pre service preparation needs, the areas corresponded to what the practitioner identified as their primary roles. The infant toddler interventionists identified needing more emphasis on working with families and interdisciplinary cooperation. The preschool teachers identified areas relating to families as well as areas related to teaching and learning of children. Both groups identified planning family involvement activities and communicating with family members about their child as needing more emphasis.

To gather empirical data on the content and practices taught to those preparing to become ECI practitioners, Bruder and McLean (1988) conducted a review of 40 early intervention personnel preparation programs funded by the Office of Special Education Programs (OSEP) at the DOE. Thirty of the programs included a training philosophy as their framework, and all 40

provided training to a variety of disciplines including physical therapists, nurses, occupational therapists, social workers, speech-language pathologists and other educators. In reviewing the programs coursework and competencies, the most frequent were in the areas of assessment, families, intervention, infancy and medical issues. Competencies also included team work, program administration and program planning. Research was notably absent in coursework and competencies. A mean of 29% of the total program hours were spent in practica, though no methodology was reported in regard to the supervision of the student during practicum hours. A formal evaluation plan was included in 32 of the projects, and 26 included specific evaluation criteria for students, including measurable and criterion referenced standards.

Bailey and his colleagues at the OSEP-funded Carolina Institute for Research in Infant Personnel Preparation defined the core intervention competencies and responsibilities assigned to each discipline through work groups of leaders from each discipline (Bailey, Palsha, & Huntington, 1990) The early childhood special education group identified the following statement to describe their mission: To ensure that environments for infants and toddlers (with disabilities) facilitate children's development in social, motor, communication, self-help cognitive, and behavioral skills and enhance children's self-concept, sense of competence and control on independence. They also identified 12 ECSE competencies: conduct and implement screenings and child finds programs, assess children's developmental competence, plan and implement developmental interventions, coordinate interdisciplinary services, integrate and implement interdisciplinary team recommendations, assess family needs and strengths, plan and implement family support services or training, evaluate program implementation and effectiveness of overall services for children and families, coordinate services from multiple agencies, advocate for children and family, provide consultation to other professionals families and caregivers, work effectively as a team member.

These findings, as well as other recommendations (McCollum & Thorp, 1988) resulted in the DEC recommendations for specialized pedagogy for those serving infants and young children with disabilities. The pedagogy included content and practices for both typical and atypical children, characteristics all types of exceptionalities, curriculum and methods, physical, medical and behavior management, interdisciplinary and interagency teaming, and program management. These recommendations became the foundation of the CEC EC personnel specialty standards which continue to guide ECI pedagogy today.

2.3.1 Personnel Standards. Personnel standards assist states in developing knowledge and skill requirements for teachers and other personnel. Nationally, professional organizations delineate discipline-specific practice standards to assure the competence of professionals who provide services under the discipline title (e.g. American Speech-Language-Hearing Association for speech and language pathologists providing speech therapy). These standards are used to accredit IHE programs of study (or state recognized alternative programs of preparation) to prepare and graduate students who are then eligible for state licensure or certification to practice under their discipline. To be accredited, IHE programs must match curricula and educational activities to the national standards and best practices in the discipline.

Most disciplines are licensed to serve clientele across the life span (e.g. nurse, occupational therapist, physical therapist, speech and language pathologist) (cf, Catalino, Chiarello, Long, & Weaver, 2015; Muhlenhaupt, Pizur-Barnekow, Schefkind, Chandler, & Harvison, 2015; Prelock & Deppe, 2015), requiring a broad curricula and practicum requirements in IHE preparation programs. Education has recognized that age levels and content areas (e.g., in ECSE) require specific competencies, therefore encouraging IHEs to offer focused programs of study.

One resulting challenge in early childhood in particular has been the multiple standards developed by national organizations (Allen & Kelly, 2015b). A few examples include the EC Generalist Standards from the National Board for Professional Teaching Standards (NBPTS) that apply to teachers of children from ages 3-8 (National Board for Professional Teaching Standards, 2012), the Model Core Teaching Standards, Interstate Teacher Assessment and Support Consortium (InTASC) of the Council of Chief State School Officers (CCSSO) for K-12 teachers (Council of Chief State School Officers, 2011), the EC Professional Preparation Standards from the National Association for the Education of Young Children (NAEYC) for teachers from birth to age 8 (National Association for the Education of Young Children (NAEYC), NAEYC, 2011), the Initial and Advanced Preparation Standards from the Council for Exceptional Children (CEC), and the Initial and Advanced Specialty Standards from the Division of Early Childhood (DEC) of the CEC (Stayton, 2015). The CEC, DEC and NAEYC standards are most relevant to teachers in ECI.

The governing body of CEC created a professional standards and practices committee to develop national standards for special education teachers in 1982. These standards were approved in 1992 and have been continually refined through research reviews and consensus from the field. The current standards were approved in 2012 and include 7 initial standards under 4 areas of focus for entry-level professionals, and 7 advanced standards for continuing education or leadership program graduates (Council for Exceptional Children, 2014). The CEC initial practice standards and focus areas are listed on Table 3.

As one of the 17 subdivisions in CEC, the DEC developed specialty standards to guide the content of ECSE preservice personnel preparation programs and state certification requirements in 1993 (Stayton, 2015). The standards were organized into a set of 93 knowledge and skill statements that aligned with the CEC standards. These were revised and revalidated in

2001 and 2007 (see Lifter et al., 2011), realigned with the language and descriptions used by CEC, and aligned with the 6 standards and 22 elements used by NAEYC for early childhood teacher preparation programs in IHEs (Chandler et al., 2012; Stayton, 2015). National accreditation under The Council for the Accreditation of Educator Preparation (CAEP; formerly the National Council for Accreditation of Teacher Education) requires IHE preparation programs in ECSE to meet the CEC personnel standards as informed by the DEC specialty set of knowledge and skills statements. When a blended ECSE/EC program applies for accreditation from CAEP, it must meet the DEC and the NAEYC personnel standards. They are also listed in Table 3. It should also be noted that ECI has been long recognized for its interdisciplinary focus of intervention (Bricker & Widerstrom, 1996; Bruder & Bologna, 1993; Kilgo & Bruder, 1997; Stayton & Bruder, 1999), yet there are no personal practice standards to guide or accredit interdisciplinary preparation programs (Stayton, 2015).

2.3.2 State Certification/Licensure. Certifications, licenses, or credentials have been used by states to guarantee that teachers have met a standard that qualifies them to provide services to children based on their discipline focus. These are awarded by a state or jurisdiction to individuals who have completed state-established, minimum requirements usually through approved programs of preparation and specialized examinations (e.g. Praxis), or portfolio review processes (e.g. edTPA). Though states use many names for this credentialing process, they are usually categorized as follows:

- Licensure/certification defined for the purposes of this study as a license or certification that stands alone;
- Licensure/certification plus endorsement, defined as situations where a specific first or base, stand-alone license and an added endorsement to that license were both required;

- Endorsement, defined as when requirements specified a particular endorsement that could not stand-alone and that could be added to a variety of base certifications;
- Dual-certification defined as when states required two distinct stand-alone certifications;
- Unified or blended certification defined as a single (common) certification acknowledging teachers are trained to work with young children both with and without disabilities.

Most states used a category specific licensure for special education according to assigned categories recognized under the EHA. In fact, in 1977 it was reported that 35 States had at least six disability categories, included hearing impairment, vision impairment, speech and language impairment, mental retardation, emotional disturbance, physical disabilities, and learning disabilities (Gilmore & Aroyros, 1977). The move to non-categorical special education certification was reported by McLaughlin and Stettner-Eaton (1988). They found that 30 out of 56 states and territories have categorical models of licensure and 26 have moved to a non-categorical model. Many states have both models.

In regard to Early Childhood Special Education, Trohanis reported that in 1980 only four states had a specific teacher license for children under the age of 5 (Trohanis, 1985). Licensure or certification for this age is challenging because of the many settings in which young children with disabilities are served and the many programs in which they may receive services such as Head Start or childcare. When the early childhood provisions of EHA were passed in 1986, there was a flurry of activity to define the competencies that those in early childhood programs needed in order to work effectively with families of young children, in particular infants and toddlers (McCollum, 1987). Bruder, Klosowski and Daguio (1991) conducted a telephone survey of the 50 early intervention state coordinators on their personnel credentialing processes and statutes for all 10 professional disciplines described in Part H of PL 99-457. Only one state reported

standards specific for personnel serving infants and toddlers age birth to 3 for all 10 disciplines recognized under PL 99-457. While most of the states reported having standards for a majority of the disciplines for children from age birth and above, the standards were not specific to the unique needs of infants and toddlers. The disciplines least likely to have standards for services to children beginning at birth were nutrition and special education, and in regard to the use of national standards to guide state certification or licensure the majority of states reported using a combination of both state regulations and national standards, with the exception of special educators. In all 46 states that responded to this question, special educator certification did not reference state standards. Most states (39) reported having a personnel preparation committee within their state Part C Interagency Coordinating Council under EHA.

In 1980 only four states had a specific teacher license for children under the age of 5 (Trohanis, 1985). When the EC provisions of EHA were passed in 1986, specific pedagogy for ECSE teachers was defined to assure a competent and confident workforce. As a result, the DEC published recommendations for teacher competencies for state certification offices and IHE preparation programs (McCollum, McCartan, McLean, & Kaiser, 1989). The recommendations were specific and supported a professional certification structure that was comprised of an entry-level generalist, and an advanced level focused on either infant-toddler or preschool-age children. The authors stressed the need for a hierarchy of competence recognizing the unique child- and family-focused knowledge and skills required by ECI teachers.

Currently, all states require certification and licensure for those disciplines that provide ECI services under IDEA. Recent reviews of requirements across the 50 states found that in comparison to all other disciplines, the EC and ECSE credentials presented the most variability (C. Chen & Mickelson, 2015; Stayton et al., 2009). There were 23 different age levels addressed by EC and ECSE teacher certifications across states, and there was little

congruence between states in regard to the exact name of ESCE licensures/certifications. The ECSE titles ranged from infant-toddler family specialist credential, special education preschool certificate, preschool special needs, special education preschool/EC endorsement, and teacher of children with disabilities 0-5 to preliminary education specialist instruction credential with an EC special education specialty. Lastly, while the majority of licensures/certifications required an exam, only 41% required specific curriculum/ coursework, and 55% required specific field/clinical work requirements (i.e., specified number of hours, populations, age ranges, experiences). Of most concern was the lack of congruence between state certification requirements and national personnel standards in ECSE (Stayton, Smith, Dietrich, & Bruder, 2012).

2.3.3 Recommended Practices in ECI. In 1992 the DEC developed a set of ECI-recommended practices that was based on literature on effective practices for young children with disabilities and their families, as well as the knowledge and experiences of researchers and other stakeholders (DEC, 2014, 1993; McLean, Snyder, Smith, & Sandall, 2002; O'Connor, Notari-Syverson, & Vadasy, 1996; Odom, McLean, Johnson, & LaMontagne, 1995; Sandall, Hemmeter, Smith, & McLean, 2005; Sandall, McLean, & Smith, 2000; Smith et al., 2002). The recommended practices began as an initiative to develop guidelines for service delivery in early intervention and ECSE. The first set of practices were published in 1993 and they were developed through an iterative process that included focus groups and surveys of those in the field. The purpose of the practices were to guide families, program personnel, and those in personnel preparation programs to implement evidence-based services and supports for infants and young children with disabilities and their families. The DEC-recommended practices have recently been revised into seven critical practice areas, under which 66 indicators are delineated (DEC, 2014). The practice areas are also listed on Table 3 and are described below.

1. Assessment: The process of gathering information through a variety of authentic methods to help make decisions regarding eligibility for service, intervention planning, monitoring a child's progress, and measuring a child's outcomes.
2. Environment: Those natural and familiar environments that promote learning within naturally occurring opportunities. Practitioners adapt, accommodate, modify environments to promote participation of young children in developmentally and age appropriate activities and routines.
3. Family: Family centered practices are used to build the capacity of families. Collaborating with families and creating a partnership with them is essential for successful early childhood intervention.
4. Instruction: Intervention strategies are integrated and comprehensive. All members of the intervention team use intentional and systematic procedures that support a child's engagement, participation, and functional outcomes.
5. Interaction: Positive and responsive interactions are critical for promoting a young child's development.

3. The Evidence for the ECI Personnel Practices

Over the past 35 years, there has been much written and many recommendations offered about the preparation, support, and continuing education of the ECI workforce (Bricker & Widerstrom, 1996; Bruder, 2010; Buysse & Wesley, 1993; Catlett & Winton, 1997; McCollum & Stayton, 1985; Stayton & Bruder, 1999; Striffler & Fire, 1999; Thorp & McCollum, 1988; Trohanis, 1994; Winton, 1990; Winton, McCollum, & Catlett, 1997). The majority of the recommendations were not based on rigorous research, nor did they often result in experimental investigations to test their validity. Recently, however, there has been a marked increase in both the quantity and quality of empirical studies being conducted on personnel practices in ECI

(Snyder, Hemmeter, & McLaughlin, 2011). This seems to be a result of a number of factors including the relatively recent emphasis on EBP under the NCLB and IDEA (Bruder, 2010; Snyder, Denney, et al., 2011), the infusion of research funding under the IES (Diamond, Justice, Siegler, & Snyder, 2013), the accountability requirements of publically funded EC and ECI programs (Kagan & Kauerz, 2012a); and the growing need for increased research and rigor to better meet the needs of the ECI workforce (Bruder, 2010; Dunst et al., 2013; Gomez et al., 2015; Horm, Hyson, & Winton, 2013; Kagan & Kauerz, 2012b; Sheridan, Edwards, Marvin, & Knoche, 2009; Snyder, Hemmeter, et al., 2011; Zaslow et al., 2010).

Though many of the studies on personnel practices address EC at risk populations (Artman-Meeker, Hemmeter, & Snyder, 2014; Buysse, Castro, & Peisner-Feinberg, 2010; Buzhardt et al., 2011; Hemmeter, Snyder, Kinder, & Artman, 2011; Hsieh, Hemmeter, McCollum, & Ostrosky, 2009; Landry, Anthony, Swank, & Monseque-Bailey, 2009; McCollum, Hemmeter, & Hseih, 2013; Moreno, Green, & Koehn, 2015; Pianta et al., 2014; Pianta, Mashburn, Downer, Hamre, & Justice, 2008; Piasta et al., 2012; D. R. Powell, Steed, & Diamond, 2010), their findings inform the delivery and evaluation of preservice and in-service for those serving infants and young children with disabilities. Likewise, studies conducted in special education also inform the design and delivery of training to ECI practitioners (Brock & Carter, 2015; Harry & Lipskey, 2014; Ploessl & Rock, 2014; Rock et al., 2009; Rock et al., 2012; Scheeler, McKinnon, & Stout, 2012; Vernon-Dotson, Floyd, Dukes, & Darling, 2013; Westling, Salzberg, Collins, Morgan, & Knight, 2014). As a result, there has been an infusion of knowledge about personnel research and practice that directly applies to ECI and the development and scaling up of effective personnel EBP.

There are at least two national mechanisms to designate the findings of educational research studies as EBP. The What Works Clearinghouse (WWC) of the IES, U.S.DOE, was

authorized to identify educational studies that provide credible and reliable evidence of the effectiveness of a given practice, program, or policy for dissemination and use. There are no WWC-approved practices or programs for ECI preservice or in-service under the category of children and youth with disabilities aged PreK to 5.

The more recent EBP standards from the CEC were designed to guide the field of special education in the identification of EBP (Cook et al., 2015; Council for Exceptional Children, 2014). A systematic process was used to identify and approve 28 quality indicators (QI) that address a number of study variables: context and setting; participants; intervention agents; practice descriptions; implementation fidelity; internal validity; outcome measures/dependent variables; and analysis for both group and single subject designs. Studies must meet all relevant QI and be replicated and considered methodologically sound (Cook et al., 2015, p. 223). Further rigor is defined through the type and number of research studies that must occur before a practice is considered evidenced based. For group designs, this requires two random control group trials of at least 60 participants or four nonrandom assigned group studies with at least 120 participants. Single subject designs require five studies with at least 20 participants. Combinations of designs can also be used to document the standard if the studies meet at least 50% of the criteria of both designs. There must also be no negative effects from the practice being tested. None of these standards have been met in ECI personnel practice studies to date.

Though stringent, these national research standards provide guidance for the design of preservice and in-service studies in ECI (see Coogle, Rahn, & Ottley, 2015). However, a broader and more relevant definition for ECI evidenced based preservice and in-service practice will be used in this monograph. An EBP is one that has been empirically established as effective by research evidence establishing a statistical or functional relationship between the characteristics of a practice and the expected outcomes or consequences that the practice is intended to have (Dunst

& Trivette, 2009a; Dunst, Trivette, & Cutspec, 2002) It is the nature of such a relationship that directly informs what a practitioner can do to produce a desired outcome (Dunst & Trivette, 2009b). This definition encompasses the range of data sources providing evidence to inform personnel preparation and continuing education in ECI. These include surveys that describe personnel practices; program descriptions and non-randomized group designs of training content and methods; experimental studies; and research reviews and syntheses. All contribute to the growing repository of evidenced based personnel practices in ECI.

3.1. Survey Data

The U.S. DoED, Office of Special Education Programs (OSEP), funded The Center to Inform Personnel Preparation Policy and Practice in Early Intervention and Preschool Special Education (CIPP) (http://uconnucedd.org/projects/per_prep/resources.html) to collect, synthesize and analyze information related to the preparation and continuing education of professionals representing all disciplines providing both early intervention (EI) and ECSE services under IDEA. Surveys collected information on the status of a number of personnel issues. For example one line of inquiry examined the supply and demand for ECI personnel (Bruder, 2010; Campbell, Chiarelo, Wilcox, & Milbourne, 2009). All state Part C and Part B (619) coordinators were interviewed and reported concerns about the limited number of professionals who had specialized training in ECI: Less than half of the state coordinators reported having a qualified work force in any discipline category. These data led to other examinations of the status of preservice, in-service, and practitioner perceptions.

3.1.1. Preservice. Surveys about program content and methods classes related to ECI were completed by IHE programs across 17 professional disciplines in all 50 states (Bruder, 2010). IHE programs reported as much variability within a discipline as there was across disciplines in regard to hours devoted to specific course content. Of more concern was that many aspects of EI/ECSE

service delivery under IDEA were not addressed. The most critical finding was that the majority of personnel programs prepared students for a life span license or certification, and as represented in their program.

Other surveys of IHE coursework on disability-related pedagogy also reported limitations in content offered for ECI practitioners. Chang, Early & Winton (2005) surveyed EC preparation personnel programs and reported that while over half stated that their mission included those who would teach in ECI, only 41% required coursework about teaching young children with disabilities. Similar findings were documented in an analysis of the websites of 226 IHE preparation programs in EC (Ray, Bowman, & Robbins, 2006). Disability was only addressed in 12% of required course hours.

CIPP also examined the presence of recommended ECI practices in coursework at 155 IHEs (Dunst & Bruder, 2005). Surveys revealed absences in a number of pedagogical areas such as family centered practices, child-focused practices, natural environments, team process and service coordination. This finding replicated other findings about the absence of recommended practices in IHE. Bailey, Buysee and Palsha (1990) surveyed 449 IHE programs representing 237 undergraduate programs and 212 master's programs, and 8 disciplines. None of the programs reported having recommended practice content for professionals in ECI.

Miller and Stayton (1998) surveyed 41 personnel preparation programs that had a unified program across both early childhood and special education. These programs had noted differences in the standards they used to document the acquisition of specialized knowledge and skills by their students, and field experiences were inconsistent as respondents reported few inclusive classrooms available for practica experiences. Dunne (2002) also reported on survey findings from 139 faculty and students from unified and specialized ECE and ECSE programs. Fifty seven surveys were received from unified programs and 82 from specialized programs

representing 23 undergraduate programs in 14 states, of which 11 self-identified as having a unified program and 13 as having separate ECE and ECSE programs. Participants from separate ECE or ECSE programs indicated a need for students to receive specialized training to serve children with special needs, and a belief that this could not be taught effectively in a unified program structure. Participants from unified programs held the belief that preparation programs must model inclusive/integrated practices in order to prepare students to teach in such settings.

Hemmeter et al. (2008) conducted a survey on the preparation of students in a specialized area: social emotional development and behavior management practices with 125 EC faculty across 2-year institutions (63) and 4-year institutions (62) in 9 states. The faculty reported that they were preparing their students to work with families, to support children's social emotional behaviors, they were not addressing children's challenging behaviors. When IHE programs for ECSE or blended EC/ECSE were compared to 4 year ECE programs, there were significant differences reported in the preparedness of students to address the extreme behavioral needs of children favoring the specialized programs. Lastly, La Paro et al. (2014) conducted a telephone survey with 128 early childhood programs in two- and four-year IHEs across seven states to examine student teaching experiences. Fifty-eight percent of the sample represented 2 year programs and 42% were from 4 year programs. The survey focused on student teaching requirements; placement sites and teachers; types of experiences; and teacher supervision and evaluation. Student teaching was defined as an intensive classroom experience during which teacher candidates are immersed in the role and responsibilities of a lead teacher (page 319). This is seen as the last application of knowledge and skills prior to graduation and employment as a teacher. Fifty-eight percent of the sample were 2 year programs and 42% were 4 year institutions. A telephone survey was conducted with each of the IHE programs, usually with a person who had the most knowledge of the program (department directors or chairs). The

survey focused on student teaching requirements; placement sites and teachers; types of experiences and teacher supervision and evaluation. There were 199 IHEs identified as having an early childhood education program. The overall response rate from these programs was 73 percent or 145 responses.

Results indicated children's developmental areas, adult children interactions, and planning were the top three teaching strategies in which the students received feedback during student teaching. Inclusion, daily routines and transitions were ranked as the lowest. The content of the feedback given to the student teachers were highest in the areas of language and literacy. Four-year programs ranked literacy activities higher than the two-year programs, and social studies was ranked lowest for both types of programs. Another purpose of the study was to analyze how students were supervised and evaluated. Ninety-five percent of the programs reported using on-site visits to provide feedback to student teachers. The number of these visits ranged from 0 to 5 or more for two-year institutions, and from 3 to 5 observations for four-year institutions. The visits ranged from 15 minutes to 180 minutes per visit, the majority reporting the visits lasting over an hour. Student journals and reflections were also used in the majority of programs as were cooperating teacher reports. Thirty-eight percent of the respondents reported using videotaped or live stream activities to analyze student teacher performance. One quarter of the programs used a published tool to evaluate student teachers. These tools included the ECERS the CLASS and a variety of others. Of the 32 programs that reported using a public observation tool, 27 programs reported who completed the tool. In over half the programs both the university or department supervisor and the cooperating teacher completed the tool. The remaining programs reported using a program specific tool that was related to the program, the state agency that oversees or teacher licensure, or a tool developed by national organization.

A secondary analysis of data from the schools and staffing survey was conducted by Ronfeldt et al. in 2014 (Ronfeldt, Schwartz, & Jacob, 2014). This survey was a national survey of K-12 teachers and it includes information on a variety of variables including their preparation for teaching, their retention as a teacher, and their perceptions of preparedness. The data that were collected from this survey were also linked to the common core of data on the teachers' schools as well as the competitiveness of their college. The data were analyzed using regression analysis for both state and district effects, as well as controls for school and teacher characteristics. In particular, the purpose was to find out if completing more practice teaching and coursework about teaching methods predicted teachers' retention, and their perception of their preparedness to teach. An additional research question focused on whether the results varied by different types of teachers and schools. Though the teachers who were included in this analysis were limited to those teaching K through grade 12, the findings suggested that the teachers who spent more time in student teacher practicum also completed an additional methods course. The analysis also suggested that teachers who teach the youngest students in the elementary level completed more preparation courses than teachers at other school levels, such as middle school and high school. Additionally, teachers who had more practice teaching also were employed in schools with larger numbers of students. Another finding was that teachers who had more practicum and method classes perceived themselves as more competent. Additional findings identified the fact that there were no differences between methods, coursework and retention across schools.

While there has been an increasing focus on linking teacher preparation programs to student outcomes, the research in this area is sparse and raises more questions than provides answers. Constantine et al. (2009) examined the association of coursework completed by teachers, their subsequent teacher practices, and student outcomes. The study included 2600

students, 62 schools, and 20 school districts. No evidence of relationships between the amount of teacher preparation (as measured by coursework) and teacher effectiveness was found as measured by student achievement or outcome. Additionally, Boyd, Grossman, Lankford, Loeb, and Wyckoff (2009) examined teacher preparation in teachers at 31 schools in New York City. They found that teachers who had more opportunities to practice the content they would teach in schools produced greater student outcomes in their first year of teaching.

Other information about preservice preparation has been provided by surveys of ECI practioners. Recchia and Beck (2014) investigated the perceptions of pre-service teachers after their first year of teaching. Thirteen students who had completed a master's degree program in integrated early childhood for children from birth to 8, and currently teaching in early childhood settings were interviewed, three of whom were certified in general early childhood education, one in special education and the rest were dually certified. Seven were currently teaching in early childhood settings that included children with disabilities. The participants felt less prepared in terms of specific curricula which aligned with their particular teaching settings. They felt more prepared in broad based skills that could be applied across a variety of classrooms. A number of themes emerged which emphasized the importance of varied practice settings, and the need to have more authentic teaching experiences. In particular, the new teachers felt challenged when in contexts where it was difficult to use practices they had learned in their graduate program, and they also reported challenges with paperwork, assessments and accommodating to the accountability climate in schools.

Lastly, to assess the future capacity of IHE preparation programs, CIPP conducted a survey with OSEP funded doctoral programs specific to ECSE (see Woods & Snyder, 2009). Less than half of the 60 programs addressed ECSE, and 23 participated in the survey. Only six

doctoral programs were interdisciplinary having two or more disciplines enrolled, and none of the 23 programs mandated any emphasis in children age birth to three.

3.1.2. In-service. State training and technical assistance systems for EI/ECSE providers across the country were examined through interviews and document review for the presence of components which contributed to a systematic, sustainable approach to professional development (Bruder et al., 2009). Defined components included:

1. Dedicated resources such as an agency budget line item
2. Staffing
3. A dedicated agency responsible for the provision of the training
4. Policies or procedures for determining professional development needs
5. Training content related to identified need or state standards
6. Quality assurance systems
7. A process for evaluating outcomes
8. Ongoing training that is provided over time
9. A formal structure for the delivery of content (training modules etc.)
10. Workplace applicability.

Only twenty of the Part C systems and 23 of the Part B (619) systems met the criteria as having a majority of components. Part C states with systems reported that training was most often delivered through workshops (*n* = 19) or the Web (*n* = 16), followed by presentations (*n* = 9) and conferences (*n* = 8). A majority of states provided CEUs for training (*n* = 15), and five linked training to a credential and two to a certificate. Training content was most often identified through administrative and consultant input (*n* = 19), and the most popular training areas were service delivery (*n* = 19), policies and procedures (*n* = 18), families (*n* = 11), and disability-specific information (*n* = 10). Training was evaluated by trainee feedback forms (18), and five

states used compliance monitoring to further assess training. These findings were similar for Part B (619) programs.

Recent data collected by Cox, Hollingsworth and Buysee (2015) had similar findings in regard to type of PD offered in states. They surveyed 831 PD providers from Iowa, Minnesota, Oregon and Virginia using the *Landscape Survey,* created by the National Professional Development Center on Inclusion (NPDCI). Almost all who received PD were practitioners with less than a BA degree, though administrators and family members also participated. The majority of PD focused on children's development and learning, classroom practices, and family communication, with less than half of the PD addressing inclusion and learning for children with disabilities or children from culturally and linguistically diverse backgrounds. Over half of the PD was reported to be based upon NAEYC developmentally appropriate practice, state early learning standards, and state professional competencies, while a quarter reported the use of NAEYC personnel standards, and less than 5% used DEC personnel standards. Half of the PD consisted of one-time events, with almost a third reporting multiple PD sessions over time, and a few providing PD the equivalent of one semester. PD providers who provided follow-up activities to trainings had more years of experience in EC, and advanced degrees.

Additional analysis of the self-reported characteristics of the PD providers and response patterns of PD characteristics revealed significant positive correlations between the number of content areas covered and the number of delivery approaches used, as well as the number of providers' years of experience in EC and the number of PD content areas covered. Significant differences were found in the level of PD intensity offered by the discipline of the PD provider: Half (51.2%) of ECE/EI providers used follow-up approaches compared to special education (19.4%) and related service providers (29.4%). The level of intensity was also found to significantly differ by PD providers' reported employer, with follow-up activities most

frequently reported by providers employed by local/regional agencies (38.4%) in comparison to university (23.8%), state agency (7.1%), and self-employed providers (12.7%). PD providers typically offering follow-up activities had more years of experience in EC. On-site follow-up predicted higher intensity PD, and follow-up by mail predicted one-time events. Significant predictors of the intensity of PD included providers' state of residence and employment agency, with local/regional staff and self-employed providers significantly less likely to offer high-intensity PD than providers from universities. PD providers with reported education level of a BA or less were less likely to typically provide higher intensity PD than those reporting an MA or more advanced degrees.

3.1.3 Self Efficacy. Part C and 619 service providers (*N*=1800) reported on their feelings of self-efficacy and experience in preservice and in-service activities (Bruder, Dunst, & Mogro-Wilson, 2011; Bruder, Dunst, Mogro-Wilson, & Stayton, 2013). The preservice variables were type of degree (discipline), years of formal postsecondary education, licensure, and participants' judgment of how well their preservice training prepared them to work with young children and their families. The in-service variables were type of state training/technical assistance available to the participants, whether participants were required to have continuing education, and the amount of in-service training the participants received. Self-efficacy was measured in terms of the participants' perceived confidence and competence to statements about recommended practices in the following areas: early literacy, natural learning environments, instructional practices, IFSP/IEP, assessment and evaluation, and family-centered practice.

Half of the practitioners had been working in the field of early intervention or early childhood special education over 10 years and represented the disciplines of special education, early childhood education, early childhood special education, speech and language pathology, occupational therapy, and physical therapy. The sample reported low levels of competence and

confidence working with children and families in all practice areas, though they judged themselves as more confident than competent in all areas.

Preservice preparedness and in-service intensity were related to all competence and confidence measures: the more the participants indicated that their preservice training prepared them to work with young children and their families, and the more in-service training the participants received, the higher their ratings of their competence and confidence beliefs. Participants with more years of experience reported higher procedural and intervention competence compared to participants with fewer years of experience. Less than a third of the sample reported that their preservice education program had prepared them very well to work with young children.

Teachers from this sample (early childhood special education, early childhood education, and special education) were partialed out for a more refined analysis of their competence and confidence in inclusive settings and natural environments. Neither the type of teaching degree nor having an advanced degree was found to be related to self-efficacy beliefs; the teachers' feelings of preparedness proved the best predictor of teacher self-efficacy beliefs (Dunst & Bruder, 2014).

There have only been a few studies that have examined the influence of personnel preparation and experience on ECI practitioner confidence and competence. Lamorey and Wilcox (2005) administered a 15-item early interventionist self-efficacy scale to evaluate interventionist training, practices, and child and program outcomes. There were significant positive correlations between EI practitioners' overall self-efficacy and years of intervention experience, and personal self-efficacy and years of experience. Moore and Wilcox (2006) also found that years of experience in ECI related to higher efficacy belief appraisals.

Other data that contribute to the understanding of ECI self-efficacy of ECI practitioners was derived from follow-up evaluations of IHE program graduates about their perceived feeling of competence. Though not focused on self-efficacy as a construct, the data reveal graduates' perceptions of their own abilities to implement the practices they learned. For example, Crais et al. (2004) surveyed 44 interdisciplinary graduates of two interdisciplinary preservice masters programs. The survey contained questions about the graduates' opportunities to implement interdisciplinary and family-centered practices in the areas of assessment, instruction, and collaborative consultation and their perceived competence in these areas. On all items, graduates rated themselves between somewhat and very competent. The survey also asked graduates to rate 15 interdisciplinary and family-centered practices according to the amount of training they received within their own discipline program compared to their interdisciplinary program. All graduates reported only receiving training in their interdisciplinary program.

Two follow-up studies with graduates of ECSE/EC programs found less positive perceptions of competence on ECI practices. Murray and Mandell (2006) interviewed 19 graduates of their ECSE program who were working in ECSE programs across six states. The majority identified significant barriers to using the family-centered practices they had been taught. Recchia and Beck (2014) investigated the perceptions of 13 preservice teachers after their first year of teaching. The students had completed a master's degree program in an integrated early childhood program for children from birth to age 8 and were teaching in early childhood wettings, s3ven including children with disabilities. The teachers felt less prepared in specific curricula that aligned with their particular teaching settings, though they felt prepared in broad-based skills they could apply across a variety of classrooms. The teachers also felt challenged in contexts where it was difficult to use the practices they had learned in their program.

Trivette, Raab and Dunst (2014) investigated factors associated with head start staff participation in a classroom-based professional development project. Thirty-six teachers and teacher assistants across 19 different classrooms participated in the professional development and a number of measures were completed that included work climate, staff belief appraisals, staff receptiveness to the professional development training, staff judgments of the social validity of the practices and staff background characteristics. The staff were trained to use evidence-based child learning opportunities and evidence-based naturalistic responsive teaching procedures with the children in their classrooms. The professional development was delivered by a coach who met with each teacher and teacher assistants once a week for 4 months spending on average 60 minutes at each visit. Coaching was defined as having the coach introduce the practice to the staff by describing its key characteristics and providing examples of how the practice could be implemented in the classroom. The coach then illustrated the key characteristics. The teacher and teacher assistants then applied the practice and the coach guided the staff to self-evaluate this implementation. The teachers and teacher assistants had multiple opportunities to use a practice. The teachers were also given performance standards to use to guide their implementation of practices. Results found that the staff judgments of the value and benefits of the practices were related to how much time they spent participating in training. Staff work climate was the best predictor of belief appraisals and their judgments of the social validity of the classroom practices. Additionally, staff belief appraisals about their career aspirations, and their belief in developmentally appropriate practices were also related to their judgment of the social validity of the practices. The staff background measures were not related to any of the other predictor variables. The authors highlighted the complexity of relationships between what practitioners believe and their performance of practices taught to them in professional development.

3.2 Program Descriptions

3.2.1 HCEEP/EEPCD Program Descriptions. Many program descriptions have evolved from projects funded by the HCEEP demonstration, outreach, or research projects which focused on child intervention, parent intervention, or in-service education. With the exception of research institutes, these projects were not designed as research studies, though a requirement for each project was the collection and evaluation of impact evidence on children and, when appropriate, families and practitioners. Demonstration and outreach projects provided descriptions about the targeted intervention and detailed information about the training content and methodology used to enable the ECI staff to perform the intervention to improve child outcomes (see Dunlap, Robbins, Morelli, & Dollman, 1988; Rogers, Lewis, & Reis, 1987). Many of these project descriptions included detail about the training and fidelity measures they used to insure outreach and replication of effective program practices and achievement of outcomes could and did occur (Bruder, Anderson, Schutz, & Caldera, 1991). In-service projects funded under this program also demonstrated a systematic focus and documentation of both adult and child impact using multiple sources of evidence. Such projects were required to adhere to best practices in adult learning, which included a guiding philosophy, training objectives, relevant and job-embedded content, rigorous methodology, performance standards, and practicum applications, including follow-up and the collection of outcome data (Bruder & Nikitas, 1992). Several illustrations of such projects follow.

Dunlap and colleagues (1988) implemented a regional service delivery model for young children with autism who lived in rural areas. The model had five components: 1) early identification and participation; 2) comprehensive assessment; 3) intensive individualized training; 4) community intervention; 5) follow-up training, consultation, and transition to public school. The model revolved around a team concept which included the child, parents, and school

team and others from the community. Training was provided to the team on both generalized principles of instruction and behavior management. The general training consisted of topics such as discrete trial presentation, instructional delivery, and reinforcement delivery. The training was individualized, and occurred over 10 and 20 hours. The training method consisted of discussion, modeling, in vivo practice with feedback, and videotaped feedback. The specific training content focused on each child's learning objectives, as the generalized training was not adequate for generalization and maintenance. The individualized training occurred in each child's home and community and consisted of 20-30 hours focused on interventions demonstrated by a trainer and then trained and transferred to other members of the team, notably parents. Follow-up consultation and transition service were provided to both the team on new techniques the child may need, and to train new members of the team as the child transitioned to classroom programs.

Another example was the Portage Model (Cochran & Shearer, 1984), which was an outreach project for the original Portage Home Visiting Project which was developed in 1969 to (1) provide educational services to preschool children with disabilities and their parents; (2) develop a practical, cost efficient and replicable program delivery system; and (3) involve parents as the mediators of their child's intervention (p. 104). The project focused on child improvement as measured through standardized assessments. Young children with disabilities who did not participate in the project served as a comparison group. The project then became a outreach model that was replicated in over 250 sites. During the replication process the Portage staff modeled project components and taught each to the replication site staff. Follow-up and on-site technical assistance were available to each replication site for at least a year while the model implementation process was monitored through records of children and staff. The

authors attributed their success to the specific training process for replication, the criteria that they used to insure replication, and the use of measures of child change.

The Playschool Model Outreach Project (Rogers et al., 1987) replicated a demonstration intervention model for children age 2 to 6 with severe disabilities, including autism. The project used a Piagetian framework with five model features. All activities were team based and included para professionals. The outreach procedures for replication clearly specified and differentiated the requirements for the training and support needed for replication, including goals, objectives, training procedures, and evaluation methods. Replication procedures began with a workshop to disseminate information about the model. After the initial workshop, outreach staff visited potential replication sites to do a discrepancy analysis between what the sites had to offer and what the model required. If the site was accepted for replication, they participated in a minimum of 40 hours of training at the model site. The training included instruction in all components of the model including the theoretical framework and its translation into daily practice. The practice included guided observations of the program, and 12 hours on the development of an implementation plan for the replication. The replication team then implemented model procedures at their site and videotaped their implementation, reviewed the tape and sent the tape back to the initial site for analysis. Each tape was then summarized with strengths, weaknesses and suggestions for improvement. Additional follow-up site visits occurred over the first year of replication for consultation and discussion of strengths, weaknesses and data review by the replication site team. A number of measures were used to assess the efficacy of the training. Besides subjective perceptions of the value of the training, there was also objective knowledge tested through a pre-/post- test of the specific components and theoretical foundations of the model. Also trainees' abilities to implement key components of the model were assessed through observation. The last and the most important measure focused on child performance across six

developmental areas for each child at the replication site using a number of standardized scales with a pre/post design with reliability indices also reported.

ECI in-service projects funded under HCEEP/EEPCD also demonstrated a systematic focus on both adult and child impact. Bruder and colleagues implemented interdisciplinary training procedures in both demonstration and outreach projects across groups of early childhood interventionists (Bruder & Nikitas, 1992), birth to three practitioners (Bruder, Anderson, et al., 1991) as well as child care providers (Bruder, 1998), university faculty (Bruder, Lippman, & Bologna, 1994), preservice students in an ECI summer institute (Bruder, Brinckerhoff, & Spence, 1991), and preservice master degree in ECI programs (Kilgo & Bruder, 1997). Guided by Knowles' adult learning framework, the training projects followed similar procedures focused on the adults' acquisition of knowledge and skills in recommended practices unique to each audience and focused on child and family change. The trainings consisted of multiple sessions of 3 hours in length dispersed over time (6 months to a year) during which short presentations, readings, explanations, discussions, case studies and demonstrations of a practices using video or modeling occurred. All training was guided and measured by objectives, syllabi, performance standards, and practicum applications with infants, young children and families with supervision and performance feedback provided by the trainer. The evaluation included multiple sources of evidence to assure acquisition and generalization of performance standards to the participant's work environment. These included pre/post questionnaires, products and competencies (e.g. written intervention plans and child acquisition data; syllabi and program offerings) and observations (interventions; teaching other adults) of the participants during initial learning and follow-up over a year. Data for each project consisted of numbers of participants who had met criterion for the performance standards on all outcome measures.

As a specific example, one in-service program focused on facilitating the development of interdisciplinary ECI preservice programs among college and university faculty (Bruder, Lippman and Bologna, 1994). Funded to increase the capacity of IHEs to prepare those in ECI, the program provided instruction and support to 38 faculty representing 12 professional disciplines at 15 universities and colleges. The faculty who participated attended a week-long seminar as a cross-disciplinary, cross-university group. The seminar was facilitated by two faculty of different disciplines and a parent of a child with disabilities. Upon conclusion of the seminar, participants attended monthly seminars and also received up to one year of individualized on-site technical assistance and support by a project faculty member. Outcomes were individualized by discipline and university program. Over three years 31 faculty infused new interdisciplinary early intervention information into existing coursework; 5 designed new courses; 3 designed an early intervention sequence within their disciplinary program; 15 designed a cross-disciplinary specialty sequence across disciplines; and 24 four instituted interdisciplinary practicum experiences. This project was expanded through federal funding for four regional training institutes for IHE's (see Winton, 1996) which continued training activities for interdisciplinary ECI faculty across the country.

3.2.2 Preservice Program Descriptions. There are many descriptions of preservice preparation practices in ECI (cf. Gallagher, Steed, & Green, 2014; Kilgo & Bruder, 1997; Macy, Squires, & Barton, 2009; Miller & Stayton, 1998; Stayton & McCollum, 2002; Stayton & Miller, 1993; Winton, 1996), as well as descriptions of program features such as the case study method of instruction and online course applications (cf. Lifter et al., 2005; Snyder & McWilliam, 1999). Most preservice program descriptions include details about philosophy, coursework, practicum requirements, methodology, and, less common, student outcomes. Though implemented 20 years apart, two ECI preservice programs will be briefly described.

Bruder, Brinkerhoff and Spence (1991) designed, implemented and evaluated a 1-year graduate interdisciplinary certificate program for students representing different disciplines who were enrolled in different IHEs in CT or were at the post masters level. The nine credit institute at the University of Connecticut included a 6-week summer session composed of didactic classes and supervised practicum applications with a follow-up year of practicum supervision (at their IHE or job site), and monthly research seminars. The coursework was divided into six modules that addressed families, medical issues, physical management, educational and instructional management, teaming, and service delivery. All modules had syllabi, learning activities, readings and evaluations. Instructors included interdisciplinary faculty, family members and service providers or agency administrators with experience and expertise in ECI. The teaching methodology reflected principles of adult learning as explicitly guided by Knowles (1980), designed to capitalize on the trainees' experience and knowledge base. The most important measure of student outcome was the successful completion of 32 competency-based tasks representing ECI pedagogy and practice. The students also had to document their ability to impact child and family outcomes through the interventions they implemented, and complete pre-/post-tests of knowledge and skill application. Evidence of the program's effectiveness was demonstrated with 32 students which included statistically significant pre-/post-test gains of students' knowledge acquisition, and completion of performance measures for all competencies with a mean score of 4.5/5. Satisfaction measures were completed with students, faculty, families and community ECI programs, and all were positive.

An interdisciplinary preservice program in ECI at the University of Oregon was described by Barton et al. (2012). The program was offered as an add-on of specialized courses and practica to speech and language pathology students (SLP) completing their graduate degree. Students took ECI classes in collaboration with the ECSE graduate program in areas such as foundations of

ECI, assessment, family guided practice, curriculum, developmentally appropriate practice, communication interventions, collaborative consultation, EBP, and parent support groups. The first four courses were taught by the ECI faculty; the latter courses were team taught by ECI faculty and SLP faculty. Students completed practicum in a variety of natural and inclusive settings; seven were university affiliated and two were in the community. Principles of adult learning were used to teach and to supervise the students, and this included the use of frequent performance feedback to the students on their intervention with young children (in person or by electronic mail). The students also had to meet competencies and rate themselves, and self-reflect on their practicum experiences. Other measures of effectiveness included course grades, caregiver satisfaction, parent and child outcomes, and job placement after graduation. All 26 graduates mastered both their program competencies and their SLP competencies, and 22 were employed in ECI settings upon program completion.

3.2.3 In-service Program Descriptions in ECI. There have been many program descriptions of various in-service components and continuing education opportunities for the ECI workforce (Blasco, Falco, & Munson, 2006; Dinnebeil, Buysse, Rush, & Eggbeer, 2008; Girolametto, Weitzman, & Greenberg, 2006; Ludlow, 2002; Malone, Stratka, & Logan, 2000; Ridgley, Snyder, McWilliam, & Davis, 2011; Snyder & Wolfe, 2008)**.** In-service programs usually contain descriptions of the participants, content, methodology, and outcomes. While most are conducted face-to-face with trainees, online programs are appearing in the literature (Brown & Woods, 2012; D. Chen, Klein, & Minor, 2008). Additionally, there have been in-service descriptions with documented child or program outcome data reported with child care audiences (see Bruder, 1998; Campbell, Milbourne, Silverman, & Feller, 2005) and IHE faculty (Bruder et al., 1994; Winton, 1996). As examples, two in-service studies having different content, methodologies, and evaluation will be described.

Boavida et al. (2014) developed and implemented a training program to teach 284 ECI practitioners in Portugal to use the Routines Based Interview (RBI) (McWilliam, Casey, & Sims, 2009) to develop functional IFSP/IEP goals and objectives for infants and young children with disabilities. Training was planned using adult learning practices, and a pilot training program was administered to 18 ECI staff, to test and refine the training. The training consisted of five sessions totaling 22 hours of small group meetings of 10-20 participants representing 14 early intervention teams. University credit was awarded to those who completed the training. Prior to training the participants provided a previously completed IFSP/IEP as a baseline. The content of the training covered topics such as ECI philosophy, the eco-map process, the RBI with families, and the development of functional IFSP/IEPs. The course was taught with case studies, video demonstrations, role plays, group work presentations and discussions. One activity required the participants to tape themselves while conducting a RBI and score it with the RBI checklist.

After the first five sessions, a 3-month application phase occurred during which time the participants were given weekly electronic prompts while they implemented the training content to develop a functional IFSP/IEP and submit it as evidence of their learning. An optional sixth training session then occurred to provide feedback to the participants on their reported experience developing the functional IFSP/IEP after the RBI interview. Of the 284 participants who began the training, 201 completed it, though only 80 provided both pre- and post-training IFSP/IEPs after completing the training. The pre-training IFSP/IEP was compared to the participants in post-training IFSP/IEP using rating scale to score the IFSP/IEP goals and objectives. After training, the IFSP/IEPs contained fewer goals and objectives, and those that were on the IFSP/IEP were scored higher on the rating scale for functionality. Both of these variables were statistically significant, with large effect sizes.

Campbell & Sawyer (2009) conducted a PD program with ECI providers on the implementation of participatory home visiting practices which focused on embedding adaptations and interventions into family routines. Participatory practice emphasizes the use of natural materials and the collaborative role of the caregiver and the provider during the home visit, compared to traditional home visiting practices which focused on teaching the child (Campbell & Sawyer, 2007). The primary outcome measure for the study were home visit behaviors as scored on pre- and post-videos using a scale that consisted of categories of home visiting practices. Measures of interrater coding documented reliability. As part of this study, providers were also asked to complete a Q-sort to assess their beliefs about ECI practices. The Q-sort contained 20 statements to rate both pre and post the training. The training consisted of small group face-to-face sessions of 3 hours each, held three months apart. During the initial training session the providers were given examples of the participatory approach and were provided a copy of a coding scheme to differentiate participatory from traditional practice. Discussion about the features of each also occurred. During the three months between sessions, the providers were expected to complete a six hour self-study guide. The guide contained activities to implement with a child and family, including the taping of two 20 minute video tapes of their target family during an activity or routine, once at the beginning of the three months and again at the conclusion of the three months. One of the other activities requested the provider to review the initial videotape using a scoring system that differentiated participatory from traditional practices. Providers then used a self-reflection process to plan their next visit using participatory practices. The second three hour training session consisted of review of the videotapes. The training enrolled 147 providers, and though this training was mandatory for continued employment, 126 completed both sessions and 96 submitted viable video tapes of the home visits. These 96 ECI providers represented multiple disciplines, were mostly female,

Caucasian, held a bachelors or master's degree, and had more than seven years of experience in ECI. The families they served lived in poverty and had child who qualified for Part C services.

The baseline videotapes showed that the majority of providers (66%) used traditional practices. After the training, 43% of the tapes demonstrated traditional practice, suggesting that a majority of providers (57%) were using participatory practices. Additional analyses of the data documented three groups of providers based on the practices they used: those who were participatory and stayed participatory; those that were traditional and stayed traditional; and those that began as traditional and moved to participatory. Those that were rated as participatory and remained that way, and those who changed to participatory, had beliefs measured in the Q-sort that aligned with recommended practices in early intervention. Those who stayed traditional continued to hold beliefs about the importance of direct services to the child rather than participation-focused providers who believed in family involvement. The findings of the study suggested that these differences in provider practices were related more to providers' prior beliefs and perceptions, than to the professional development they received.

3.2.4. Program Descriptions of IES Funded Research Development Projects. Recent program descriptions are the result of funding by the IES. The focus of this funding is the development of a promising intervention which, when completed, could be tested for efficacy. The development projects focus on the refinement of training content, methodology or both. Two examples will be provided, to illustrate the process through which training projects (in particular in-service projects) are currently funded. The target population addressed in these projects are young children at risk for delay and they are included to describe current funding examples and to inform ECI in-service activities.

Diamond and Powell (2011) provided a description of the development of a PD intervention focused on early language and literacy which was funded by the IES. The authors utilized data that had been collected in a previous investigation on an early language and literacy PD package which utilized coaching, technology, and EC teacher participation .However, the results of this study demonstrated variations across teachers' use and implementation a component of the PD (e.g., video links). This revised intervention focused on targeted sound and word instruction using a more intensive PD. To revise this PD package the authors implemented 5 small studies which built upon each other to refine and revise both the content and methodology of the PD. The studies used Head Start or childcare teachers and targeted: 1) focus groups to assess teachers' ideas about teaching literacy skills; 2) use of hypermedia resources to examine the usefulness of these; 3) distance coaching to investigate teachers compliance with the coaching protocol; 4) an intervention pilot study to investigate the implementation of the combined distance an in-class coaching protocols; and 5) a revised intervention pilot study with random assignment into either an intervention or a control group. During the focus group meeting, teachers were asked to discuss their current practices. Participants included 81 lead teachers and 56 assistant teachers from 5 Head-Start agencies in 83 Head Start classrooms in 21 different Head Start centers. There were 14 focus groups, each lasting 90 minutes. The results suggested that the teachers approached instruction of vocabulary in different ways. There was much variability across the teachers and this demonstrated variability in content knowledge. This resulted in more specific content related to vocabulary and teaching literacy with social skills. Specifically, sound awareness including letter sounds was embedded in the training materials. Additional video materials and targeted strategies were also developed.

The second study provided computers to teachers to assess their use of the hypermedia resources. The teachers demonstrated the use of this resource over two weeks; one finding

being that teachers used the text more than they did the videos. This was reflected in the next revision of the training materials in that more bulleted text was embedded into the resources. The third study focused on an evaluation of the coaching model. Each teacher was asked to submit a 20 minute video tape of their instruction, and the coach provided feedback to the teacher using a CD in which the coaches' comments were matched to specific examples of teaching or other resources. The revision resulted in more explicit and prescriptive teaching targets given to teachers during the lesson, and the coaching focused on a related instructional strategy. Next a pilot study of the comprehensive intervention was conducted and as result of the study the PD was again refined and revised to focusing on only one instructional approach based on the feedback from the teachers that it was more doable and fit better into classroom planning. Finally, a randomized control pilot was conducted. Teachers were assigned to either the intervention or control group. The intervention group received PD consisting of 12 coaching sessions and an average of 8.6 calendar days separated coaching sessions. Coaches made four, 2 hour coaching visits to each teacher and 31 minutes of that time was focused on consultation. Teachers submitted 8 videotapes and coaches selected and provided feedback on an average of three segments of each teacher submitted videotape. The results suggested that the intervention group of teachers provided more vocabulary instruction and as a result there were more child advances, teacher utterances, and teacher questions than the control group of teachers.

A recent teacher study group program funded by IES focused on improving teachers' skills in emergent literacy (Cunningham et al 2015). A teacher study group was described as being similar to professional learning groups or professional learning communities. This program description provided information about a three-part development process on the effectiveness of study groups as measured by both teacher and child outcomes. The authors state that the professional teacher study groups were focused on a relationship building model of PD. The

teacher study groups provided intensive and ongoing support for the application of a specific practice through the use of conversations, reflection, feedback, and troubleshooting. A skilled facilitator as well as the peers in the group provided advice, feedback and support for the implementation of new practices. The teachers who participated in the study groups represented three different cohorts, each cohort lasting for one year. Nineteen teachers participated in the study: 65% had at least either an associates or bachelor's degree, the rest having high school degrees. The teacher study group consisted of 11 sessions during the first year, and 15 sessions during years two and three which also focused on more targeted instruction. The sessions were held twice a month for two hours over a period of 7 to 8 months each year. The sessions were led by a doctoral level member of the research staff during year 1 and 2, and 4 sessions of year 3, at which time a school district employee began facilitating the sessions. All sessions followed a four step process based on principles of effective learning: review, content presentation, practice, and preparation. During review, teachers discussed assigned homework and reviewed a two page research based article about a new concept, and discussed their challenges when implementing new strategies or activities in their classrooms. Next, the facilitator led an interactive presentation to help build teachers' knowledge. The third segment focused on applying the new knowledge into the teachers' instruction, and this was practiced during the group. The last section prepared the teachers to implement the new practice in activities in their classrooms with children.

A checklist was used to measure the fidelity of the group content and methodology. The estimates for all sessions ranged from 60 to 90% during year 1, 71 to 95 % during year 2, 74 to 94% during year 3 with the doctoral level researcher; during year 3 with the school district employee it was 71 to 92%. Measures of effectiveness included teacher knowledge and beliefs, classroom practices, and child outcomes. Pretest scores suggested a very low level of teachers' knowledge and ability to perform phonological awareness tasks and their knowledge of this

content was also low. After the training these scores increased significantly. Unfortunately, the teachers' scores on the general knowledge of child development assessment did not increase significantly from pre- to post-test. Classroom practices also demonstrated significant positive changes from pre to post observations, though there were no changes in print knowledge and read alouds. The children demonstrated gains, and using a rubric to compare national norms, the children did show higher than expected gains. The article includes detailed information, explanations, and examples of the measures that were used to demonstrate these changes.

3.3 Experimental Studies

Most of the ECI personnel studies that meet EBP standards and demonstrate experimental control used single-case designs. Single-subject studies must be able to document a defensible functional relationship between the independent and dependent variable as represented by a visual inspection of graphed data (Kratochwill et al., 2013). This includes the examination and analysis of multiple features of the data display, such as the consistency of behavior change within and across levels of baseline, intervention, and any other condition; the trend of the data within and across conditions, and variability of data in each condition. Other data features to inspect include the immediacy of any change between conditions, overlap of data points across and between conditions, the projected pattern of the data, and any anomalies within the data. Other statistical manipulations of the data may also be used (e.g. effect sizes) to support the visual inspection.

While EC studies also use single-subject designs, a majority implement randomized group comparison designs to demonstrate experimental control of the independent variable. The implementation of group designs must also meet research standards (Cook et al., 2015). This includes the random assignment of subjects to comparison groups, the equivalency of the groups on measures of interest prior to intervention, minimal attrition of participants and the use of

statistical tests of power and effect size to measure the impact of the independent variable. Both types of designs require operational definitions of the independent and dependent variables, the use of internal control procedures such fidelity measures to insure the treatment is being implemented as intended, and reliability measures to insure the validity of results. Both types also require replication of findings to ensure external validity of both the treatment and the outcomes. Examples of studies addressing differing populations and dependent variables follow. All have met standards for experimental design.

3.3.1 Preservice Studies. Experimental studies in preservice preparation are sparse, and single-subject methodology is used by the few that have been published. Barton et al. (2012) provided intervention to five student teachers who were at the conclusion of their preservice program. A multiple-baseline single-case research design across participants was used to examine the effects of coaching on the implementation of an intervention package to increase children's dramatic play behaviors. The five target children had IEPs, were between 3 and 5 years of age, and were enrolled in a university-based preschool program. Two training conditions were compared in this design: didactic training and didactic training plus coaching. Observational data (event recording) were collected on the teacher's use of practices during a 5 minute videotaped play routine which occurred two or three times per day.

The intervention package consisted of a number of practices that were evidence-based including contingent imitation, a system of least prompts, and specific praise after the child used a target play behavior (Barton & Wolery, 2010). A 1 hour didactic session on the intervention package was presented to the teachers after baseline concluded. It consisted of videos, a manual and role-playing. Data were collected on the teacher's use of practices after the didactic session. Coaching was then introduced as an intervention. Four coaches who were supervisors of the student teachers provided the intervention. The coaches were doctoral students and all had

degrees in early childhood special education. They were provided a manual detailing the intervention and data forms to record the teacher's responses and suggestions for improvement. The coaches provided feedback to the teacher on her use of the intervention package before, during, and after sessions.

Visual analysis of the data showed that the coaching added to the effectiveness of the intervention. That is, four of the five teachers improved beyond baseline only after coaching was introduced, thus providing evidence for experimental control and the effectiveness of the coaching intervention. Interrater reliability, social validity, and fidelity measures also documented adherence to research standards.

An extension of this study (Barton et al., 2012) examined the effect of this training package on children's behavior. This study also used a multiple-baseline design across four teachers and replicated procedures from the first study with additions: all teachers received the 1 hour didactic training prior to baseline; the coaches received more explicit training, and direction as to the frequency with which they provided prompts and feedback to the teachers during the session; fidelity data on the coach training and implementation was collected; and observational data on child pretend play behaviors were collected across four children age 3-5 years with IEPs. Again, there was a functional effect demonstrated across the teachers as a result of coaching and as well as with the target child's use of play behaviors.

Coogle, Rahn, & Ottley (2015) used a single-subject multiple-probe single-case design to examine the effectiveness of using bug-in-ear coaching on teachers' use of specific communication interventions. The addition of a bug-in-ear (BIE) allows coaching to occur simultaneously while interventions are being conducted in classrooms (Rock et al., 2009; Rock et al., 2012; Scheeler et al., 2012). The technology has been used for over 60 years, though recent advances allow a less intrusive application of the strategy. Coogle et al. implemented BIE with

three ECI student teachers who were completing their final semester of an undergraduate licensure program and participating in a student teaching internship. They were teaching in separate preschool public school inclusionary classrooms, each of which contained 16 children without disabilities and 4 with disabilities. The intervention consisted of a brief training via a narrated PowerPoint presentation that provided information related to four communication strategies with the students: wait time, sabotage, choice making, and in-sight/out-of-reach. The researchers provided definitions and examples for each strategy.

When in the classroom, the teachers received prompting and immediate feedback from a supervisor (through the BIE) on their use of the communication strategies during a 10 minute play routine. The play routines included four children at a time, one with autism. The supervisor was remotely watching and listening to the teacher on Skype via an IPad that swiveled to follow the teacher. After baseline, the supervisor provided feedback through the BIE two times per day for 10 minutes each over four days, attempting to provide one directive prompt a minute as needed. The results showed the intervention was successful for all three teachers using visual inspection of graphed data that documented changes in level, trend, and variability. Large effect sizes were also calculated. The patterns across the teachers were similar, except for variability of unprompted use of strategies, during the generalization and maintenance phases of the study. Fidelity measures were documented and implemented with 25% of the observations and social validity measures suggested a high rate of acceptance of the strategies by the three teachers.

3.3.2 In-Service Studies with Infants and Young Children with Disabilities. A number of single-subject studies have been conducted with ECI populations in inclusive EC or Head Start classrooms across a range of adult practitioners and student populations using a number of strategies to effect change across a number of specific adult and child outcomes (Casey & McWilliam, 2011; Friedman & Woods, 2015). The following are sample illustrations of

experimental designs that provide data to support EBP strategies. Though they varied in methodology, reliability, and fidelity, data were collected as were data on the social validity of all of the interventions presented in these studies.

Hemmeter, et al. (2015) conducted a study to examine a professional development intervention on three teachers' use social-emotional practices as delineated in the Pyramid Model. The Pyramid Model for Promoting Social-Emotional Competence in Young Children (Fox, Dunlap, Hemmeter, Joseph, & Strain, 2003) is a comprehensive three-tiered model for promoting young children's social-emotional development and addressing children's challenging behavior. The first level of the model provides a foundation of universal practices that are appropriate for all children in a classroom. A second level focuses on targeted interventions for children who have difficulties in relationships with others and problem solving. The third and last level focuses on children with challenging behavior and it involves using a team approach, functional assessment, and structured intervention strategies.

The setting for the study was three classrooms in three elementary schools. Each classroom had 14-16 children, most whom lived in poverty, half of whom had disabilities, and at least two to four children with challenging behaviors. Each classroom was staffed by a teacher and assistant teacher, and each of the three teachers were certified in ECSE, two had master's degrees and the third was in a master's program. The dependent variables for the study were the teachers' use of specific pyramid practices as measured by pyramid checklists, a global measure of pyramid practices, and a global measure of classroom behavior. All measures had been developed, refined and used in previous research studies. The checklists were completed by each teacher's coach and the observation tools were completed by data collectors. A multiple-probe design across practices and replicated across teachers was used to measure experimental control.

The teachers were each assigned a coach who observed their target teacher's classroom and met with the teacher to describe the study and help the teacher identify three goals to target for intervention that were related to the Pyramid practices. Across the teachers these goals included schedules and routines, behavior expectations, problem solving and emotional literacy. Each of these goals were associated with a set of specific practices which became the focus of the coaching. Observations and coaching occurred through activities such as large group activities, transitions and center times. Intervention through coaching was introduced after a baseline of a minimum of three observations was established. Baseline data continue to be collected on the other set of practices through weekly probe data.

Intervention began with a meeting between the coach and the teachers to refine an action plan and timeline for the implementation for the first set of practices. Training was then provided over 30-60 minutes and included Power Point, video examples, and discussions on the practices. The coach also used implementation guides for the practices, the coach and the teacher developed steps to implement each practice and identified resources to help the teacher. After initial intervention, booster sessions were also implemented with teachers as needed. All observations were followed by coaching feedback three times per week. Most of the feedback occurred in meetings and a third were done by email. The feedback sessions followed a specific procedure which included discussions about any challenges the teacher was having implementing the practice and the provision of needed resources to help the teacher with implementation challenges. Each coach also provided weekly coaching sessions and debriefing meetings. These sessions consisted of prompting and providing praise for the teachers' use of practices as they were happening. No data were collected during these weekly sessions.

Each teacher received coaching until she met 80% of all checklist indicators for the target practice for three consecutive observations. If the teacher's behavior went below criterion

on behaviors that had met criterion in a previous phase she received a reminder to continue to use the previous intervention behavior. Observations also occurred across activities throughout the study at different times of the day to measure generalization of the practices using the checklists. Maintenance data were collected on the use of each practice via the checklists after criterion was reached. Coaching was also not provided during generalization or maintenance observations. Each teacher demonstrated acquisition of the specific practices after coaching was provided. This was demonstrated through visual inspection of the data which represented the percentage of target practices for each corresponding checklist. Generalization probes showed mixed results. One teacher met criterion for generalization, one had inconsistent demonstration of practices across activities, and the third used practices but did not meet criteria levels. In regard to maintenance, one teacher demonstrated maintenance for all behaviors while the other two needed prompting to use practices. In regard to the presence of challenging behavior within the classroom, two teachers demonstrated a decrease in these challenging behaviors after intervention while one did not. The total scores on the observation tool of Pyramid practices improved by 26% and 21% respectively with two teachers, and the third teacher improved by 3%.

BIE technology has also been used as a method to deliver in-service PD. Ottley and Hanline (2014) provided intervention to four teachers who taught in three inclusive early childhood centers. A multiple-baseline single-case study documented the effects of coaching through the BIE. The BIE technology consisted of a Bluetooth wireless earpiece and two cell phones, and the intervention was recorded by a camcorder, and a smart pen was used to scribe anecdotal notes. The focus of the intervention was on increasing the teachers' use of communication strategies, in particular ten specific strategies which were operationally defined. The teachers were not trained in ECSE, and one held a bachelor's degree, two had an associate's degree, and one had a CDA degree. The children who were the targets of the intervention all had

disabilities which included autism and communication delays. Observations of the teachers occurred during indoor play routines.

After a stable baseline was demonstrated, each educator was given feedback on their use of communication strategies, and the researcher chose low-frequency practices as observed during baseline as each teacher's intervention targets. The three practices were then randomly sequenced for the intervention which began with a description and a rational for the use of the practice by the coach to the teacher. Examples of the practice were demonstrated, and the teacher used the practice until she did it correctly. The teacher then implemented the practice with the target child during a play routine while the supervisor used the BIE to provide immediate feedback to them. This was either a prompt to use the practice or positive verbal reinforcement after the practice was used. Once criterion was met with the first practice, the second and then the third were introduced using the same procedures. The intervention was delivered over 6-9 weeks, and the teachers participated in 27-37 of the 20 minute coaching sessions.

Coding was conducted on the first three minutes of each observation. Children's communication overtures were also recorded and documented through event recording. A functional relationship both within and across phases was demonstrated between the BIE coaching and the use of communication practices for each teacher. Visual inspection of the data documented the effect as did effect sizes for three of the four educators. Maintenance data suggested a decrease in the use of communication strategies over time. Strategies with the largest effect were maintained by the educators at a higher rate than those with moderate to small effect sizes. Two of the four children demonstrated more communication as a result of the training.

Lastly, a multiple baseline design across three home visitors and three caregiver child dyads was conducted by Krick Oborn and Johnson (2015). The study examined a multicomponent PD package to facilitate the delivery of family-guided, routine-based

intervention (FGRBI) to families and their children receiving Part C home visiting services (Woods, Kashinath, & Goldstein, 2004). The PD focus was on the effectiveness of coaching using electronic feedback to increase the home visitor's use of FGRBI as a strategy during home visits. The home visitors had master's degrees and ECSE teaching licenses. The caregivers who participated included a step grandmother, a mother, and a father. All home visits were videotaped across baseline and intervention phases and coded for the percentage of intervals that the home visitors used any of seven specific FGRBI caregiver coaching strategies. The family routines were also coded.

After baseline, the intervention phase began with a workshop that included two individualized 2-hour sessions focused on FGRBI and caregiver coaching strategies. Adult learning strategies were used which consisted of PowerPoint, handouts, video examples, discussion modeling, and practice. If the home visitor did not demonstrate the criterion of more than 70% use of home visiting strategies after 3 weeks, the coaching intervention began. During coaching each home visitor submitted their videotape of the weekly home visit, and they received an email with graphic and written performance feedback following a five-step protocol from the coach. The feedback ended with a final question or prompt to the home visitor. A maintenance probe was completed four weeks after the end of the intervention was completed.

The workshop did not result in any of the home visitors reaching the preset 70% criterion on home visiting behaviors, so all participated in individualized coaching. After 6 weeks of email feedback from the coaches after reviews of the home visiting tapes, all three home visitors demonstrated an increase on the use of target strategies during home visits. Only one of the home visitors demonstrated the target behaviors during the maintenance probe, and none of the three acknowledged receipt of all 6 weeks of electronic feedback. One reported receiving feedback for four weeks, another for three weeks and another for two weeks. Only one of the home visitors

demonstrated the target behaviors during the maintenance probe, and none of the three acknowledged recipe of all 6 weeks of electronic feedback. Only one also provided reflective responses back to the coaches. There were minor changes in how home visitors used family routines during their home visits, and 25-55% of the observed time didn't involve the child with the caregiver or with them.

A single case multiple probe design study was conducted with three para educators who worked with young children with complex communication needs in an inclusive classroom program (Douglas, Light, & McNaughton, 2013). The para educators had varying backgrounds and experience and the children ranged in age from 2.5 to almost 5 years of age. The interventions which were taught to the para educators consisted of two specific intervention packages to increase the use of communication, including the use of alternative and augmentative communication strategies. The strategies were trained over 2 hours dispersed across four sessions and delivered over 2 weeks. The training consisted of a brief video about the importance of communication and a presentation and discussion on best practices for communication intervention using the targeted strategy. The dependent variable was the para educator's frequency of providing communication opportunities via 12 minutes of coded videotaped play sessions. Children's communication turns were also coded. Data were also collected on treatment fidelity and social validity. Each of the para educators increased their use of communication strategies as evidenced by visual inspection of the collected data, though maintenance was variable with only one para educator maintaining her new strategies. All children showed increases in communication skills, though there was variability of data across both para educators and children during intervention.

Casey and McWilliam (2008) examined the use of graphic feedback to increase preschool teachers' use of incidental teaching. Incidental teaching was selected as the target behavior of this

study to address the individualized goals of children with disabilities within the context of daily activities in preschool settings. The study included two groups of classrooms: Group 1 participated in the first half of the school year and consisted of four classrooms located in two inclusive community programs serving mostly families of children with disabilities; Group 2 participated in the second half of the school year and consisted of six classrooms located in inclusive community programs, a public elementary school, and a community-based child care program. One child with a disability was selected from each classroom as the focus of observations. A multiple-baseline design was employed across child participants with baseline, intervention, and maintenance phases, and classrooms were observed 3 days per week for 30 minutes at a time. Classrooms initially received 1-2 hour training sessions on incidental teaching and the Incidental Teaching Checklist (Jung & McWilliam, 2005) was used in an in situ practice session in the classroom. During each of the 12 post-training observations, the teacher was presented with graphic and verbal feedback on the use of incidental teaching during the previous session. Data on teaching interactions were collected using the Engagement Quality and Incidental Teaching for Improved Education (E-Qual-ITIE) (Casey & McWilliam, 2008) coding system that provided measures of incidental teaching, non-elaborative responses, and nonresponsive directives in 15 second intervals. Overall results suggested that presenting graphical feedback is an effective method of increasing the number of intervals in which teachers used incidental teaching with the target children. For Group 1, the mean number of intervals in which incidental teaching was used increased between baseline and the intervention phase for every classroom, and in three classrooms the mean number of intervals was higher during the maintenance probes than during baseline, and for two classrooms, it was higher during the maintenance probes than during intervention. Similarly for Group 2, the mean number of intervals in which incidental teaching was used increased between baseline and the intervention phase for every classroom, with the

mean number of intervals higher during the maintenance probes than during baseline for every classroom. The authors suggest two important implications of their findings for improving the quality of teaching in preschool classrooms: (1) improvements in embedded and naturalistic instruction in preschool classrooms are feasible, and (2) the practices of in-service teachers can be monitored and improved upon to enhance the quality of learning environments.

3.3.3 In-service Studies with Young Children at Risk for Disability. In-service studies conducted with young children at risk also demonstrate the effects of in-service training. For example, Powell and colleagues (2010) used technology with a group of Head Start teachers to examine PD on language and literacy. Through a randomized control study, teachers either received coaching in their classroom or coaching through the use of video technology. The control group was a waitlist control. The teachers who received either coaching intervention made improvements in their classrooms literacy environment and they showed significant improvements in their instruction of letters and words. There were no differences between the two coaching conditions, suggesting that any type of focused support can result in teacher change.

Buzhardt et al. (2010; 2011) investigated the teaching of three evidence-based practices to home visitors. These practices were 1) frequent brief assessment of children's early communication skills for screening and progress monitoring, 2) strategies from two language promoting interventions, and, 3) database decision making in the application and use of the strategies. Results indicated that the home visitors who used the technology and intervention made significantly greater gains in total communication than those who did not.

Fabiano and colleagues (2013) compared the effects of workshop training in comparison to workshop plus intensive four-day on-site training in a group of Head Start teachers. Eighty eight teachers were involved in the study and they were divided equally between those who had an associate's degree, a bachelor's degree and a master’s degree. Twenty-seven Head Start centers

participated in the study which focused on training teachers on positive behavior support skills. Both groups received the same one-day workshop and the experimental group also received four days of intensive learning within the preschool classroom. Both groups of teachers also had access to a behavioral consultant during the school year. Outcome measures included classroom quality as well as a student behavior. In particular, a teacher observation measure examined the frequency of child and teacher behavior. Each time the child displayed a challenging behavior the behavior was coded as well as the teacher's behavior in response. A classroom rating scale was also used and this was completed by teachers. Lastly, teachers were asked to rate the four days of intensive learning they received in comparison to the workshop. They were also asked if they would attend the training again and if they would recommend it. The integrity of the training was measured for 100% of the teachers receiving the intensive training and 90% of the teachers who only received the workshop. The integrity measure suggested than a hundred percent of planned content was covered in all sessions. Results suggested that the intensive training had positive effects on the measures of behavior management and instructional learning. However, these effects diminished over the school year. In regard to teacher praise, both of the groups improved their use of praise, thought the intensive group improved it at a higher rate and maintained the improvement throughout the year.

The National Center for Research on Early Childhood Education focused on examining the effects of PD on outcomes for teachers and children (Pianta et al., 2014). The authors used the coaching model from past research on an intervention model called My Teaching Partner (MTP). The effects of the coaching was measured on improvement in classroom interactions with 170 teachers enrolled in a study investigating the impact of PD and child interactions. The MTP coaching model engaged teachers in multiple cycles of guided analysis of video clips of their own interactions. The teachers also had access to a website library of clips of other

teachers' interactions reflecting affective interactions. Outcome measures included the number of coaching cycles, the time viewing video exemplars of others behavior, and the number of prompts to which a teacher was exposed to the components of the coaching. Findings suggested that teachers exposed to a greater number of coaching interventions showed more improvement in classroom interactions over the year. More exposure to prompts was associated with growth from baseline in instructionally supportive interactions while watching video exemplars was associated with growth in emotionally supportive behaviors using an analysis of linear effects. Moreno and colleagues (2015) compared interventions used in ordinary infant-toddler care classrooms for improving child-caregiver interactions. One group of care-providers attended a community college class on infant and toddler development using a textbook. The course was usually part of a program of multiple courses that result in a degree. The other three groups participated in an in-service course of content modules both were at least 45 hours of class time, and were randomly assigned to either no coaching, 5 hours, of coaching or 15 hours of coaching. The coaching emphasized a strengths-based and child-centered focus and consisted of one hour of observation and feedback. The coaches also left written feedback for the participants. The sample was comprised of care-providers with varying degrees of education; 35% having a bachelors or master's degree, 25% had some college, 10% had a 2 year degree, while 11% had high school or less. Outcome measures included classroom observation of caregiver child interaction, a knowledge questionnaire, and a self-efficacy scale. The results suggested little to no effects across groups on the self-efficacy instrument, and little effect across groups on the knowledge questionnaire with a small effect on the 15 hour coaching group. On the interaction measure, the 15 hour group showed the most improvement in using the intervention and sustained their use at follow-up.

Cabell et al. (2015) investigated a professional development package on the use of children's vocabulary across a preschool year. The investigation was a component of a larger study examining the effects of a specific language curriculum package on teachers' conversational responsivity in the classroom. In this study, the authors investigated the impact of a PD intervention focused on teaching teachers to use contingent talk within a multi-turn (more than four times) teacher-child conversation during small group instruction. The investigation examined how the teachers' conversational strategies (volume and quality) were related to gains in children's vocabulary across the year. A particular feature that was investigated was the use of concentrated vs. distributed conversational use. The child language and literacy data which were collected included classroom observations of small group activities and direct assessment of children's vocabulary skills. This study focused on 44 teachers and 297 randomly selected children from the preschool classrooms enrolled in the larger study.

The teachers were assigned one of two professional development conditions: one was an extensive program focused on conversational responsivity; the other was a control condition of typical classroom practices. The treatment package included a direct training designed to increase teachers responsivity, and access to a consultant who provided off-site coaching throughout the academic year. The program involved two, one-day workshops held in the fall in the winter. The sessions focused on specific conversational strategies to engage and stimulate the children's language, and included role-playing scenarios with the teachers to practice intervention strategies. The teachers were also asked to read portions of the curriculum manual over the academic year. The teachers were also assigned a research assistant as a consultant and were asked to submit video tapes every two weeks that represented an activity with a set number of children and specific strategies to include. The consultant looked at these video tapes throughout the year, and provided written feedback to the teachers about their implementation

of the intervention. The feedback documented what the teachers did well, and suggestions for improving the use of the intervention strategy. Fidelity was measured by examining the strategy used during a play-doh group activity during the fall, winter and spring time points with a partial interval observation tool.

The teachers assigned to the control condition also attended a fall and winter in-service workshop, but the PD topics did not include the conversational responses strategies. The control teachers also were provided video recording equipment and associated training on using it. They were also provided a schedule of activities, and the number of children to include in a videotape, the difference being that it did not include specific strategies to use with the children. The control teachers were given access to off-site consultants who either provided generic feedback, or no feedback.

The specific measurement of the observed teacher behaviors focused on the frequency and pattern of teacher conversations, including conversational length, number of conversations, the extent to which children verbally-initiated conversations, and strategy frequency. The intervention teachers demonstrated improvement beyond the control group. In addition, the children in the intervention group demonstrated significant gains on the Peabody Picture Vocabulary Test in the clinical evaluation of language fundamentals. The results suggest that the use of the conversational strategy was significantly related to children's vocabulary development during the preschool years. In addition, the results demonstrated that a concentrated versus distributing pattern of strategy use had more impact on vocabulary gains. Findings suggested the professional development increased the teacher child engagement in multi-turn conversations, child initiated conversation, and teachers' conversational strategies.

3.3.4 In-service Studies Focused on Child Intervention and Outcome. While most of the literature focused on in-service and preservice personnel practice identify adult behavior as

the dependent variable, studies that deliver intervention to children identify them as the dependent variable; yet these intervention studies also have an impact on the adults who deliver the interventions. As such, these studies contribute to the efficacy literature on ECI personnel practice, though this is not the primary outcome interest (see Barton, 2015).

As an illustration, Strain and Bovey's (2011) implementation of training strategies in their randomized control trial on the effects of a classroom-based model for young children with ASD warrants attention. This study used a clustered randomized design to examine the effects of a packaged intervention on 177 young children who had ASD in 27 classrooms in comparison to 117 young children also with ASD across 23 classrooms. The intervention children participated in the learning experiences and alternative program for preschoolers and their parents (LEAP), which was originally developed in 1982. The teaching staff received intensive training to implement the model practices with fidelity. This consisted of a total time commitment of 23 days of on-site training, modeling, and feedback over 2 years. The LEAP model was composed of a number of program features including high intensity of learning opportunities, inclusive classrooms with a 1-5 adult/child ratio, positive behavioral guidance, sound instructional interventions, promotion of social and communication skills, use of peer-mediated learning, and family involvement.

The training of the teaching staff included detailed protocols for each of the core features of the LEAP model, including fidelity measures with quality indicators to insure the integrity of the intervention delivery. Training methodology consisted of:

(a) Presentation of skill area to be learned in written/presentation format

(b) Discussion of skill area between trainee(s) and trainer(s

(c) Demonstration of skill by LEAP trainer with simultaneous observation by trainee(s)

(d) In-vivo practice by trainee(s) with observation and feedback provided by trainer

(e) Evaluation of trainee competency based on direct observation or permanent product

(f) Training of on-site supervisor to support direct-line replication staff

(g) Follow-up training and maintenance checks on a 6 to 8 week basis

The comparison classrooms were equivalent in regard to classroom structure, and the teaching staff received manuals and Power Point presentations about the core LEAP intervention features. Efficacy was measured through a battery of general and domain-specific child development, as well as measures of quality for classroom features. After 2 years, the LEAP classrooms demonstrated a high level of implementation using the observational protocol. The comparison classrooms also made gains bringing their average to 38% of program components over 2 years in comparison to the 87% of implementation for the intervention classes. This was the only metric that allowed a pre/post comparison of teacher impact. Most importantly, children in the LEAP intervention group made statistically significant gains on all child measures compared to the children in the comparison groups. Teachers rated their experience with the LEAP replication process very highly.

Barton (2015) also conducted a study that aimed to increase the acquisition, generalization and maintenance of play and other behaviors with four children with disabilities in an inclusive EC program. She implemented a single-case multiple-probe design across three behaviors and replicated across four children. The four teachers who participated did not have specialized training and only one had a bachelor's degree and they received coaching from two PhD level students. The goal of the coaching was to teach the teachers to use contingent imitation during play, use a system of least prompts, discriminate non-pretend play from pretend play, and to identify examples of four types of pretend play. The design included probe and three instructional conditions: a) functional play, b) symbolic play, and c) IEP specified behaviors. Four standard toy sets were used for conditions and assessment.

The intervention sessions were 5 minutes in duration during which time the teacher implemented the strategies to facilitate the child's performance on the target play or instructional behavior with assistance from the coach. The coaches provided feedback prior to, during, and after each session. The teacher was given a checklist with at least two examples of each type of target behavior prior to each session intervention session. It also contained the prompt hierarchy with a review from the previous session. The coach also recorded the correct use of the prompting sequence on a one page post session feedback form and provided corrective verbal prompts to the teacher as needed and recorded the number of corrective verbal prompts she used. After the session the coach reviewed the post session feedback form and ask the teachers to indicate that they received the feedback. Probe sessions consisted of a five minute play session during which time the teacher was told to not use any of the teaching behaviors with the child. All sessions were videotaped for coding purposes.

A functional relationship was demonstrated using standards for visual analysis of data for all four children's acquisition, maintenance and generalization of play and intervention targets. The children also showed an increase in more diverse play schemes on a measure of unprompted different pretend play behavior. Fidelity measures and interobserver reliability also documented the integrity of the findings.

3.4 Research Reviews and Syntheses about ECI Personnel Practice

3.4.1 Research Reviews. There have been an increasing number of reviews conducted on studies in both EC and ECI personnel preparation and continuing education. Common features of reviews include a thorough identification and categorization of studies that contain the feature of interest and an analysis of the features in each study. Systematic reviews begin with a process to identify the universe of studies that meet predefined criteria for inclusion. This is usually accomplished by searching a number of databases using terms describing the features of interest.

Studies that are identified are then screened by titles and abstract to exclude irrelevant studies. Criteria can be revised to narrow or expand the search before each study is analyzed and categorized for final inclusion in the review. All of the following report methodology and reliability measures within their article, and they are not included in depth below.

Two recent narrative reviews on EC PD were conducted under the auspices of the US DoED. Zaslow et al. (2010) conducted a review of effective features of early childhood PD. She organized the review into four areas: (1) improving the human and social capital of early childhood educators, (2) strengthening the institutions or organizations providing the PD, (3) improving children's outcomes in specific developmental domains, and (4) improving the overall quality of children's experiences in early childhood settings (Zaslow et al., 2010, p. 4). The literature review addressed children under 5 and included studies on early educators who were defined as preschool teachers, prekindergarten teachers, kindergarten teachers, and child care staff. Her review included databases, curricula, and a variety of studies that were published in peer-reviewed journals, volumes, or government reports of evaluation. The inclusion criteria identified 37 studies in the literacy area, 7 in math, 14 in social skills, 10 on comprehensive curricula, and 11 on comprehensive approaches. She categorized and described these studies by type of design and impact. Her conclusion called for additional research on specific features of teacher PD such as the inclusion of audiences of those who work outside of preschool classrooms, with infants or with children with cultural and linguistic backgrounds. She also recommended more rigor in studies to target PD approaches such as timing and setting. Lastly, she recommended more emphasis on the integration of learning across content areas for children.

A thorough review of research in early intervention and early childhood education funded by the IES was conducted by Diamond, Justice, Siegler and Snyder in 2013 (Diamond et al., 2013). They reviewed research that focused on environment and instructional practices,

instruction designed to impact academic and social outcomes, child skills and learning, and PD in early education. They categorize PD interventions as directed to helping teachers implement new curriculum, improve instructional practices, or improve instruction within a specific domain (Diamond et al., 2013, p. 32). The assumption being that effective PD practices result in improved academic and social outcomes for young children. The authors cite studies funded by IES that demonstrate teachers' behaviors can be influenced by training, that children's behavior can then be impacted by new teacher behavior, and technology can be an effective tool for PD. The authors conclude their review on IES-funded PD studies with a number of recommendations to increase studies to improve overall teaching practices.

Snyder et al. (2012) conducted a systematic review of the key features of the PD literature in EC using a framework from the National Professional Development Center on Inclusion [NPDCI] (National Professional Development Center on Inclusion, 2008). The review provided descriptions of the participant characteristics, content focus, and type of PD addressed in the reviewed studies, but it did not evaluate the effectiveness of any. An in-depth description of a subset of studies focused on instructional practices and was highlighted in the review. The research team used the NPDCI framework to develop working categories and definitions focused on the who, the what, and the how of PD. The development of the working categories and associated definitions for the how of PD were informed by the literature, research and an iterative process. The result was operationalized definitions for nine working categories of facilitated teaching and learning experiences, and 16 categories and definitions of forms of follow-up.

The review used a two-step search for eligible studies conducted from mid-2006 through February, 2011 which resulted in the identification of 1,816 nonduplicative articles. These were narrowed through a refinement of the criteria and a thorough review of the studies. Descriptive

statistics were generated for each coding category, and comparative descriptive analysis was conducted for several subsets of studies including the characteristics of all studies included in the review (n = 256) and the subset of studies in which instructional practices were identified as a content focus for the PD (n = 63). With respect to the who of PD, the reported settings for all studies were equally split among preschool/early childhood education teachers, Head Start, and child care. PD participants were reported to interact with young children with disabilities or children at risk for disabilities in 44% in the larger group of studies and 77% of the instructional practices studies. In regard to the what of PD, the most frequently reported content areas for the larger group of studies included social-emotional topics (27%) and pre-academic (25%) and instructional practices (25%). With respect to the how of PD, only 68% of the larger group of studies included a description of the PD strategies used to help learners in comparison to 98.8% of studies focused on instructional practices. The most frequently occurring categories of PD were in-service training (34% of all studies; 27% of instructional practices studies) and staff development (28% of all studies; 44%% of instructional practices studies).

Some type of follow-up after PD was reported more frequently in the instructional practices studies (91%) compared with the larger set of studies (84%), with coaching or performance feedback as the most frequent form of follow-up (52% of all studies; 65% of instructional practices studies). Research staff was reported to be the most frequent providers of follow-up (49% of all studies; 55% of instructional practices studies), followed by program consultants (28% of all studies; 23% of instructional practices studies). Single-subject experimental design was most frequently reported in the instructional practice studies versus the larger set of studies (55% versus 26%). Additionally, the instructional practice studies were more likely than the larger group of studies to report outcome measures for the practitioner (92% versus 81%), as well as the child (57% versus 50%).

Another systematic review of PD research in EC was conducted by Snell, Doswell-Forston, Stanton-Chapman, and Walker (2013). They analyzed 20 years of research on professional development delivered to those teaching preschoolers, primarily in classroom settings. They identified 891 potential articles that fit their criteria. After systematically reducing this pool, a total of 69 studies were identified as the final sample. The review focused on identifying the characteristics of professional development presented in these studies: the study samples, the training topics and methods, and the research characteristics and outcomes of the studies. Of the total sample, 57 studies of 39 participants (range from 1 to 500). The majority of these were female with an average age of 37 years and an average of 9 years of experience. The majority of classroom settings in which the professional development occurred was in Head Start. Forty-nine of the studies also reported on the child participants, and in 36 studies the children were typically developing. The majority of these studies focused on child interventions in the areas of communication and social skills (37 studies). Sixty-one of the studies reported using lecture-based classes or workshops to deliver the professional development, and 45 included applications of the content through demonstrations of practice. Only 15 studies reported any follow-up contact or support after the training was conducted. Most often (49 studies), the professional intervention was delivered by experimenters, consultants, or both. The studies were equally split between single-subject experimental designs, experimental treatment control group designs, experimental no treatment control group designs, and quasi-experimental designs. Direct observation measures were the most frequently used in 34 studies, followed by interviews, surveys, and self-rating scales. Less than half of the studies (31) reported social validity measures. Of the 30 studies that measured fidelity, only 18 of the measures were reported as acceptable. Nine studies measured generalization across settings or

skills and only six reported positive effects. Maintenance of the adult behavior or skills was measured in four of the studies.

Casey and McWilliam (2011) conducted a systematic review of the use of feedback interventions used in early childhood classrooms (infant to grade 4). Seventeen studies were identified that met criteria, and all used single-subject methodology. The 86 adults in the studies were distributed across preservice students (17), para-professionals (29), and teachers (40) within a range of classrooms from Head Start, public schools, and child care. All classrooms had either children with disabilities or risk conditions. The feedback was delivered in all but two of the studies by a researcher, and in all studies it was delivered in private to the target teachers. All but one study used verbal feedback, one used graphing alone, eight used verbal and graphing, eight used written, two used written, and six used a combination. Feedback was provided prior to intervention in six studies, and in combination with consequence (praise) in seven studies. Goal setting was used in two studies, one of which used antecedents and consequences in combination with goal setting.

The studies were analyzed for effectiveness using visual analysis and five met criteria for having consistent positive effects using standards for single-case analysis. The authors expressed concerns over the insufficient baselines, lack of information about outcomes, and the small evidence base for performance feedback in ECI. Nonetheless, a recent systematic review of the performance feedback literature with school-age students concluded performance feedback as studied in single-case studies they reviewed could meet the guidelines established by the WWC for an EBP (Fallon, Collier-Meek, Maggin, Sanetti, & Johnson, 2015).

By far the most common terminology for performance feedback used in ECI has been coaching. Artman-Meeker et al. (2014) conducted a systematic review of the use of coaching in EC. Her original sample consisted of 4,705 studies that met the inclusion criteria and this was

reduced to 49 studies through a systematic review of the studies. The specific variables reported for each of the studies included: teacher-child characteristics, settings, dependent variables, independent variables, initial training, coaching components and strategies, measurement of implementation and intervention fidelity, overall outcomes, social validity, preparation and supports provided to coaches, and study rigor using adapted WWC procedures and standards. Not all studies reported data in all these categories.

Across all 49 studies, the teachers ranged in age from 20-44, across education levels from high school to master's degree, and had between 0 to 25 years' experience. Thirty-five studies reported on the children in the studies, and 26 studies reported their ages which ranged from birth to 7, the majority being between 3 and 5. Twenty-two of the studies included children with, or at risk for, disability, and 18 of these 22 studies included children with identified disabilities; nine included children with autism, and two included children who were dual-language learners. Fifteen of the studies focused on the language and literacy domain, five on language only and five on literacy only, nine on instructional strategies, and eight in social-emotional development.

Twenty-one of the studies reported that the coaches had at least a bachelor's degree, 13 reported the coach had a master's degree. Only seven reported that the coaches had experiences as a coach or mentor. The role of the coach was reported in 44 of the studies. Most reported that coaches were primary research staff. Thirty-nine of the studies reported that the coaching happened in the teacher's classroom with the teacher. Four studies provided coaching at a distance, and in six studies a combination of face-to-face and distance was used. In 20 studies debriefing or feedback from the coach occurred immediately after an observation had occurred; in 13 studies, this occurred on the same day of the observation; and in 14 studies it occurred one or more days after the observation. Twenty-six of the studies reported the time spent in coaching, and in these studies, teachers participated in 3-32 coaching sessions and which varied

from 2 minutes to 5 hours per session, over 4.5 months, on average. Almost all of the studies expected coaches to provide feedback to teachers, yet only 10 of the 49 studies described any training or support to help the coaches learn how to provide feedback.

Twelve coaching practices were identified by the authors and used to categorize the coaching that occurred. The 12 strategies were then reduced to five features: a focus on partnerships, action planning, focused observation, reflection and feedback, and action in the work setting. Only two of the studies reported using all of the features, and 26 studies reported all features except for a focus on partnership. The most frequently used strategy across the 49 studies was performance feedback which included a range of practices.

Thirty-two of the studies used a group experimental design methodology, and a number of standards from WWC were used to assess the soundness of the studies: random assignment across conditions, equivalency of baselines across groups, sample comparability and a description of sample attrition. Thirteen of the studies met all four of the adapted standards and 19 did not meet any. Seventeen studies utilized a single-subject research design; four of the 17 studies met the WWC standards and also demonstrated strong evidence of a functional relationship.

3.4.2 Research Syntheses. Dunst and Trivette (2009a) conducted a meta-analysis and research syntheses on the following adult learning methods: (1) accelerated learning, (2) coaching, (3) guided design, and (4) just-in-time training. Results demonstrate that all four adult learning methods were associated with more positive learner outcomes as measured by the average effect sizes and 95% confidence intervals across all studies and outcomes combined.

Dunst et al. (2015) conducted a metasynthesis of 15 research reviews of in-service PD. The purpose of the metasynthesis was to determine the extent to which studies of in-service PD

that included key characteristics and core features of in-service training were associated with changes and improvements in educator and student outcomes. A multiple-case design was used to analyze the research syntheses in the metasynthesis. This design is grounded in a conceptual framework for testing hypothesized relationships between independent and dependent variables in order to establish causal inferences. Each research synthesis was considered a separate case, and the focus of the analysis was the extent to which the relationships between in-service PD and teacher and student outcomes were similar in the research syntheses.

Research syntheses were located using search terms, and follow-up searches were conducted using controlled vocabulary, key word, and natural language searches as alternative terms were identified from retrieved publications and reports. The reference sections of retrieved journal articles, book chapters, books, dissertations, and other published and unpublished reports and papers were examined to identify additional reviews. Research syntheses were included if in-service PD was the main focus of a literature review, there was an explicit attempt to identify the characteristics of and conditions under which in-service training was effective, and sufficient information was included in the reports to code and conduct secondary analyses of the relationships between the key characteristics of in-service PD and research findings. More than 25,000 abstracts (including duplicate abstracts in different databases) were generated from searches. These were reviewed and reduced to 36 reviews that were then examined to determine if they met the inclusion criteria. Fifteen reviews formed the final group for analysis.

PD features were coded within five sets of characteristics which included (a) the focus of in-service training, (b) the in-service setting, (c) the in-service characteristics, (d) the research synthesis findings, and (e) the metasynthesis findings. Two of the investigators independently abstracted and coded information for the 15 in-service features as well as background information about the studies in the research syntheses (e.g., type of synthesis, research designs,

number of studies). The 15 research syntheses included 550 studies of more than 50,000 early intervention, preschool, elementary, secondary education teachers, educators, and practitioners. Seven syntheses included only group design studies (e.g., experimental, quasi-experimental, and pre-experimental investigations or program evaluations) and six syntheses included a mixture of group design studies and either descriptive case studies or single-subject studies. The investigators of two research syntheses did not include information in their reports about the types of studies in their reviews. The participants included pre-K or K to grade 12 teachers (N = 8 reviews), K to grade 5, 6, or 8 teachers (N = 3 reviews), early childhood practitioners (N = 3 reviews), or both pre-K to grade 12 teachers and other non-educators (N = 1 review). Eleven research syntheses included studies of in-service PD to promote use of different types of instructional or behavioral practices, two research syntheses included studies to promote teacher understanding and use of content knowledge or skills, and two research syntheses included studies of in-service training to promote teacher or practitioner use of different job-related practices or to support teacher confidence in their teaching practices. The content areas of in-service training included mathematics or science (N = 5 reviews), teacher-child interactions (N = 1 review), teacher praise (N = 1 review), teacher confidence (N = 1 review), or a mixture of different content knowledge and practice (N = 7 reviews).

Eleven of the research syntheses included studies that provided in-service PD in both contextual and noncontextual settings, and four syntheses provided in-service training entirely in teachers' classrooms or schools, child care or preschool settings, or other work environments. All of the research syntheses included descriptions of in-service training and some type of authentic teacher learning opportunities. Most of the research syntheses included the majority of key characteristics and features considered necessary for in-service PD to be effective as displayed on Table 4.

Acquisition or improvements in teacher instructional or behavior practices were the primary outcomes in 14 research syntheses. Nine research syntheses included student academic performance, knowledge acquisition, or skill development as the primary outcomes, while four included student or child behavioral outcomes measures, and three included both types of child outcomes. Twelve research syntheses included both teacher instructional practices and student or child outcome measures. Five included both teacher content knowledge, instructional practice outcomes, and student or child outcome measures. Five included only teacher outcome measures, and one research described only student outcome measures.

Fourteen of the research syntheses included information about the duration or amount of in-service training provided. The number of hours of in-service training associated with positive effects ranged between 15 and 80+, and in several reviews, it was stated that multiple in-service sessions distributed over weeks or months of PD was a factor contributing to positive and significant effects. All of the research syntheses included information about the nature and extent of follow-up supports provided to teachers after the completion of the initial in-service PD. Ten investigators explicitly stated that ongoing follow-up supports were a factor that reinforced in-service training, whereas three investigators made statements, or it could be surmised that follow-up supports contributed to positive outcomes. Investigators of all 15 research syntheses reported or described the characteristics of and conditions under which in-service PD was most effective. These included trainer introduction, demonstration, and explanation of the benefits of mastering content knowledge or practice, active and authentic teacher learning experiences, opportunities for teachers to reflect on their learning experiences, coach or mentor supports and feedback during the in-service training, extended follow-up supports to reinforce in-service learning, and in-service training and follow-up supports of sufficient duration and intensity. The patterns of results, taken together, provide strong evidence for the relationships between specific in-service PD

characteristics and core features and teacher and student outcomes. Results that were the same or similar in the different types of research syntheses for different types of practices bolster contentions about the necessary, but not sufficient, conditions, for in-service training.

4. Summary

This monograph documented the need for increasing the quantity and quality of ECI practitioners who can meet the growing numbers of those infants, young children, and their families who qualify for services under IDEA. An overview of the evidence supporting preservice preparation and continuing education in-service for ECI personnel was presented, beginning with the foundation from which this evidence evolved. This foundation reflects the long and strong history of ECI, as illustrated through the preparation and ongoing training of high-quality and interdisciplinary personnel who can facilitate growth and development with infants, young children, and their families.

This history of ECI personnel development through preservice and in-service activities is supported by a number of interrelated elements that have continuously driven the field forward. Among these are legislative and statutory mandates under IDEA for ECI service delivery and personnel development activities, that latter area to assure the competence of those providing ECI services. In particular, the U.S. DOE has provided funding for many of the advances in personnel development through preservice, in-service and research investments from the Office of Special Education Programs (OSEP) and the IES. The subsequent regulations, policy guidance, and federal directives for the use of these funds influence both the research that is conducted, and the translation of research findings into EB personnel practices. As such, the U.S. DOE will continue to direct personnel research, policy and practice in ECI. The contribution of this investment cannot be underestimated.

The field of ECI personnel practice is also supported by theoretical frameworks about adult learning as applied to the training and ongoing preparation of those ECI practitioners. Research has driven the evolution and validation of early theories about how people learn, and current evidence-based recommendations for personnel practice and policy that are consistent with early work in this area. The challenge remains, though, on how to apply the components of these evidence-based frameworks into standard practice. We cannot ignore the research base on the unique learning needs of adults, and the skills needed by those who teach them. An additional caution to the field is warranted in regard to the use or recommendation of complex frameworks such as implementation science to guide the implementation of EBP. For example, such framework requires a viable infrastructure to support the necessary sequence of activities associated with the effective demonstration of a system change. Though a necessary goal for systems design, refinement and evaluation, implementation is dependent on innovative practices that have met standards for EBP, demonstrations of the effectiveness of a group of EBP under controlled conditions to solve a service problem, and the scaling up of the demonstration within an infrastructure that is sustainable. Many failures of this process occur because the scaling up and implementation of practice does not follow a validated sequence, or the target practice(s) does not have a solidified base of empirical support.

The last foundational support for ECI personnel practice is pedagogy. The roots of ECI pedagogy continue to drive the content of IHE programs, state certification requirements, national standards, and recommended practice. The need to operationalize and align these core components of ECI pedagogy is an obvious next step in the research agenda for personnel practice. It is also a necessary direction for quality assurance of ECI personnel, including personnel from related service and other occupational categories.

The data that were presented in this monograph as evidence to guide personnel practice in ECI emanate from a variety of sources including surveys, nonexperimental demonstrations, experimental studies, and research reviews and syntheses. Survey data describe the lack of a systematic approach in both preservice and in-service programs in ECI are reflected by descriptions of IHE program offerings, state in-service and PD program offerings, and perceptions of those in ECI practice. The information provides needs assessment data for the field and, as such, can be viewed as a baseline for the future change.

In addition, descriptions of ECI interdisciplinary preservice personnel programs that were implemented 20 years apart remain consistent across a number of program features. Both of the described programs were funded by OSEP, and both met the program standards established by OSEP for preservice funding. Nonetheless, data from both surveys and experimental studies consistently identify shortcomings in preservice training in regard to the abilities and perceptions of program graduates. Yet, inadequacies in preservice training continue to be identified through observations of baseline skills of teachers about to graduate and surveys on the self-perceptions of program graduates. This is another obvious research need in ECI.

The descriptions of in-service programs included in this monograph are typical of what is being offered through state and local ECI systems. The data from the two examples reviewed document interventions that were focused, coherent, part of a state, regional or local system, aligned with incentives or program expectations, and reflective of personnel practices that can result in child and family change. The data that were collected, though not under experimental conditions. As such, they provide insight into mechanisms that support or inhibit the acquisition of new knowledge and skills within the ECI workforce. In particular, data on home visitors' philosophy of intervention influenced their home visiting behavior, even after training. Those that continued to implement business as usual practices illuminates the need to address the

cognitive and motivational aspects of adults participating in training aimed at changing their behavior. As supported by adult learning theorists, changes in behavior must be self-directed and based on a need to change. This aspect of learning is often neglected in ECI examples. Both of the in-service programs reviewed also demonstrated attrition of their practitioner sample.

The evidence that was provided through experimental studies of preservice and in-service practices represented a sample of the available evidence. Though there are a number of experimental group designs that have demonstrated the effects of training and PD activities on teacher behavior, these studies have focused on teachers and children who are in preschools, Head Start programs or child care. These studies demonstrate that the frequency and intensity of the PD intervention does matter when measuring both child and adult outcomes. While the results of such studies inform ECI personnel practice, there have been few group designs either implemented or replicated with ECI practitioners who work with infants and young children who are receiving services under IDEA. Reasons for this are speculative, such as the heterogeneity of children's learning profiles both within and across diagnostic categories or areas of delay, the influence of the IFSP and IEP on the delivery of experimental interventions, and the cost of group of designs in terms of funding and personnel resources. None of these reasons have been tested empirically.

The examples of research studies that documented experimental control over ECI personnel practices and personnel outcomes consisted of single-case studies and one example of a random group design focused on child impact. The studies included different categories of personnel, all of whom were providing ECI to infants and young children who were eligible for services under IDEA, or young children at risk for delay. These included preservice teachers, ECSE certified teachers with master's degrees, early childhood providers without college preparation, para educators and home visitors. Various intervention practices were taught to these practitioners ranging from the dramatic play skills, language and literacy skills, social emotional

and behavior support skills, communication skills, home based family guided interventions and classroom based behaviors and skills. The types of children in the studies ranged from typically developing, to having risk conditions and/or disabilities. They ranged from 17 months to preschool age, and all attended inclusive classroom programs with the exception of the study that occurred during home visits.

Experimental control was demonstrated across studies between the interventions delivered to the trainee and the measured impact it had on their skills. The interventions were described in detail and consisted of strategies consistent with adult learning practice. Measures of inter-observer reliability, procedural fidelity and social validity were implemented across the studies, as were criterion and standards for single-case analysis. Less consistently demonstrated across studies was the impact of interventions on measures of child skills or on measures of generalization and maintenance of the trainee skills.

Most of the intervention was delivered by research staff, though little information was provided on their proficiency either implementing intervention to children or to the trainees in the studies. Some of these studies also delivered a high intensity of prompting and feedback to the trainee during intervention through BIE delivered directives or by a coach who provided instruction and feedback while intervention data were being collected. Conversely, some of coaching and observational sessions were of relatively short duration ranging from 5 minutes to 20 minutes over weeks or months. Lastly, low levels of intervention behaviors demonstrated by trainees during baselines suggesting a lack of knowledge and skills in ECI practice. This was documented across student teachers at the end of their preservice program, to highly qualified and educated teachers and early interventionists in practice.

Finally, research reviews that were included in the monograph suggested a high level of variability across studies that met inclusion criteria for general research on personnel practices as

well as on targeted practices such as instruction, performance feedback, and coaching. The studies that used coaching were especially problematic because of the conflicting, changeable and non-empirically based definitions used to describe this popular feature of personnel practice. Potential measurement confounds across studies were illuminated, as were issues related to the replication of such wide varying applications of the coaching construct. Across other reviews, variation across features such as strategies to teach to generalization and maintenance was also identified, as was the fact that most research studies relied on research staff to implement the interventions under study. However, research syntheses provided evidence for key features of personnel preservice and in-service interventions that have consistently resulted in adult learning and student impact and change.

5. Recommendations

The studies and reviews that were presented in this monograph are ripe with recommendations for future research on the preservice and in-service needs of ECI personnel. These recommendations are made in the context of the growing numbers and diversity of the ECI workforce, and the complexity of competencies needed by them to meet the growing and diverse needs of ECI population. This complexity is compounded by a lack of infrastructure within state and local personnel development systems and the resulting reliance of such systems on ineffective training mechanisms (e.g., conferences, once offered workshops without follow-up) because of funding and logistical constraints. Such systems are also demonstrating challenges in identifying, training, and supporting qualified instructors and other personnel development specialists to deliver evidenced-based education and training to ECI practitioners. Yet, it is clear that the federal and state focus on EC and resulting increases in EC programs will continue. What is less clear is how ECI systems will meet the current and future need for well-trained personnel, representing different disciplines, educational backgrounds, and learning styles, to deliver EBP to

eligible infants and young children under IDEA, across a variety of EC settings, and, in collaboration with EC staff.

In 1960, the US Navy required a paradigm shift to accommodate the increasing complexity of their work in the era of growing and different demands (e.g., nuclear threats, collaboration with other armed forces). As a result the Navy coined the KISS principle to address the factors that governed their new world order. This principle proposed that most systems work best if they are kept simple rather than made complicated; therefore simplicity should be the key goal in systems design, and unnecessary complexity should be avoided. In the spirit of this principle, the following recommendations will attempt to simplify and clarify the direction needed for future ECI preservice and in-service practice.

5.1. Focus on the "right" variable for sustainable change. The job of personnel in ECI is to facilitate child and family change through the delivery of measurable interventions and outcomes. Therefore, the focus of all preservice and in-service activities should be on the child and family, and measures of effectiveness should reflect this. Guskey (2014) has recently recommended this shift for PD planning, and this has been reinforced for ECI by Dunst (2015). If all training activities focus on the achievement of child and family outcomes and change, preservice and in-service curriculum, activities, and outcome measures should then be guided by the theory of change reflected on Figure 3. If the target of any adult training is centered on the infants and young children who are the recipients of ECI, we will see child change immediately, and in response to adult interventions, rather than the current status demonstrated in the personnel development literature where child results are not expected immediately, if at all, during personnel training. This will not only improve our effectiveness with those in ECI, but our efficiency. Infants and young children in need of intervention do not have time to wait.

5.2 Operationalize and align all ECI personnel knowledge, skills and recommended practices to guide preservice and in-service research and training for those serving infants and young children under IDEA. ECI has national personnel standards (Stayton, 2015) that are used to accredit IHE preparation programs in ECSE. Personnel standards from NAEYC are also used for those IHE programs with blended programs (e.g., EC and ECSPED). ECI-recommended practices are also available (DEC, 2014) to guide interdisciplinary preservice and in-service training. These standards and practices are not currently operationalized nor aligned with each other. This must be done as a first step to clarify the expectations and competencies for all who provide ECI services. These standards and practices are research based, grounded in inclusionary service delivery, and include competencies that can be implemented across service delivery sites and other personnel (e.g., collaborative consultation). Once this first alignment is complete, personnel standards across related disciplines can be added to a personnel standards matrix to identify and differentiate similar and differing practices aligned by discipline and child need. Figure 4 contains a scheme using the pyramid graphic to illustrate as a first step, the CEC-DEC, NAEYC personnel standards, and DEC practices aligned with child need.

5.3 Create infrastructure support for a comprehensive system of personnel development. The need for high-quality preservice and in-service training opportunities for those who serve infants and young children with disabilities and their families must be addressed through systems thinking. All systems are comprised of interrelated components, and each component must use EBP for administration, leadership, resource allocation, implementation, and evaluation. Personnel systems under IDEA evolved using such a system: the CSPD. The components and indicators of a proposed CSPD for ECI personnel as conceptualized by the Early Childhood Personnel Center, in collaboration with other national centers, are in Table 5. Such an infrastructure will support the identification, implementation, and evaluation of EBPs in the areas

of personnel standards, recruitment and retention strategies, preservice and in-service activities, evaluation, and leadership, coordination, and sustainability. A viable CSPD allows for the design and integration of research and practice across all EC personnel systems. It also creates a mechanism for the development of a coherent agenda for personnel development activities that are responsive to state and local system need and individual practitioner competency acquisition from a continuum of preservice to in-service. A CSPD for ECI practitioners can become the foundation of an effective and sustainable training system which will build state capacity for EBP, and allow states to move away from a reliance on external and temporary training agents who may not use evidence based, nor sustainable (in terms of both funding requirements and maintenance strategies) system change approaches for ECI personnel.

5.4 Acknowledge and address the complexity of variables inherent in ECI personnel research and practice. ECI systems are complex, as are the children and families within such systems. The characteristics of personnel who are providing services contribute to the complexity under which research is implemented. Additionally, research designs have to be contextually referenced to the local, regional, and state culture and systems in which ECI operates. This requires the creation of theories of change (Figures 1 and 3) that can be delineated into logic models to guide systematic examinations of independent variables, dependent variables, and mediators and moderators to the outcomes of interest, including system impact. Figure 5 contains such a logic model developed to accompany Table 5.

5.5 Create a repository of research findings to inform current and future personnel policy and practice. Almost 20 years ago Guralnick (1997) proposed an expansion of ECI EBP through the design and implementation of precise, rigorous, and targeted studies that would result in a rich repository of findings to inform policy and practice. Three sets of variables (programs features, child and family characteristics, and outcomes) were delineated as integral to such

research designs. Referred to as second-generation research, these designs could facilitate the examination of specificity within and across variables and the interactions among them, to identify evidence of effectiveness. Such designs could also include variations within program features and population characteristics such as systems and persons who provide preservice and in-service activities. For example, Artman-Meeker et al. (2014) investigated the use of coaching as a type of professional development element under the feature of performance feedback. Across studies she found inconsistencies in the definitions and implementation of this element, and a dearth of empirical evidence to support the external validity and generalization of findings when coaching was used as an intervention. While many have called for an operationalized and consistent definition of coaching to guide research and practice (cf. Friedman, Woods, & Salisbury, 2012; Kemp & Turnbull, 2014; National Center for Quality Teaching and Learning, 2014; Snyder, Hemmeter, & Fox, 2015), experimental evidence is needed before we can generalize the effects of this performance feedback element across population characteristics and outcomes. Research designed in this way provide a mechanism to systematically build a shared repository of EBP across content areas, personnel practices, and target populations and outcomes. Figure 6 contains an illustration of second-generation design components using personnel development features that have been identified as effective across preservice and in-service personnel studies (Dunst et al., 2015).

5.6 Build and sustain the ECI workforce by conducting research on individualized learning needs. Differences in adult learning styles have been demonstrated through measures of adult learning as a result of either preservice or in-service activities. Experimental studies also continue to demonstrate failures when trying to change adult behavior through the teaching of more than a targeted and small set of skills to practitioners, or measuring the generalization and maintenance of those skills, or when moving an EBP from a controlled demonstration to a

real-world situation on a larger scale. These failures will only increase if we do not conduct research on effective learning methods for the future ECI workforce: those who have grown up learning very differently than any before them. For example, the current generation has been taught through media-directed instruction using tablets or phones, personal learning plans, immediate feedback loops on learning acquisition and progress through online personal teaching and record-keeping systems (e.g., power school), access to video exemplars when needed (e.g., Kahn Academy), and instant-messaging systems driven by pictures (e.g., Instagram and Snapchat). In fact, the College Board is recognizing the needs of current learners by teaming with Kahn Academy to redesign all college and graduate school preparation courses for 2016.

Individualized intervention, progress monitoring, and the acquisition of outcome-based standards have long been the cornerstone of service delivery to infants, children, and families under IDEA. We must begin to use similar methodology in the delivery of training to the personnel who deliver these services. The creation of individualized and effective learning systems for ECI personnel will require a commitment to participatory planning for both research studies and the translation of research findings into policy and practice. Responsive and personalized learning systems that are aligned with standards and competencies must be designed and studied to insure their effectiveness along with individuals'ability to self-direct, manage, and monitor their own learning over time as job requirements change (including the discovery of new EBP). This will require the exploration and use of learning mechanisms such as competency-based evaluation systems and registries, learning menus, and measurement systems. ECI must be prepared for the future learning of those who are, or will become, members of the workforce by identifying and applying innovative EBP in adult learning, so that we may focus the workforce on achieving child and family outcomes.

5.7 Embrace a culture of research collaboration to build and sustain the ECI workforce. This last recommendation is the most important, and the most difficult to achieve. Very rarely has research on personnel practices been done collaboratively across multiple investigators who represent different philosophies or methodologies. Indeed, funding mechanisms create competition, and, as a result, methodologies are rarely shared, especially when external research funds are limited. This has created research gaps between research findings and applications to practice, practice gaps when interventions are not implemented with fidelity, and outcome gaps when EBP with infants, young children, and families cannot be replicated because of problems with the interpretation, application, and implementation of intervention features (e.g., coaching). These gaps will continue until they are collectively addressed by the ECI research community.

The ECI research community has a responsibility to implement research studies to identify effective interventions to use with infants, young children and families, and effective interventions to facilitate the implementation of these interventions by the ECI workforce. Until this community agrees to collaborate on a collective and iterative research agenda on personnel practice, we will not be able to move beyond the current status of multiple and various interpretations and applications of features of personnel practice. This could be accomplished by agreeing to a common nomenclature, or agreeing to share methodologies to add value to the knowledge base. As a field we must move beyond individually driven, myopic, and sometimes ill-defined research and technical assistance agendas. Most importantly, the ECI field has a responsibility to infants, young children, and families to implement EBP in all interventions, most importantly and as described in this paper, when teaching ECI personnel.

"Perfection of means and confusion of goals seem, in my opinion, to characterize our age." This quote has been attributed to Albert Einstein, and applies to many challenges we have today.

One such challenge was recently demonstrated by our country's response to coronary heart disease. Death rates from this disease decreased by 38% between 2003 and 2013 according to the CDC. This was due to the findings of one researcher who noted differing rates of heart disease mortality, by hospital, that could not be attributed to state, regional or resource differences. He and a group of his colleagues then surveyed a random sample of 365 hospitals and discovered that those that used one or more of six specific practices to cut down on the time it took to get patients from the ER into an OR treatment room to open their arteries did better than those that did not use such practices. Additionally, the higher the number of the practices used, the faster the patients were being treated, and the better the cardiac outcomes. These findings were published in a peer reviewed journal in 2006 and presented at major cardiology meetings. The field of cardiology embraced these six EBPs, and hospitals (by definition being complex systems) implemented them. Evaluations documented that many more lives were saved than were under previous treatment protocols (Kolata, 2015, June 19).

The field of ECI also has the need and the opportunity to facilitate of change in how evidenced based personnel practices are applied to teach practitioners to implement child and family interventions with fidelity to achieve targeted learning outcomes. Syntheses of reviews of personnel practice methods related to positive outcomes have identified six EBPs (Dunst et al., 2015) and these are on Table 4 and Figure 6. These are the guidelines that should be used to implement efficient and effective preservice and in-service training in ECI. If personnel in the field of ECI demonstrate the same sense of urgency as cardiologists and use these practices to frame all future research endeavors on personnel practice, we may realize better outcomes in ECI with the infants and young children we serve.

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Figure Captions

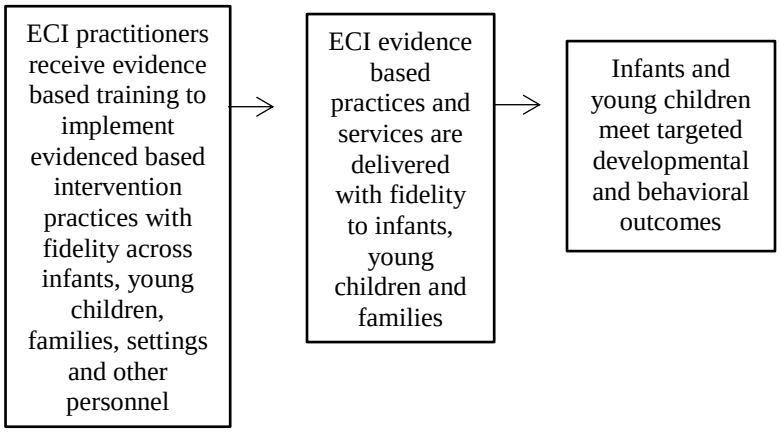


Figure 1. Theory of change for early childhood personnel development

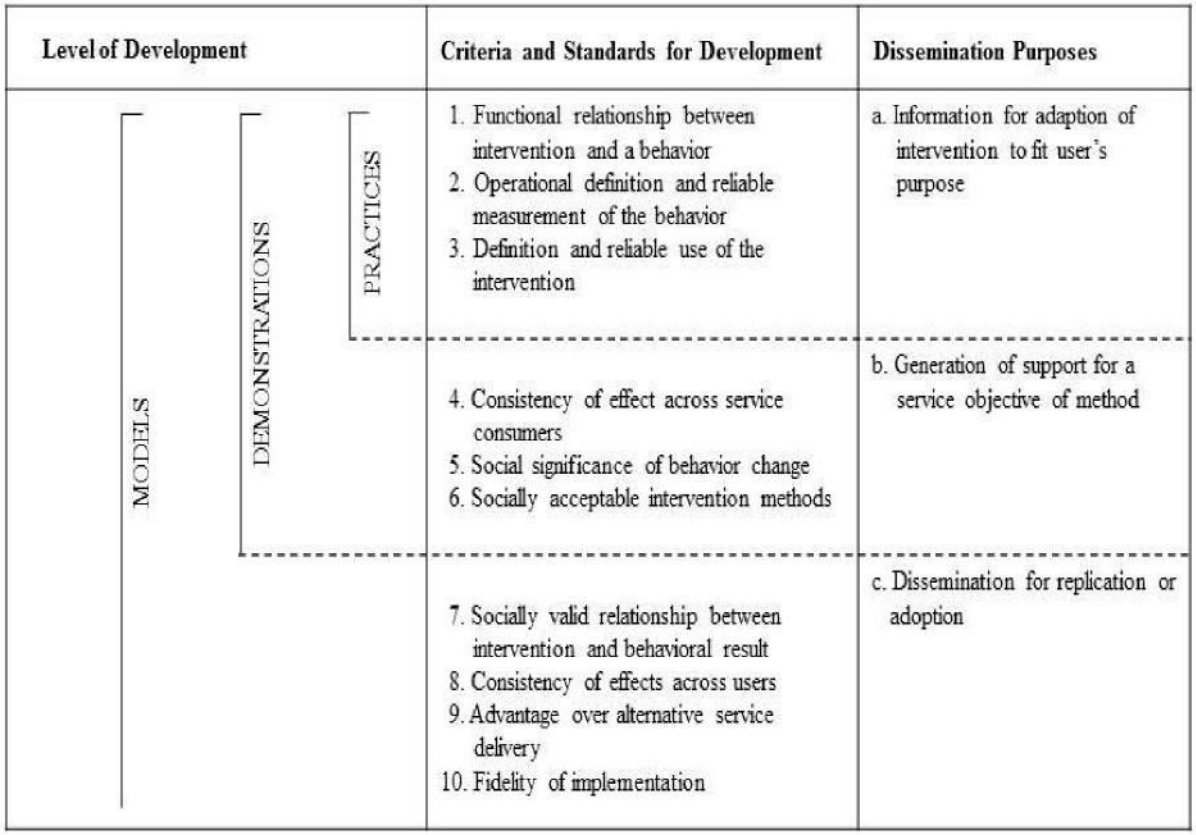


Figure 2. Relationship between program development criteria and standards, dissemination purposes, and levels of development of innovative practices

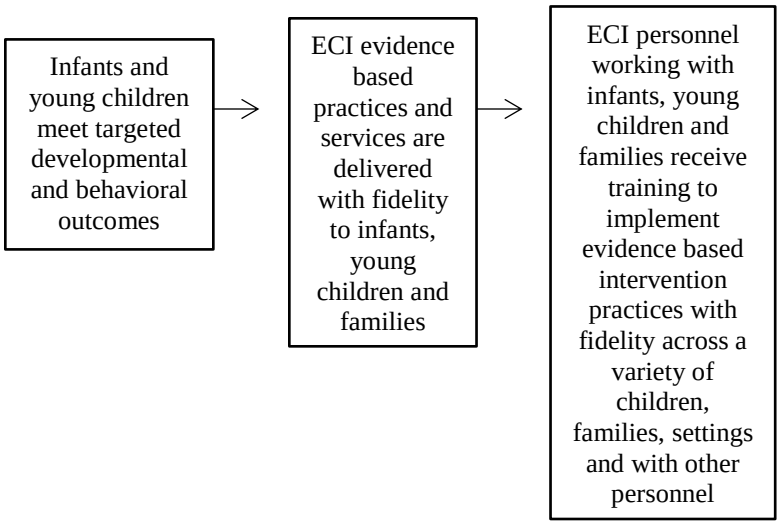


Figure 3. Refocused model of change for personnel development

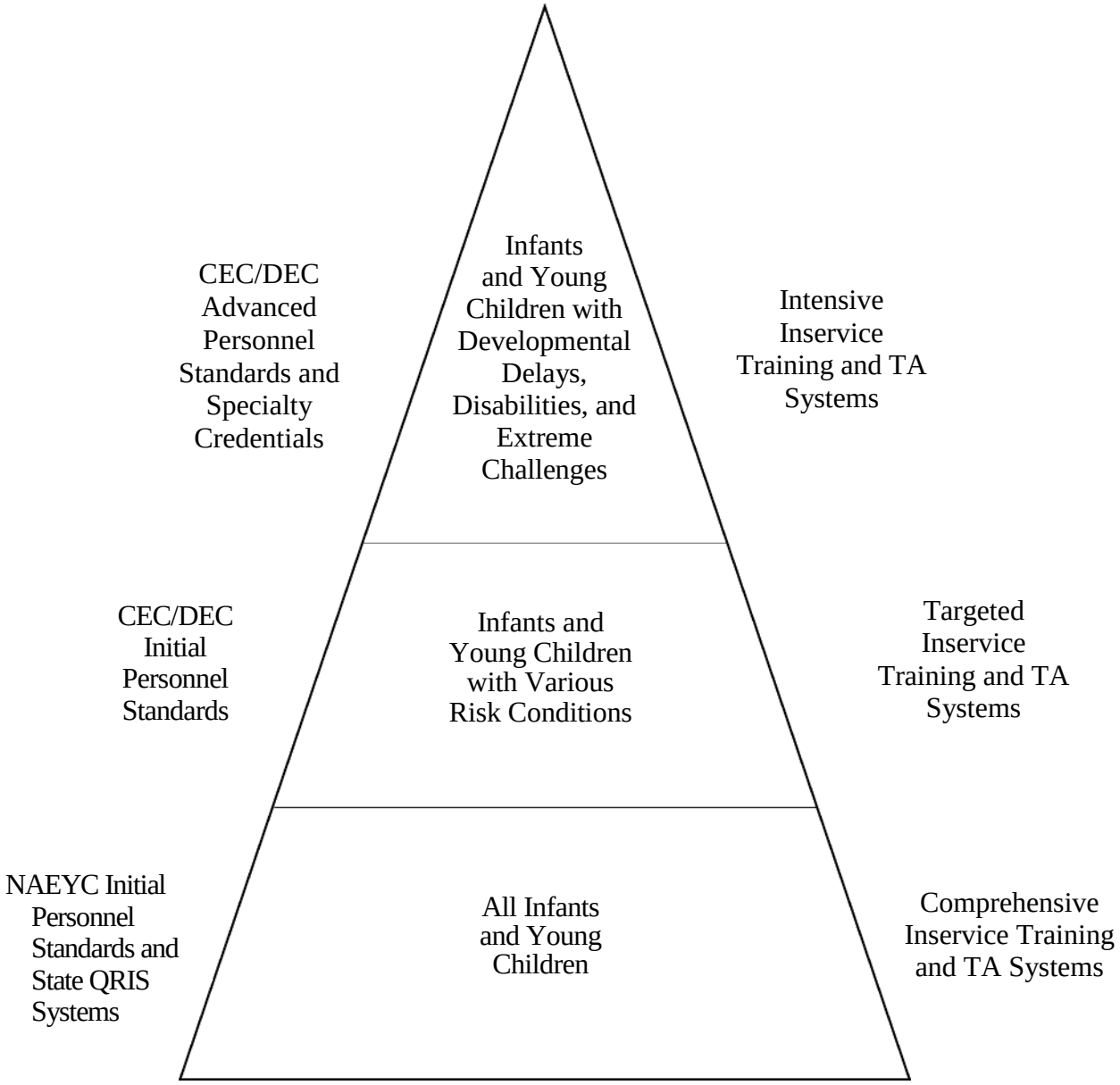
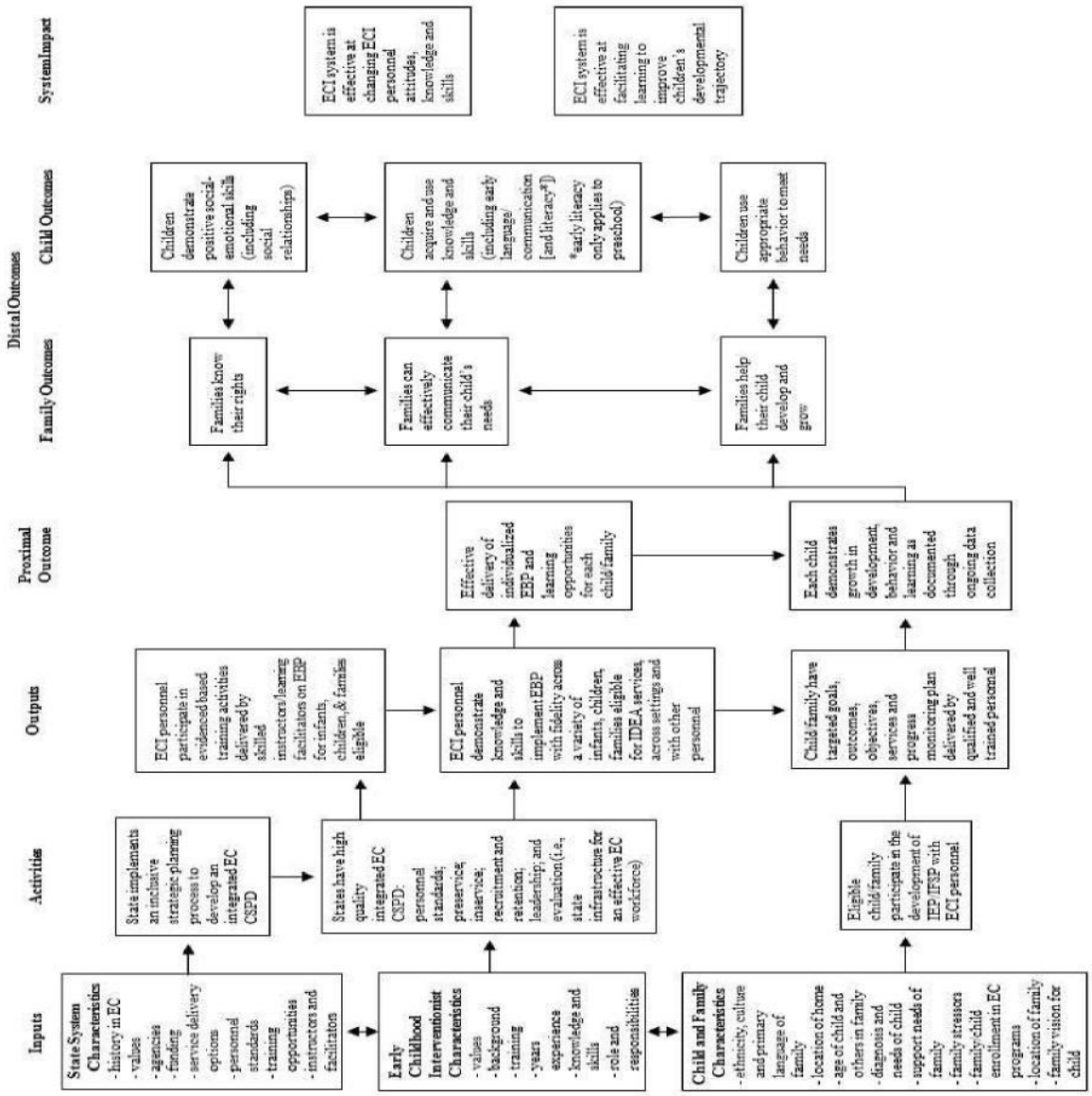


Figure 4. Personnel hierarchy of knowledge and skills

Figure 5. Logic model for ECI personnel practice



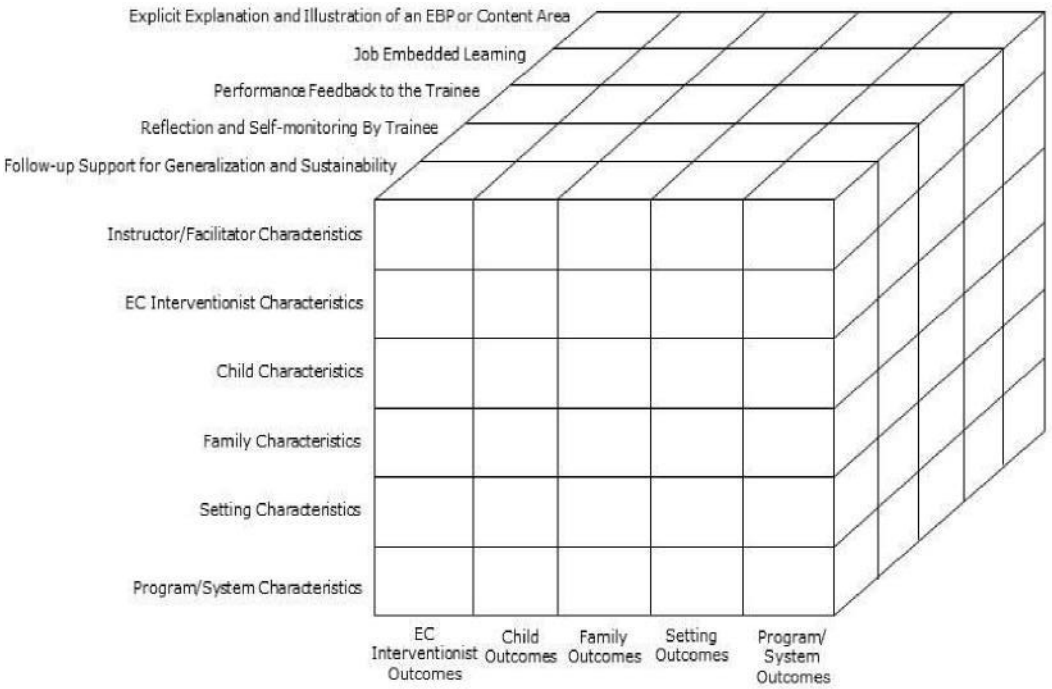

Explicit Explanation and Illustration of an EBP or Content Area
Job Embedded Learning
Performance Feedback to the Trainee
Reflection and Self-monitoring By Trainee
Follow-up Support for Generalization and Sustainability
Instructor/Facilitator Characteristics
EC Interventionist Characteristics
Child Characteristics
Family Characteristics
Setting Characteristics
Program/System Characteristics
EC Interventionist Outcomes
Child Outcomes
Family Outcomes
Setting Outcomes
Program/ System Outcomes

Table 1. *Functions of the Adult Educator*

• Motivating the learner by creating an environment and conditions that will be conducive to facilitate learning.
• Diagnosing the learner's needs within the scope of the given situation.
• Planning a sequence of objectives and experiences with the learner to produce the desired learning and outcomes.
• Selecting the most effective methods and techniques for producing the desired learning.
• Providing the human and material resources necessary to produce the desired learning.
• Evaluating the learning outcomes and helping the learner self-evaluate and measure their experiences to re-diagnose additional learning needs.

(Knowles, M. S. (1980). *The modern practice of adult education: From pedagogy to andragogy.* Englewood Cliffs: Prentice Hall/Cambridge p. 26-27.)

Table 2. *Trainer roles in the different phases of PALS*

PALS phases	Trainer roles
Introduction	Preview learning topic
	Describe key elements
	Provide examples
	Include trainee input
	Illustrate application
	Demonstrate application
Application	Facilitate application
	Observe trainee application
	Provide in vivo feedback/guidance
	Facilitate learner assessment of options
Informed understanding	Establish learning standards
	Engage learners in self-assessment
	Provide guidance to learners
	Provide behavioral suggestions
Repeat Learning Process	Joint planning
	Trainer guidance
	Trainer/trainee mentoring

Table 3. *Early Childhood Personnel Standards and DEC Recommended Practice Areas*

CEC Focus Areas	CEC/DEC Initial Standards	NAEYC Initial Standards	DEC Recommended Practices
Learner and Learning	Learner Development and Individual Learning Differences Learning Environments	Building Family and Community Relationships	Environment Family
Content Knowledge and Foundations	Curricular Content Knowledge	Using Content Knowledge to Build Meaningful Curriculum	
Instructional Pedagogy	Assessment Instructional Planning and Strategies	Observing, Documenting, and Assessing to Support Young Children and Families Using Developmentally Effective Approaches Promoting Child Development and Learning	Assessment Interaction Instruction
Professionalism and Collaborations	Professional Learning and Ethical Practice Collaboration	Becoming a Professional	Leadership Teaming and Collaboration Transitions

Table 4. *Types of Trainer and Learner Activities Included Identified in Effective In-service for Teachers*

	Trainer/Coach Roles		Active Learning		Trainer Supports	
Study	Introduction	Illustration	Authentic Learning	Learner Reflection	Coaching/ Mentoring	Performance Feedback
Blank & De las Alas (2009)	✓	✓	✓✓	✓	✓✓	NR
Blank et al. (2008)	✓✓	✓✓	✓	✓	✓	NR
Capps et al. (2012)	✓	✓✓	✓	✓	✓	✓
Cavanaugh (2013)	✓	✓	✓✓	NR	✓	✓✓
Dunst, Trivette, & Hamby (2010); Dunst & Trivette (2012)	✓✓	✓	✓✓	✓	✓	✓
Fukkink & Lont (2007)	✓✓	✓✓	✓✓	✓	✓	✓
Ingersoll & Kralik (2004)	✓	NR	✓✓	✓	✓✓	NR
Ingersoll & Strong (2011)	✓	NR	✓✓	✓	✓✓	NR
Isner et al. (2011)	✓	NR	✓✓	✓	✓✓	✓
Joyce & Showers (1995); Showers et al. (1987)	✓✓	✓✓	✓✓	✓	✓✓	✓
Kretlow & Bartholomew (2010)	✓	✓✓	✓✓	✓	✓✓	✓
Saylor & Johnson (2014)	✓	✓✓	✓✓	✓✓	NR	✓
Snow-Renner & Lauer (2005)	✓	✓	✓	✓	NR	✓
Yoon et al. (2007); Guskey & Yoon (2009)	✓	✓✓	✓	NR	✓	NR
Zaslow et al. (2010)	✓✓	✓✓	✓✓	✓✓	✓✓	✓

NOTE. ✓✓ = Primary focus of the inservice professional development in the studies in the research syntheses, ✓ = Secondary or minor focus of the inservice professional development, and NR indicates that the research synthesists did not describe or include information in their reports to infer that the professional development included the inservice practice characteristic.

Table 5. *CSPD Framework*

Subcomponent 1: Leadership, Coordination, and Sustainability
Quality Indicator PN1: A cross sector leadership team is in place that can set priorities and make policy, governance, and financial decisions related to the personnel system.
Quality Indicator PN2: There is a written multi-year plan in place to address all sub-components of the CSPD.
Subcomponent 2: State Personnel Standards
Quality Indicator PN3: State personnel standards across disciplines are aligned to national professional organization personnel standards.
Quality Indicator PN4: The criteria for state certification, licensure, credentialing and/or endorsement are aligned to state personnel standards and national professional organization personnel standards across disciplines.
Subcomponent 3: Preservice Personnel Development
Quality Indicator PN5: Institution of higher education (IHE) programs and curricula across disciplines are aligned with both national professional organization personnel standards and state personnel standards.
Quality Indicator PN6: Institution of higher education programs and curricula address early childhood development and discipline specific pedagogy.
Subcomponent 4: In-service Personnel Development
Quality Indicator PN7: A statewide system for in service personnel development and technical assistance is in place for personnel across disciplines.
Quality Indicator PN8: A statewide system for in service personnel development and technical assistance is aligned and coordinated with higher education program and curricula across disciplines.
Subcomponent 5: Recruitment and Retention
Quality Indicator PN9: Comprehensive recruitment and retention strategies are based on multiple data sources, and revised as necessary.
Quality Indicator PN10: Comprehensive recruitment and retention strategies are being implemented across disciplines.
Subcomponent 6: Evaluation
Quality Indicator PN11: The evaluation plan for the CSPD includes processes and mechanisms to collect, store, and analyze data across all subcomponents.
Quality Indicator PN12: The evaluation plan is implemented, continuously monitored, and revised as necessary based on multiple data sources.