Metasynthesis of Inservice Professional Development Research

Literature Synthesis 4

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Metasynthesis of Inservice Professional Development Research:

Features Associated with Positive Educator and Student Outcomes

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Abstract

Findings from a metasynthesis of 15 research reviews of inservice professional development to improve or change teacher content knowledge and practice and student/child knowledge and behavior are described. The research reviews included 550 studies of more than 50,000 early intervention, preschool, elementary, secondary education teachers, educators, and practitioners. Inservice professional development experts' contentions about the key characteristics and core features of effective inservice training were used to code and analyze the research reviews. Results showed that inservice professional development was effective when it 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 inservice training, extended follow-up supports to reinforce inservice learning, and inservice training and follow-up supports of sufficient duration and intensity. Implications for improving inservice professional development are described.

Key terms: *Metasynthesis, multiple-case studies, inservice professional development, core inservice features, replication, teacher change, student change*

Metasynthesis of Inservice Professional Development Research: Features Associated with Positive Educator and Student Outcomes

Inservice professional development and continuing education are considered essential for educators to become proficient and sustain expertise in their teaching professions (Donovan, Bransford, & Pellegrino, 1999; Guskey, 2002, 2014). According to Darling-Hammond et al. (2009), "well-designed professional learning helps teachers master content, hone teaching skills, evaluate their own and their students' performance, and address changes needed in [their] teaching and learning" (p. 7). Yet, many teachers and educators consider themselves ill prepared for their professions (e.g., Akiba, LeTendre, & Scribner, 2007; Lewis et al., 1999; Lu, 2005). At least one reason for teachers' judgments of their lack of preparedness is the types of continuing professional development either offered or procured as part of inservice training opportunities.

As part of a status report on teacher development, Darling-Hammond et al. (2009) found that attendance at one-time workshops, conferences, or training sessions are the primary types of inservice professional development for nearly all teachers, and that other types of inservice training considered more effective are experienced much less often by teachers. Similar findings were reported by Lewis et al. (1999) as part of their analyses of the inservice experiences associated with teacher preparedness and quality. Darling-Hammond et al. (2009) concluded their review of teacher professional development by stating that "We found that well-designed professional development is still relatively rare, and few of the nation's teachers have access to regular opportunities for intensive learning" (p. 19).

The purpose of the metasynthesis described in this paper was to ascertain the extent to which studies of inservice professional development that included key characteristics and core features of inservice training considered effective by professional development specialists were

associated with changes and improvements in educator and student outcomes (Desimone, 2009; Guskey, 2002). This was accomplished by identifying research syntheses of inservice professional development and coding and systematically analyzing the types of inservice afforded teachers and educators to determine whether the inclusion of key characteristics and core features in fact were related to positive teacher and student outcomes.

The investigators of the research syntheses included in the metasynthesis either explicitly or implicitly employed a framework similar to the one shown in Figure 1. The framework is based on ones proposed by Desimone (2009) and Guskey (2002) for designing and researching inservice professional development. According to the model, professional development that includes key characteristics and core features is expected to increase or improve teacher knowledge, skills, and practices, and in turn be related to improved student and child outcomes.

Insert Figure 1 about here

The characteristics and features that have been identified as important for inservice training to be effective include professional development specialists' explicit explanations and illustrations of specific content knowledge and practice to be learned (Archibald, Coggshall, Croft, & Goe, 2011; Desimone, 2009; Donovan et al., 1999; Dunst & Trivette, 2009; Garet, Porter, Desimone, Birman, & Yoon, 2001; Wei, Darling-Hammond, Andree, Richardson, & Orphanos, 2009), active and authentic teacher learning opportunities (Archibald et al., 2011; Desimone, 2009; Donovan et al., 1999; Dunst & Trivette, 2009; Garet et al., 2001; Guskey, 2002; Wei et al., 2009), explicit inclusion of different types of practices for engaging teachers in reflection on their understanding and mastery of content knowledge or practice (Archibald et al., 2011; Desimone, 2009; Donovan et al., 1999; Dunst & Trivette, 2009; Garet et al., 2001; Wei et

al., 2009), coaching, mentoring, and performance feedback during the inservice training (Archibald et al., 2011; Donovan et al., 1999; Garet et al., 2001; Guskey, 2002; Wei et al., 2009), ongoing follow-up supports to reinforce inservice learning (Archibald et al., 2011; Donovan et al., 1999; Dunst & Trivette, 2009; Guskey, 2002; Wei et al., 2009), and professional development of sufficient duration and intensity to provide repeated opportunities to become proficient in the use of content knowledge and practice (Archibald et al., 2011; Desimone, 2009; Dunst & Trivette, 2009; Garet et al., 2001; Guskey, 2002; Wei et al., 2009). Accordingly, inservice professional development that included the majority of these key characteristics and features was expected to be associated with positive teacher and student outcomes.

A multiple case design was used to analyze the research syntheses in the metasynthesis (Riedl, 2007; Yin, 2014). According to Yin (2014), multiple case research is grounded in a theoretical or conceptual framework that provides a foundation for testing hypothesized relationships between independent and dependent variables in order to establish causal inferences. Therefore, each research synthesis was considered a separate case, and the extent to which the relationships between inservice professional development and teacher and student outcomes were the same or very similar in the research syntheses was the focus of analysis. This is what Yin (2014) describes at literal replication where each case predicts similar results. As noted by Eisenhardt and Graebner (2007), “Central to theory building from case studies is replication logic...where each case serves as a distinct experiment that stands on its own as an analytic unit” (p. 25). The use of this methodology for examining the research syntheses was expected to contribute to the internal and external validity of the results from the metasynthesis (Gibbert & Nair, 2013).

Method

Search Strategy

Research syntheses were located using the following search terms: (in-service OR inservice) AND (professional development OR staff development OR continuing education OR training) AND (literature review OR narrative review OR systematic review OR meta-analysis OR summative review OR traditional review) AND (teacher OR educator OR practitioner) AND (early intervention OR early childhood OR preschool OR elementary OR secondary). Follow-up searches were conducted using controlled vocabulary, key word, and natural language searches as alternative terms were identified from retrieved publications and reports.

ERIC, PsychInfo, MEDLINE, Academic Search Complete, CINAHL, and Health Source were searched to identify research syntheses. There were supplemented by searches of Infotrac, ProQuest, WorldCat, Google Scholar, and Google. 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 inservice professional development was the main focus of a literature review, there was an explicit attempt to identify the characteristics of and conditions under which inservice 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 inservice professional development and findings in the research syntheses. Literature reviews were excluded if any of the three inclusion criteria were not met or after an initial review of a research synthesis it was determined that insufficient information was reported to be able to ascertain the scope of inservice training.

Search Results

More than 25,000 abstracts (including duplicate abstracts in different databases) were generated from searches. These were reviewed to determine which were literature reviews and research syntheses, and which included studies or evaluations of inservice professional development in early childhood, elementary, or secondary education. This resulted in a preliminary list of 36 reviews that were then examined to determine if they met the inclusion criteria. Eighteen reviews were initially considered relevant for the metasyntheses. Three reviews were subsequently excluded because they included either too little information about inservice training (Cornelius & Nagro, 2014; Solomon, Klein, & Politylo, 2012) or the inservice training in the studies in the review were limited in terms of the characteristics of the professional development afforded the teachers (Gersten, Taylor, Keys, Rolfhus, & Newman-Gonchar, 2014). Eight of the research syntheses were published in peer reviewed journals and seven syntheses were unpublished government or professional organization reports.

Metasynthesis Coding

Table 1 includes the inservice professional development features that were coded and used to conduct the secondary analyses of the reviews as well as the description or definitions of the five sets of characteristics. The core features were developed based on characteristics described by a number of professional development specialists as essential for inservice professional development to be effective (e.g., Bransford et al., 2000; Darling-Hammond et al., 2009; Desimone, 2009; Guskey, 2002).

Focus of training. The focus of training included both learner objectives and the content knowledge or practice that was the focus of inservice professional development. According to

Desimone (2009), inservice professional development is most likely to be effective if it emphasizes specific content knowledge and the instructional practices used by teachers to promote student/learner understanding and use of the knowledge.

Inservice setting. The settings in which the inservice training was conducted were coded as either or both the teachers' classrooms or early childhood intervention settings (contextual) or settings other than those where teachers or early childhood practitioners taught students or worked with young children (noncontextual). The settings in which inservice training was coded as either primary or secondary based on how much of the professional development was conducted in either contextual or noncontextual settings.

Insert Table 1 about here

Inservice characteristics. Desimone's (2009) core features of professional development, findings in *How People Learn* (Donovan et al., 1999), and recommendations in other sources (e.g., Guskey, 2014; Zaslow, 2014) were used to operationalize and code six different characteristics of the inservice training afforded the teachers. These included the methods used by professional development specialists to introduce the content knowledge or practice to the teachers and the methods used to illustrate or demonstrate the use and importance of the content knowledge or practice. The teachers' role in learning the content knowledge or practice was coded in terms of type of active involvement (authentic or real-life opportunities, simulations, etc.) in learning to use the content knowledge or practice and the methods used to engage the teachers in reflection on their understanding and mastery of the content knowledge or practice. Inservice support was coded in terms of coaching or mentoring to promote and strengthen the teachers' confidence and competence during the inservice training or direct performance

feedback on how well the teachers applied content knowledge or used an intervention or instructional practice. Each of the six characteristics was coded as either a primary or secondary focus of the inservice training based on information in the research syntheses.

Research syntheses outcomes. The research syntheses were coded in terms of both teacher and student/child outcomes. The teacher outcomes included changes or improvements in attitudes or beliefs, improvements in content/subject area knowledge, and the use of instructional or behavioral practices. The student or child outcomes included improvements in student knowledge or academic performance, child skill acquisition, and changes in student or child behavior.

Metasynthesis findings. The dosage of inservice training was ascertained in terms of inservice duration (number of sessions, hours or length of training). Follow-up training was coded in terms of the types of ongoing extended supports provided to reinforce inservice learning in the teachers' schools, classrooms, or early childhood intervention settings. The results from the research syntheses were ascertained from the findings reported by each research synthesist or by secondary analysis of the results in the literature reviews in terms of the inservice professional development characteristics associated with positive teacher and student outcomes.

Interrater Agreement

Two of the investigators independently abstracted and coded information for the inservice features in Table 1 as well as background information about the studies in the research syntheses (e.g., type of synthesis, research designs, number of studies). Interrater agreement of the Table 1 features was attained on 87% to 100% of the 15 research synthesis characteristics. Interrater agreement for the three metasynthesis findings, for example, was 93% for inservice duration, 100% for ongoing extended supports, and 93% for the research synthesis findings.

Disagreements were resolved through repeated reviews of the research reports until 100% agreement was reached on all information by both metasynthesists.

Method of Analysis

A replication logic was used to ascertain if the presence of different inservice professional development features and characteristics was associated with the same or similar results in each of the research syntheses (Hak & Dul, 2010b; Riedl, 2007; Yin, 2014). According to Hak and Dul (2010a) and Yin (2014), replication is demonstrated when the characteristics of each case (research synthesis) are much the same and are associated with similar results, and the nature of the relationships among independent and dependent variables allow causal inferences. As noted by Eisenhardt and Graebner (2007), the use of replication logic in case study research contributes to theory building which in the case of inservice professional development research either confirms or disconfirms the hypothesized relationships between the core features of inservice training and teacher and student outcomes (e.g., Desimone, 2009; Guskey, 2002).

Results

Research Syntheses

Selected characteristics of the 15 research syntheses and study participants are shown in Table 2. Five of the syntheses were traditional narrative reviews, four were meta-analyses, three were systematic reviews, and three were summative reviews (Davies, 2000; Dunst, in press). Seven syntheses included only group design studies and six syntheses included a mixture of group design studies and either descriptive case studies or single subject studies. The majority of group design studies included experimental, quasi-experimental, and pre-experimental investigations or program evaluations (Shadish, Cook, & Campbell, 2002). One research synthesis included only experimental studies (Dunst, Trivette, & Hamby, 2010a), and two research syntheses included only experimental and quasi-experimental studies (Blank & De las

Alas, 2009; Yoon, Duncan, Lee, Scarloss, & Shapley, 2007). The investigators of two research syntheses did not include information in their reports about the types of studies in their reviews (Joyce & Showers, 1995; Saylor & Johnson, 2014).

Insert Table 2 about here

The 15 research syntheses included more than 550 studies. The participants included PreK 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 preK to grade 12 teachers and other non-educators (N = 1 review). The research syntheses that included the number of participants or where the number could be estimated from information in the research reports found that the studies included more than 43,000 teachers, educators, and other adult learners. Based on information in the research syntheses that did not include the number of participants, it was conservatively estimated that the 15 reviews included as many as 50,000 early childhood, elementary, and secondary education teachers and students/children.

Focus of Inservice Training

Eleven research syntheses included studies of inservice professional development 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 inservice 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 inservice 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).

Inservice Training Context

Eleven of the research syntheses included studies that provided inservice professional development in both contextual and noncontextual settings and four syntheses provided inservice training entirely in teachers' classrooms or schools, childcare or preschool settings, or other work environments. Eight of the research syntheses included studies of inservice training where the preponderance of professional development occurred in contextual settings, whereas six research syntheses included studies of inservice training provided primarily in noncontextual settings (workshops, summer institutes, university classes, etc.). One research synthesis included inservice training about the same amount in both contextual and noncontextual settings (Snow-Renner & Lauer, 2005).

Characteristics of the Inservice Training

Table 3 shows the particular characteristics of inservice professional development that were included in the majority of studies in the research syntheses. All of the research syntheses included studies that incorporated at least 4 of the 6 characteristics as either primary or secondary practices (Mean = 5.20, SD = 0.77). Eighty percent of the research syntheses (N = 12) included practices for 5 or 6 of the characteristics. All of the research syntheses included both professional development specialist descriptions (introduction) of content knowledge or practice constituting the focus of inservice 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 inservice professional development to be effective (e.g., Desimone, 2009; Donovan et al., 1999; Ericsson & Charness, 1994; Guskey, 2002; Zaslow, 2014).

Insert Table 3 about here

Research Synthesis Outcomes

Acquisition or improvements in teacher instructional or behavior practices were the primary outcomes in 14 research syntheses. Content knowledge mastery and use were the outcomes in eight research syntheses, and changes in teacher attitudes or beliefs were also the outcomes in eight syntheses. Five research syntheses included all three teacher outcomes (practice, knowledge, attitudes). Eleven of the research syntheses included 2 of the 3 teacher outcomes.

Nine research syntheses included student academic performance, knowledge acquisition, or skill development as the primary child outcome measures, and four research syntheses included student or child behavioral outcome measures. Three research syntheses included both types of child outcomes.

Twelve research syntheses included both teacher instructional practices and student or child outcome measures. Five research syntheses included both teacher content knowledge and instructional practice outcomes and student or child outcome measures. Five research syntheses included only teacher outcome measures, and one research synthesis included only student outcome measures.

Metasynthesis Findings

Table 4 shows the findings from each research synthesis in terms of the dose of the inservice professional development, the extent of ongoing extended supports provided to the teachers to reinforce inservice learning, and the findings from the research syntheses. The patterns of results are remarkably similar regardless of type of research synthesis, types of

studies included in the syntheses, and type of content knowledge or practice. Taken together, the metasynthesis indicated that inservice professional development was effective when it included most of the key characteristics and core features described in Table 2, was of sufficient duration and intensity, and included extended follow-up supports and opportunities to reinforce the use of content knowledge or practice.

Insert Table 4 about here

Inservice dose. Fourteen of the research syntheses included information about the duration or amount of inservice training afforded the teachers. Eight of the research syntheses included explicit descriptions of "how much" inservice professional development was associated with positive teacher or student outcomes (Blank & De las Alas, 2009; Blank, de las Alas, & Smith, 2008; Dunst & Trivette, 2012b; Joyce & Showers, 1995; Saylor & Johnson, 2014; Snow-Renner & Lauer, 2005; Yoon et al., 2007; Zaslow et al., 2010). The number of hours of inservice training associated with positive effects ranged between 15 and 80+. In a number of reviews, it was stated that multiple inservice sessions distributed over weeks or months of professional development was a factor contributing to positive and significant effects (Dunst & Trivette, 2012b; Fukkink & Lont, 2007; Isner et al., 2011; Joyce & Showers, 1995).

The dose of inservice professional development reported in three research syntheses was similar in terms of the hours, intensity, or number of sessions, although no relationships between dose and teacher or student outcomes were reported nor could they be discerned from information in the synthesis reports (Blank & De las Alas, 2009; Fukkink & Lont, 2007; Isner et al., 2011). Nonetheless, it could be surmised that the similar doses were factors likely contributing to positive outcomes.

The fact that different doses of inservice professional development were found to be associated with positive outcomes was neither surprising nor unexpected. As noted by Zaslow et al. (2010), smaller dosages of professional development may suffice for discrete practices, whereas larger dosages may be necessary for broader-based and comprehensive sets of practices.

Ongoing supports. All of the research synthesis included information about the nature and extent of follow-up supports afforded teachers after the completion of the initial inservice professional development. Ten investigators explicitly stated that ongoing follow-up supports were a factor that reinforced inservice training, whereas three investigators made statements or it could be surmised that follow-up supports contributed to positive outcomes (Cavanaugh, 2013; Ingersoll & Kralik, 2004; Saylor & Johnson, 2014). In the majority of cases, the conclusions or statements made by the research synthesists permitted inferences about the importance of extended supports as a factor associated with or contributing to positive teacher and student outcomes.

Inferences about the links between extended supports and positive outcomes derive from the fact that the same or similar statements were made by many research synthesists (Capps, Crawford, & Constas, 2012; Ingersoll & Strong, 2011; Kretlow & Bartholomew, 2010; Zaslow et al., 2010) or it was possible to discern the conditions under which extended supports were associated with positive outcomes (e.g., Cavanaugh, 2013; Saylor & Johnson, 2014). Blank and De las Alas (2009), for example, explicitly stated “the importance of continuing learning reinforcement activities after the initial period of teacher training” (p. 24) as a factor contributing to positive student outcomes. This type of inferential statement was echoed by many research synthesists (e.g., Blank et al., 2008; Ingersoll & Strong, 2011; Kretlow & Bartholomew, 2010).

Research synthesis results. Investigators of all 15 research syntheses reported or described the characteristics of and conditions under which inservice professional development was most effective. What is reported in the table is the particular inservice professional development characteristics that the research synthesists or the metasynthesists found associated with positive teacher or child outcomes.

Most research synthesists concluded that the inservice professional development afforded the study participants "produced strong evidence," "showed significant effects," "was most effective," "provided empirical support," etc. when it included trainer introduction, demonstration, and explanation of the benefits of mastering content knowledge or practice; active and authentic teacher learning experiences together with opportunities to engage in reflection on the use of the content knowledge or practice; and coaching, mentoring, or performance feedback during both the inservice professional development and follow-up sessions in the settings where the teachers used the content knowledge or practice.

Thirteen of the research synthesists included explicit statements or conclusions about the key characteristics and core features of inservice professional development that were found to be associated with positive teacher or child outcomes. The statements or conclusions in Table 4 are either direct quotations or paraphrased descriptions in the research syntheses reports. The results from two of the research syntheses are summarizations of findings which contain information about the particular inservice practices that were found to be associated with positive outcomes (Yoon et al., 2007; Zaslow et al., 2010). The patterns of results, taken together, provide strong evidence for the relationships between specific inservice professional development characteristics and core features and teacher and student outcomes. The fact that the results were the same or similar in the different types of research syntheses for different types of practices

bolsters contentions about the necessary, but not the sufficient conditions, for inservice training to be effective.

Discussion

The metasynthesis described in this paper used replication logic to determine the extent to which research on inservice professional development that included an attempt to identify which inservice training characteristics under which conditions were associated with positive teacher or student outcomes. A multiple case design was used to select cases (research syntheses) that included the same or similar inservice professional development characteristics and core features and to determine the extent to which the use or presence of the characteristics or features were related to the same or similar teacher or student outcomes. As noted by Yin (2002), a multiple case study design is analogous to the ability to conduct multiple experiments on the same or related topics or practices.

The focus of analysis in the metasynthesis was the extent to which there was literal replication of the results (pattern matching) between the use of the key characteristics and core features of inservice professional development and either the results reported by the research synthesists or those ascertained by the metasynthesists. Three sets of characteristics were used to determine the extent to which literal replication (Yin, 2014) was demonstrated: (1) the characteristics of inservice professional development used to promote teacher, educator, and early childhood practitioner understanding and use of content knowledge or instructional practices, (2) the extended supports that were used to reinforce inservice learning, and (3) inservice training of sufficient duration and intensity to ensure inservice recipients had sufficient time and opportunity to learn and become proficient in the knowledge or practices constituting the focus of inservice professional development.

Results showed that replication was demonstrated in all 15 research syntheses for the inservice professional development characteristics (100%), in 13 research syntheses for extended follow-up supports (87%), and in 12 research syntheses for inservice duration and intensity (80%). Taken together, the three sets of findings (evidence) provide support for the contentions made by Donovan et al. (1999), Desimone (2009), Guskey (2002), and others (e.g., Zaslow, 2014) with regard to planning and conducting inservice professional development so it includes key characteristics and core features to increase the probability of the effectiveness of inservice training.

The metasynthesis, however, was not able to determine whether changes in teacher learning were associated with improvements in student outcomes as purported by a number of research synthesists. As noted in the introduction, a number of research synthesists either explicitly or implicitly hypothesized the types of relationships depicted in Figure 1. This framework and conceptual model constituted the theory-of-change that guided the analysis of the 15 research syntheses described in this paper. There were, however, no attempts to explicitly ascertain the relationships between changes in teacher knowledge, practices, or attitudes and beliefs to changes or improvements in student academic performance, knowledge, or behavior either because the investigators of the primary studies did not do so or the research synthesists did not attempt to relate teacher and student outcomes. This was most certainly a shortcoming of many if not most of the research syntheses and in turn is a shortcoming and limitation of the metasynthesis.

The need for studies, and research syntheses of those studies, where the kinds of relationships depicted in Figure 1 are an explicit focus of analysis are clearly needed if advances are to be made in terms of a more complete understanding of which inservice characteristics

implemented under which conditions (e.g., setting, duration, follow-up supports) are directly and indirectly related to teacher and student outcomes. As noted by Yoon et al. (2007), "to substantiate the empirical link between professional development and [student outcomes], studies should ideally establish two points. One is that there are links among professional development, teacher learning and practice, and student learning. The other is that the empirical evidence is of high quality--that the study proves what it claims" (p. 3).

The types of linkages that Yoon et al. (2007) call for are those that implementation science methodologists (e.g., Kelly & Perkins, 2012) consider necessary for demonstrating the direct effects of implementation practices (inservice professional development) on the use of intervention practices (e.g., teacher instructional methods), the direct effects of intervention practices on learner outcomes (e.g., student achievement), and the indirect effects of implementation practices on learner outcomes mediated by intervention practices (Dunst & Trivette, 2012a; Dunst, Trivette, & Raab, 2013; Rudnick, Freeman, & Century, 2012). These types of studies, and research syntheses of the studies, are the next generation of research that is likely to shed light on how inservice professional development influences and is related to both teacher and student outcomes. Advances in an understanding of ***how*** inservice professional development is associated with teacher and student benefits is most likely to occur if different key characteristics and core features of inservice training are measured and related to outcomes of interest.

Implications for Practice

The findings reported in this paper provide yet additional empirical support for the professional development frameworks described by Browder et al. (2012), Desimone (2009), Dunst and Trivette (2009), Guskey (2014), and others (e.g., Gall & Vojtek, 1994; Glazer &

Hannafin, 2006; Joyce & Showers, 2002) for planning and conducting inservice training to promote and improve teacher acquisition of content knowledge and instructional practices and in turn enhance child and student learning and competence. Each of the frameworks include methods and strategies, guidelines and activities, and suggestions for ensuring inservice professional development include key characteristics and core features. These characteristics and features include, but are not limited to, the methods and procedures to introduce and illustrate or demonstrate content knowledge or practice to teachers, authentic teacher learning opportunities and teacher reflection on knowledge and skills acquisition, inservice professional development specialist coaching, mentoring, or feedback during the inservice training, extended and ongoing follow-up supports to reinforce inservice learning, and inservice professional development of sufficient duration and intensity to promote teacher mastery and continued use of the content knowledge or practice constituting the focus of inservice training.

A particular finding in the metasynthesis that deserves special attention in planning and conducting inservice professional development is the appropriate dose of inservice teacher training and the need to explicitly include distributed teacher learning opportunities with enough time between opportunities to reflect on and internalize knowledge and skill acquisition and to receive ongoing supports to reinforce teacher mastery. As noted by Zaslow et al. (2010), the dose necessary to produce observable and sustained effects is likely to differ depending on the complexity of the knowledge or practice of inservice professional development, but regardless of complexity, effective inservice professional development if it includes multiple teacher learning opportunities rather than provide inservice training in only one or a few sessions.

References

Akiba, M., LeTendre, G. K., & Scribner, J. P. (2007). Teacher quality, opportunity gap, and national achievement in 46 countries. *Educational Researcher, 36*, 369-387. doi: 10.3102/0013189X07308739

Archibald, S., Coggshall, J. G., Croft, A., & Goe, L. (2011). *High-quality professional development for all teachers: Effectively allocating resources*. Washington, DC: National Comprehensive Center for Teacher Quality.

Blank, R. K., & De las Alas, N. (2009). *Effects of teacher professional development on gains in student achievement: How meta analysis provides scientific evidence useful to education leaders* (pp. 1-62). Washington, DC: Council of Chief State School Officers.

Blank, R. K., de las Alas, N., & Smith, C. (2008). *Does teacher professional development have effects on teaching and learning?: Analysis of evaluation findings from programs of mathematics and science teachers in 14 states* (pp. 1-35). Washington, DC: Council of Chief State School Officers. Available at http://www.ccsso.org/projects_evaluation_of_professional_development.

Bransford, J. D., Brown, A. L., Cocking, R. R., Donovan, M. S., Bransford, J. D., & Pellegrino, J. W. (Eds.). (2000). *How people learn: Brain, mind, experience, and school* (Expanded ed.). Washington, DC: National Academy Press.

Browder, D. M., Jimenez, B. A., Mims, P. J., Knight, V. F., Spooner, F., Lee, A. (2012). The effects of a "tell-show-try-apply" professional development package on teachers of students with severe developmental disabilities. *Teacher Education and Special Education, 35*(3), 212-227. doi: 10.1177/0888406411432650

Capps, D. K., Crawford, B. A., & Constas, M. A. (2012). A review of empirical literature on inquiry professional development: Alignment with best practices and a critique of the findings. *Journal of Science Teacher Education, 23*, 291-318. doi: 10.1007/s10972-012-9275-2

Cavanaugh, B. (2013). Performance feedback and teachers' use of praise and opportunities to respond: A review of the literature. *Education and Treatment of Children, 36*(1), 111-137. doi: 10.1353/etc.2013.0001

Cornelius, K. E., & Nagro, S. A. (2014). Evaluating the evidence base of performance feedback in preservice special education teacher training. *Teacher Education and Special Education, 37*(2), 133-146. doi: 10.1177/0888406414521837

Darling-Hammond, L., Wei, R. C., Andree, A., Richardson, N., & Orphanos, S. (2009). *Professional learning in the learning profession: A status report on teacher development in the United States and abroad*. Dallas, TX: National Staff Development Council. Available at http://www2.smcoe.k12.ca.us/spedtf/Documents/NSDCstudyProfLearningLearnProf.pdf.

Davies, P. (2000). The relevance of systematic reviews to educational policy and practice. *Oxford Review of Education, 26*, 365-378. doi: 10.1080/713688543

Desimone, L. M. (2009). Improving impact studies of teachers' professional development: Toward better conceptualizations and measures. *Educational Researcher, 38*(3), 181-199. doi: 10.3102/0013189X08331140

Donovan, M. S., Bransford, J. D., & Pellegrino, J. W. (Eds.). (1999). *How people learn: Bridging research and practice*. Washington, DC: National Academy Press.

Dunst, C. J. (in press). Role of research syntheses for identifying evidence-based early childhood intervention practices. In S. L. Odom, B. Reichow, E. Barton, & B. Boyd (Eds.), *Handbook of early childhood special education*. New York: Springer.

Dunst, C. J., & Trivette, C. M. (2009). Let's be PALS: An evidence-based approach to professional development. *Infants and Young Children, 22*(3), 164-175. doi: 10.1097/IYC.0b013e3181abe169

Dunst, C. J., & Trivette, C. M. (2012a). Meta-analysis of implementation practice research. In B. Kelly & D. F. Perkins (Eds.), *Handbook of implementation science for psychology in education* (pp. 68-91). New York, NY: Cambridge University Press.

Dunst, C. J., & Trivette, C. M. (2012b). Moderators of the effectiveness of adult learning method practices. *Journal of Social Sciences, 8,* 143-148. doi: 10.3844/jssp.2012.143.148

Dunst, C. J., Trivette, C. M., & Hamby, D. W. (2010a). Meta-analysis of the effectiveness of four adult learning methods and strategies. *International Journal of Continuing Education and Lifelong Learning, 3*(1), 91-112. Available at http://research.hkuspace.hku.hk/journal/ijcell/.

Dunst, C. J., Trivette, C. M., & Hamby, D. W. (2010b). Meta-analysis of the effectiveness of four adult learning methods and strategies: Supplemental tables and references. Asheville, NC: Orelena Hawks Puckett Institute.

Dunst, C. J., Trivette, C. M., & Raab, M. (2013). An implementation science framework for conceptualizing and operationalizing fidelity in early childhood intervention studies. *Journal of Early Intervention, 35*(2), 85-101. doi: 10.1177/1053815113502235

Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges. *Academy of Management Journal, 50*(1), 25-32. doi: 10.5465/AMJ.2007.24160888

Ericsson, K. A., & Charness, N. (1994). Expert performance: Its structure and acquisition. *American Psychologist, 49*, 725-747.

Fukkink, R. G., & Lont, A. (2007). Does training matter? A meta-analysis and review of caregiver training studies. *Early Childhood Research Quarterly, 22*, 294-311. doi: 10.1016/j.ecresq.2007.04.005

Gall, M. D., & Vojtek, R. O. (1994). *Planning for effective staff development: Six research-based models*. Eugene, OR: ERIC Clearinghouse on Educational Management. (ERIC Document Reproduction Service No. ED372464).

Garet, M. S., Porter, A. C., Desimone, L., Birman, B. F., & Yoon, K. S. (2001). What makes professional development effective? Results from a national sample of teachers. *American Educational Research Journal, 38*, 915-945. doi: 10.3102/00028312038004915

Gersten, R., Taylor, M. J., Keys, T. D., Rolfhus, E., & Newman-Gonchar, R. (2014). *Summary of the research on the effectiveness of math professional development approaches* (pp. 3-15). Tallahassee, FL Southeast Regional Educational Laboratory at Florida State University. Available at http://ies.ed.gov/ncee/edlabs.

Gibbert, M., & Nair, L. B. (2013). Towards rigorous case study research: How replication logic enhances internal and external validity. *Academy of Management Proceedings (Meeting Abstract Supplement), 2013*(1), 15672. doi: 10.5465/AMBPP.2013.15672abstract

Glazer, E., & Hannafin, M. (2006). The collaborative apprenticeship model: Situated professional development within school settings. *Teaching and Teacher Education, 22*, 179-193.

Guskey, T. R. (2002). Professional development and teacher change. *Teacher and Teaching: Theory and Practice, 8*(3/4), 381-391. doi: 10.1080/135406002100000512

Guskey, T. R. (2014). Planning professional learning. *Professional learning: Reimagined, 71*(8), 10-16.

Guskey, T. R., & Yoon, K. S. (2009). What works in professional development? *Phi Delta Kappan, 90,* 495-500.

Hak, T., & Dul, J. (2010a). Pattern matching. In A. J. Mills, G. Durepos, & E. Wiebe (Eds.), *Encyclopedia of case study research* (pp. 664-666). Thousand Oaks, CA: Sage.

Hak, T., & Dul, J. (2010b). Replication. In A. J. Mills, G. Durepos, & E. Wiebe (Eds.), *Encyclopedia of case study research* (pp. 805-807). Thousand Oaks, CA: Sage.

Ingersoll, R., & Kralik, J. M. (2004). The impact of mentoring on teacher retention: What the research says. *ECS Research Review: Teaching Quality*. Denver, CO: Education Commission for the States.

Ingersoll, R., & Strong, M. (2011). The impact of induction and mentoring programs for beginning teachers: A critical review of the research. *Review of Education Research, 81*(2), 201-233. doi: 10.3102/0034654311403323

Isner, T., Tout, K., Zaslow, M., Soli, M., Quinn, K., Rothenberg, L. (2011). *Coaching in early care and education programs and quality rating and improvement systems (QRIS): Identifying promising features*. Washington, DC: Child Trends.

Joyce, B., & Showers, B. (1995). *The design of training and peer coaching: Student achievement through staff development: Fundamentals of school renewal* (2nd ed.). White Plains, NY: Longman.

Joyce, B., & Showers, B. (2002). *Student achievement through staff development* (3rd ed.). Alexandria, VA: Association for Supervision and Curriculum Development.

Kelly, B., & Perkins, D. F. (Eds.). (2012). *Handbook of implementation science for psychology in education*. New York, NY: Cambridge University Press.

Kretlow, A. G., & Bartholomew, C. C. (2010). Using coaching to improve the fidelity of evidence-based practices: A review of studies. *Teacher Education and Special Education, 33*, 279-299. doi: 10.1177/0888406410371643

Lewis, L., Parsad, B., Carey, N., Bartfai, N., Farris, E., Smerdon, B. (1999). *Teacher quality: A report on the preparation and qualifications of public school teachers*. Washington, DC: U.S. Department of Education, National Center for Education Statistics.

Lu, X. (2005). Teacher quality and teacher preparedness in secondary public schools: Evidence from SASS 1999-2000. *Dissertation Abstracts International: Section A: Humanities and Social Sciences, 66*(12), 4343.

Riedl, R. (2007). On the replication of positivist case study research. *Proceedings of the European Conference on Information Systems*, Paper 70, pp. 1515-1526. Available at http://aisel.aisnet.org/ecis2007/1570.

Rudnick, M., Freeman, C., & Century, J. (2012). Practical applications of a fidelity-of-implementation framework. In B. Kelly & D. F. Perkins (Eds.), *Handbook of implementation science for psychology in education* (pp. 346-360). New York, NY: Cambridge University Press.

Saylor, L. L., & Johnson, C. C. (2014). The role of reflection in elementary mathematics and science teachers' training and development: A meta-synthesis. *School Science and Mathematics, 114*(1), 30-39. doi: 10.1111/ssm.12049

Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Boston, MA: Houghton Mifflin.

Showers, B., Joyce, B., & Bennett, B. (1987). Synthesis of research on staff development: A framework for future study and a state-of-the-art analysis. *Educational Leadership, 45*(3), 77-87.

Snow-Renner, R., & Lauer, P. A. (2005). *Professional development analysis*. Denver, CO: Mid-continent Research for Education and Learning (McREL).

Solomon, B. G., Klein, S. A., & Politylo, B. C. (2012). The effect of performance feedback on teachers' treatment integrity: A meta-analysis of the single-case literature. *School Psychology Review, 41*(2), 160-175.

Wei, R. C., Darling-Hammond, L., Andree, A., Richardson, N., & Orphanos, S. (2009). *Professional learning in the learning profession: A status report on teacher development in the United States and abroad: Technical report*. Dallas, TX: National Staff Development Council.

Yin, R. K. (2002). *Case study research: Design and methods* (3rd ed.). Thousand Oaks, CA: Sage.

Yin, R. K. (2014). *Case study research: Design and methods* (5th ed.). Thousand Oaks, CA: Sage.

Yoon, K. S., Duncan, T., Lee, S. W.-Y., Scarloss, B., & Shapley, K. L. (2007). *Reviewing the evidence on how teacher professional development affects student achievement.*

Washington, DC: US Department of Education, Institute of Education Science, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Southwest.

Zaslow, M. (2014). General features of effective professional development. In H. P. Ginsburg, M. Hyson, & T. A. Woosa (Eds.), *Preparing early childhood educators to teach math* (pp. 97-115). Baltimore: Brookes Publishing.

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

Figure Caption

Figure 1. Framework for linking inservice professional development, changes in teacher and educator knowledge, skills, and practices, and improvements in student and child learning.

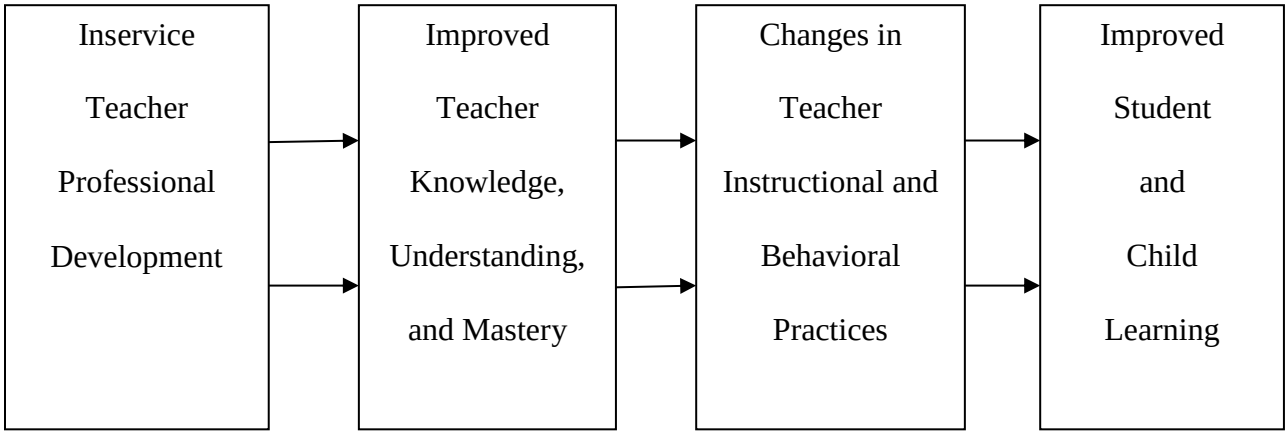
Inservice Teacher Professional Development
Improved Teacher Knowledge, Understanding, and Mastery
Changes in Teacher Instructional and Behavioral Practices
Improved Student and Child Learning

Table 1
Characteristics of the Inservice Professional Development Coded in the Metasynthesis of the Research Reviews

Inservice Features	Descriptions of the Coded Variables
Focus of Training	
Learner Objectives	Content knowledge, instructional practices, teacher confidence, teacher reflection, behavioral practices, intervention-related skills
Content Area	Specific content knowledge or subject areas, teacher-child interactions, childcare practices, mixture of different knowledge and practice
Inservice Setting	
Contextual	Inservice training conducted in teachers' classrooms, childcare programs, preschool classrooms, children's homes, or another contextual setting
Noncontextual	Inservice training conducted in locations (workshops, summer institutes, university classes, etc.) other than the participants' classrooms, schools, or other instructional settings
Inservice Characteristics	
Trainer or Coach Introduction	Methods used to introduce or describe the content knowledge, subject area, or practice to the learners
Trainer or Coach Illustration	Methods used to demonstrate or illustrate the practice or application of the content knowledge (modeling, simulations, observations, video tape examples, coherence[a])
Authentic Learning Opportunities	Methods used to provide the learners opportunities to use the practice or content knowledge (real-life experiences, simulations, role playing, learner-led instruction, developing lesson plans, induction, etc.)

Table 1, continued.

Inservice Features	Descriptions of the Coded Variables
Learner Reflection	Methods used to engage teachers in discussions of and reflection on their inservice learning experiences or opportunities (group meetings, collective participation, journaling, peer discussions, inquiry, self-assessments, etc.)
Coaching or Mentoring	Methods used to provide guidance and support to learners (in-vivo observations, coaching sessions, teacher-mentor discussions, etc.) during inservice training
Performance Feedback	Methods used to provide direct feedback to learners or the assessment of learner performance or mastery (visual displays of data charts, observational feedback, discussions, email correspondence, telephone conversations)
Study Outcomes	
Teacher/Learner Outcomes	Learner attitudes or beliefs, content/subject area knowledge, instructional or behavioral practices
Student/Child Outcomes	Student knowledge or academic performance, child skill acquisition, student or child behavior
Meta-Synthesis Findings	
Inservice Dose	Number of sessions, number of hours, and/or length of inservice training associated with effective professional development
Extended Supports	Type of ongoing trainer or coach follow-up supports associated with effective professional development
Research Synthesis Results	Research synthesists' descriptions or metasynthesists' summary of the findings

reported in the research reviews in terms of the inservice characteristics associated with observed effects

[a]Coherence is the term used to describe how trainers illustrate how inservice training content (knowledge or practice) is aligned with State, District, School, or professional organization standards of practice or teacher beliefs and knowledge.

Table 2
Selected Characteristics of the Research Syntheses and Study Participants

Study	Type of Synthesis	Type of Studies	Research Designs[a]	Number of Studies	Participants	Number of Participants
Blank & De las Alas (2009)	Meta-analysis	Group	E, Q	16	K-12 teachers	749
Blank et al. (2008)	Systematic Review	Group	Q, P, D	25	K-12 teachers	> 3000
Capps et al. (2012)	Summative Review	Mixed	P, D	17	K-12 teachers	> 400
Cavanaugh (2013)	Summative Review	Mixed	Q, S, D	25	PreK-12 teachers	86
Dunst, Trivette, & Hamby (2010); Dunst & Trivette (2012)[b]	Meta-analysis	Group	E	21	Educators Non-educators	1204
Fukkink & Lont (2007)	Meta-analysis	Group	Q, P	17	Early childhood practitioners	959
Ingersoll & Kralik (2004)	Narrative Review	Group	Q, P	10	K-12 teachers	> 18,000
Ingersoll & Strong (2011)	Narrative Review	Mixed	E, Q, P, D	15	K-12 teachers	> 15,000
Isner et al. (2011)	Narrative Review	Group	E, Q, P	44	Early childhood practitioners	Not Reported
Joyce & Showers (1995); Showers et al. (1987)	Meta-Analysis	Mixed	Not Reported	≅ 200	K-12 teachers	Not Reported
Kretlow & Bartholomew (2010)	Summative Review	Mixed	E, Q, S	13	PreK-8 teachers	110
Saylor & Johnson (2014)	Narrative Review	Mixed	Not Reported	21	K-6 teachers	Not Reported
Snow-Renner & Lauer (2005)	Narrative Review	Mixed	Q, P, D	37	K-12 teachers	Not Reported
Yoon et al.(2007); Guskey & Yoon (2009)	Systematic Review	Group	E, Q	9	K-5 teachers	201
Zaslow et al. (2010)	Systematic Review	Group	E, Q, P	78	Early childhood practitioners	> 3400

[a]E = Experimental, Q = Quasi-experimental, P = Pretest - posttest, S = Single subject, D = Case study.
[b]The analyses reported in this paper are only for adult learners that participated in inservice training studies.

Table 3
Types of Trainer and Learner Activities Included as Part of the Inservice Professional Development

	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 4
Measures of the Duration of Inservice Professional Development (PD), Extended Supports, and the Major Findings in the Research Syntheses

Study	Inservice Dose	Extended/Follow-Up Supports	Research Synthesis Results
Blank & De las Alas (2009)	PD implemented for an average of six or more months for an average of 91 hours.	"Information on PD provided in programs that had [positive] effects...show the importance of continuing learning reinforcement activities after the initial period of teacher training or intensive knowledge development" (p. 21).	The synthesis "produced strong evidence of active methods of teacher learning during PD [including] leading instruction, discussion with colleagues, observing other teachers..., professional networks, collective participation, and two of the following types of [trainer activities]: coaching, mentoring, internships, or study groups [where PD] included follow-up steps with teachers in their schools" (p. 21).
Blank et al. (2008)	"The total time in PD in the studies with significant effects was 50 hours or more" (p. 1).	"Significant effects [were found] in programs designed with a content-focused PD plus sufficient [follow-up] time [as part of] an in-school component" (p. 1).	The synthesis results "showed significant effects of PD when [inservice training] included a focus on content knowledge...plus training and follow-up...of 50 hours or more...in the [teachers] classroom or school so that teaching practices learned could be reinforced and improved after the teachers had begun to try them with students" (p. 26).
Capps et al. (2012)	Studies included between 12 and 320 hours of inquiry PD.	"Extended support is important because it offers teachers a chance to ask questions and interact with PD [professionals] and colleagues...and opportunities to receive feedback" (p. 299).	The synthesis found the PD was effective when it focused on "supporting teachers in developing inquiry-based lesson plans, providing authentic inquiry experiences, and focusing on content knowledge" (p. 291).

Table 4, continued.

Study	Inservice Dose	Extended Follow-Up Supports	Research Synthesis Results
Cavanaugh (2013)	Not Reported	Performance feedback provided to teachers frequently during the course of the studies increased teachers' use of student praise.	"Performance feedback was effective when delivered in a variety of formats including self-monitoring of audio or video, visual display of data using graphs, and emailed descriptions of teachers use of effective practice" (p. 124) and was enhanced with additional training and support for some teachers.
Dunst, Trivette, & Hamby (2010); Dunst & Trivette (2012)	Studies that included 20 to 40 hours of training distributed over multiple sessions were associated with more positive learner outcomes.	"Findings demonstrate that how instructors engage learners, provide guidance [and support], orchestrate learner self-evaluation and reflection, and support learner deep understanding" (p.106) on repeated occasions matter in terms of positive learner outcomes.	The synthesis results showed that "the more actively involved learners were in mastering new knowledge or practice and the more trainers supported and facilitated the learning process when the learning occurred over multiple sessions with a small number of learners, the better were the learner outcomes" (pp. 105-106).
Fukkink & Lont (2007)	Studies included 16 sessions and 55 hours of training on average and were provided over the course of 6 months on average.	"Some form of supervision (coaching, mentoring, guided practice) constituted a supplementary part of the PD" (p. 301).	The synthesis findings "demonstrate that specialized training improved the pedagogical competencies of caregivers in childcare, including their professional attitude, knowledge, and skills" (p. 305) if PD included "experimental learning, guided practice, and other authentic learning opportunities together with coaching or mentoring" (p. 301).

Table 4, continued.

Study	Inservice Dose	Extended Follow-Up Supports	Research Synthesis Results
Ingersoll & Kralik (2004)	Duration of inservice training was quite varied in the studies included in the review.	Mentoring typically involved multiple follow-up sessions with teachers to provide ongoing supports, guidance, and advice.	The synthesis results "provide some empirical support for the claim the assistance for new teachers—and in particular, teacher mentoring programs—have a positive impact on teachers' [attitudes and knowledge] and retention" (p. 14) when PD includes authentic induction experiences supported by a mentor or coach.
Ingersoll & Strong (2011)	Studies that included more intensive mentoring generally had PD with more positive effects.	"Most studies...provide support for the claim that [ongoing] support and assistance...have positive impacts on teacher outcomes" (p. 201).	The synthesis "studies we reviewed provide empirical support for the claim that induction for beginning teachers, and teacher mentoring programs in particular, have a positive impact" (p. 38) on teacher and student outcomes. Induction that was most effective included mentoring and authentic teaching practices together with extended supports.
Isner et al. (2011)	Coaching was provided, on average, for 6 to 12 months and involved, on average, weekly or bimonthly coaching sessions.	The opportunities to receive ongoing support, guidance, and feedback from coaches were viewed by many early care staff as highly supportive.	The synthesis results showed that positive results ensued when "the activities used in coaching models were tailored to support the goals of coaching [and included] a variety of activities...to maximize the individual relationships between the coach and the practitioner and the opportunity for direct observation, reflection, and modeling of practices" (p. 11).

Table 4, continued.

Study	Inservice Dose	Extended Follow-Up Supports	Research Synthesis Results
Joyce & Showers (1995); Showers et al. (1987)	"Teaching [practices] of medium complexity...require 20 or 25 trials in a classroom for 8 to 10 weeks" to learn a new practice (Joyce & Showers, 1995, p. 110).	Coaching is most effective when "it begins in training sessions and continues in the workplace following initial training" (Joyce & Showers, 1995, p. 112).	The synthesis results show that "almost all teachers can take useful information back to their classrooms when training includes four parts: (1) presentation of theory, (2) demonstration of the new [instructional] strategies, (3) initial practice in the workshops, and (4) prompt feedback about their efforts [and that teachers] are more likely to keep and use new strategies and concepts if they receive coaching...on the new ideas in their classrooms" (Showers et al., 1987, p. 79).
Kretlow & Bartholomew (2010)	"The total duration of PD ranged from several hours to 16 weeks" (p. 240).	Coaching was more effective when it included "follow-up observations [and] specific feedback" that was scheduled and provided on a regular basis (p. 292).	The synthesis results show that coaching is most effective when it includes "(1) highly engaged, instructive group sessions; (2) follow-up observation(s); and (3) specific feedback, often including sharing observation data and self-evaluation followed by modeling" (p. 292).
Saylor & Johnson (2014)	"Increased contact hours... produced an increase in the frequency, duration, and depth of reflective practice" (p. 30).	The few studies that included ongoing follow-up supports tended to be associated with more positive teacher outcomes.	The synthesis findings indicate that inservice training is most effective when it includes a "content focus, active [teacher] learning, collective participation, coherence, and necessary duration of activities...for teachers to engage in discourse [reflection] with others, as well as individual reflection on their practices" (p. 37).

Table 4, continued.

Study	Inservice Dose	Extended Follow-Up Supports	Research Synthesis Results
Snow-Renner & Lauer (2005)	PD is most likely to "positively affect teacher instruction [if it] is of considerable duration" (80 or more hours) (p. 6).	"Deep changes in teacher instruction...entailed initial participation in a summer institute and follow-up throughout the school year with on-site coaches to encourage teacher reflection and facilitate instructional change" (p. 6).	"Our synthesis...[shows that] professional development is most likely to positively affect teacher instruction [when it] is of considerable duration, focused on specific content and/or instructional strategies..., characterized by collective participation of educators, coherence, and infused with active [teacher] learning" (p. 6).
Yoon et al. (2007); Guskey & Yoon (2009)	"Studies that included more than 14 hours of PD showed a positive and significant effect on student achievement" (p. 3.).	"In all but one study follow-up sessions supported the main PD event" (p. 3).	The synthesis findings indicate that workshops or summer institutes which focus on research-based instructional practices, involve active teacher learning experiences, provide teachers' opportunities to adapt practices to their unique classroom situations, and include follow-up sessions of more than 14 hours of professional development were more likely to produce positive results.
Zaslow et al. (2010)	"In general, models with a high 'dosage' of PD tended to be associated with positive outcomes for teachers...and children" (p. 41).	"The general model of PD used in the studies involved initial training for classroom teachers...with follow-up support or training provided through site visits and consultations from [PD] experts" (p. 70).	The synthesis shows that professional development may be more effective when it includes specific articulated objectives of training, practice modeling, authentic practices, collective participation, follow-up of sufficient intensity and duration, and is aligned with standards for practice (coherence).