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## Professional development for in-service educators: a description of outcomes associated with six approaches

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PROFESSIONAL DEVELOPMENT  
FOR IN-SERVICE EDUCATORS:  
A DESCRIPTION OF OUTCOMES  
ASSOCIATED WITH  
SIX APPROACHES

THESIS

SUBMITTED TO

The School of Education and Allied Professions

THE UNIVERSITY OF DAYTON

In Partial Fulfillment of the Requirements for  
the Degree

Educational Specialist in School Psychology

by

Jessica M. Mohler

UNIVERSITY OF DAYTON

Dayton, Ohio

August, 2008

SCHOOL PSYCHOLOGY PROGRAM  
DEPARTMENT OF COUNSELOR EDUCATION AND HUMAN SERVICES  
SCHOOL OF EDUCATION AND ALLIED PROFESSIONS

WE HEREBY APPROVE THE THESIS SUBMITTED

BY

Jessica M. Mohler

ENTITLED:

Professional Development for In-Service Educators: A Description of Outcomes  
Associated with Six Approaches

AS PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

Educational Specialist in School Psychology

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Chair

Date

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Date

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Date

PROFESSIONAL DEVELOPMENT FOR IN-SERVICE EDUCATORS:  
A DESCRIPTION OF OUTCOMES ASSOCIATED WITH SIX APPROACHES

by

Jessica M. Mohler

The University of Dayton, 2008

Julie Q. Morrison, Committee Chair

Professional development is both a requirement of the federal law and a professional obligation for educators seeking to maximize their impact on students. Several professional development approaches have achieved prominence in education, and the purpose of this study was to examine the quantity and quality of the available research associated with six prevalent approaches. Quantity was based on searches of the ERIC and PsychInfo databases for studies published between the years 1995 and 2005. Quality was based on an examination of methodological characteristics of the research and by critically examining the professional development activities in relation to the five elements of strong interventions (Lentz, Allen, & Ehrhardt, 1996). The results of this study suggest that the research regarding the professional development of teachers is limited in terms of outcomes-based evidence of their effectiveness.

To my mother for instilling in me the importance of aspiring, who sacrificed much so that I might venture, whose support has given me the courage to aim high, and whose strength has provided me the conviction to fulfill.

It is with sincere gratitude that I acknowledge all of my committee members, Dr. Julie Morrison, Dr. Sawyer Hunley, and Dr. Patricia Grogan for their collaboration on this study.

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## CHAPTER I

### Introduction

With the passage of *The No Child Left Behind Act* in 2001, school districts are held accountable for providing “highly qualified” teachers for every student. Specifically, this legislation states, “Each state education agency (SEA) must develop a plan to ensure that all teachers are ‘highly qualified’ no later than the end of the 2005-06 school year...In general, a ‘highly qualified teacher’ is a teacher with full certification, a bachelor’s degree, and demonstrated competence in subject knowledge and teaching skills” (U.S. Department of Education, 2002, p. 57).

In order to assist SEA’s with meeting this goal, Title II funds are allocated for the purpose of preparing, training, and recruiting high quality teachers. The way these funds are used is at the discretion of the districts and schools in an effort to ensure that each is able to meet their individual needs, provided that the funds are used for “scientifically based professional development interventions” (U.S. Department of Education, 2002, p. 57). Specifically, states may use 2.5% of funds to implement “teacher quality activities” as part of the overall improvement program. The effectiveness of programs implemented is to be judged by evidence of changes in student achievement over time (U.S. Department of Education, 2002).

The decision to allocate funds to schools to facilitate the presence of a qualified teacher in every classroom was determined in response to research findings that associate teacher efficacy with academic achievement of students (U.S. Department of Education

2002). Such evidence is included in the 1996 report from the National Commission on Teaching and America's future, as cited by Darling-Hammond (1998, 1999). The report concluded that money spent on teacher training resulted in greater increases in student achievement than investments made in other areas. One central argument included in the commission's report was, "What teachers know and can do is one of the most important influences on what students learn" (Darling-Hammond, 1998, p. 6).

Additionally, in an investigation of student academic achievement in 900 Texas school districts, Ferguson (1991) found that between 20% and 25% of the variance in achievement gains was accounted for by teacher quality. Years of experience, master's degrees, and scores on a statewide recertification exam were used as measures, but scores on the statewide recertification exam resulted in higher levels of variance in student standardized test scores. This variance remained evident even when accounting for teacher experience, class size and examined separately from student socioeconomic status (Ferguson, 1991).

The results of a yet another, more recent study provide further evidence that the variance in student achievement is largely attributable to the contribution of the teacher (teacher effects). Using data from a four-year experiment in which teachers and students were randomly assigned to classes to estimate teacher effects on student achievement, Nye et al. (2004) found that the variance due to the differences among teachers was substantial in comparison to the variance attributable to naturally occurring school effects. Thus, "which teacher a student happens to get within a school matters more than which school the student happens to attend" (Nye, Konstantopoulos, & Hedges, 2004, p. 247). This empirical evidence of the impact of teacher effects on student achievement

supports previous research concluding that the teacher is the primary school-based determinant that affects the variance in student achievement (Goldhaber & Brewer, 1997; Greenwald, Hedges, & Laine, 1996; Hanushek, 1996; Sanders & Rivers, 1996).

In addition to meeting the requirements of a “highly qualified” teacher, educators are expected to keep up on an ever-growing base of research and transfer this knowledge into practice through the use of research-based strategies and evidenced-based instructional interventions in the classroom. As Guskey (2000) explains,

Educational researchers are constantly discovering new knowledge about the teaching and learning process. As this professional knowledge base expands, new types of expertise are required of educators at all levels. And like practitioners in other professional fields, educators must keep abreast of this emerging knowledge base and be prepared to use it to continually refine their conceptual and craft skills (p. 16).

Research indicates that this is often a challenging task and in order to assist classroom teachers with implementing research-based practices, effective in-service professional development activities are essential (Denton, Vaughn, & Fletcher, 2003).

#### *Summary and Purpose of the Study*

Teacher efficacy has been identified as one of the most important factors associated with student achievement (Darling-Hammond 1998, 1999; Ferguson, 1991; Goldhaber & Brewer, 1997; Greenwald, Hedges, & Laine, 1996; Hanushek, 1996; Nye, Konstantopoulos, & Hedges, 2004; Sanders & Rivers, 1996). In response to this, federal regulations require that there be a “highly qualified” teacher in every classroom. Federal funding is provided to schools to assist with implementing teacher training activities,

with the provision that money be spent on research-based interventions (U.S. Department of Education, 2002). Additionally, educational researchers are continually identifying evidence-based instructional practices (Guskey, 2000). Teachers are expected to respond to these findings as they emerge through implementing these practices in their classrooms. Effective professional development is necessary in order to successfully fulfill these obligations.

Several approaches exist for implementing professional development activities, however limited outcome-based research is available to date that describe the common approaches and their effects on teacher learning and practice. The purpose of this study was to examine the quantity and quality of the available research associated with six prevalent approaches to the professional development of K-12 teachers. Quantity was based on searches of the ERIC and PsychInfo databases for studies published between the years 1995 and 2005. Quality was based on an examination of methodological characteristics of the research and by examining the degree to which five elements of strong interventions (Lentz, Allen, & Ehrhardt, 1996) are incorporated.

## Chapter II

### Literature Review

#### *Principles of Effective Professional Development*

A recent review of the literature conducted by Kinnucan-Welsch, Rosemary, and Grogan (2006) identified six design principles that are linked to high quality professional development:

(a) High quality professional development directly connects to student learning goals that are clear and accepted by all; (b) professional development involves active learning for teachers; (c) professional development is embedded in the context of work in schools and classrooms; (d) professional development is continuous and ongoing; (e) professional development is based on an ongoing and focused inquiry related to teacher learning, student learning, and what we know about good instruction; and (f) coherence is evident in all aspects of the professional development system (pp. 427-430).

Similar to the principles outlined above, Guskey (2000) identifies four principles of effective professional development. The first of these principles is that professional development should focus on learning and learners. Those efforts that surround a goal that is directly related to student learning are most effective.

The second principle is an emphasis on individual and organizational change. With the goal of improving student learning, individual changes surrounding improved instruction need to be made. This cannot happen unless system-wide organizational

changes support the conditions necessary to allow for these changes to occur. This includes collaboration between administration and teachers toward meeting the shared goal of improved learning for students.

The third principle is described as making small changes that are guided by a grand vision. This grand vision maintains focus on the overall goal of improved learning for students. It is suggested that the best efforts to obtain this larger goal is to start small with incremental changes that provide noticeable outcomes.

The fourth principle is that effective professional development is ongoing and procedurally embedded. It is suggested that professional development programs and activities that occur outside of and are viewed to be separate from an individual's daily professional activities are not successful. Successful professional development needs to be viewed as part of one's everyday professional responsibilities.

Other examples of principles of effective professional development are presented in the literature and are similar to those identified by Kinnucan-Welsh, et al. (2006) and Guskey (2000). All agree that past attempts at professional development that have relied on one-day seminars have not been effective at producing long-term change. The consensus is that effective professional development needs to be an ongoing, embedded, and sustained effort (Bean, 2004; Darling-Hammond, 1998, 1999; Denton et al., 2003; Dutro, Fisk, Koch, Roop, & Wixon, 2002; Klingler, 2004; McRobbie, 2000; Vogt & Shearer, 2003; Wixon & Yochum, 2004).

### *Approaches to Professional Development*

*Training.* Training is a form of professional development that most are familiar with, and is often referred to as “in-service” training. It is a form that constitutes a majority of past attempts at assisting teachers with learning about new theories and developing new skills (Guskey, 2000; Joyce & Showers, 1980). Training usually involves a presenter or presenters that are understood to possess expertise on a particular theory or practice. The presenters share their expertise through discussion and related activities, usually in a large group setting (Guskey, 2000). This may also be referred to as the “presentation of theory or description of skill strategy” approach to professional development. (Joyce & Showers, 1980, p. 380).

The most appealing aspect of this approach is that it is the most efficient with regard to cost and time. It allows for a large amount of information to be disseminated to a large amount of people at once. These qualities however are not always associated with the most effective outcomes. Although it can be effective at increasing knowledge, as a component in isolation, this approach does not always allow for new skills to be acquired or be transferred back to the classroom (Joyce & Showers, 1980). Another drawback to this approach is that it does not account for individual differences in learning or interests. For this method to be effective, often the sessions must, “be extended, appropriately spaced, or supplemented with additional follow-up activities to provide feedback and coaching necessary for the successful implementation of new ideas” (Guskey, 2000, p. 23).

It is important to note that the term “training” is often used to describe any professional development activity or may be used synonymously with the term

professional development. For the purposes of this study, training will refer to those activities that take place primarily in group settings and include the component of dissemination of information on skill or theory in workshop or seminar formats. This may occur in one or over multiple sessions and may be combined with other components such as practice, modeling, and/or feedback within the training session.

*Coaching.* Coaching is typically defined as a process of cycles of systematic observation and assessment of skills with feedback (Guskey, 2000; Joyce & Showers, 1981), although the component of feedback is not always included in the definition. Joyce & Showers (1980) define coaching as “hands-on, in-class-room assistance with the transfer of skills and strategies to the classroom” (p. 380). In this definition, feedback is not included in the process but is defined separately as an individual component of professional development in general. Joyce & Showers (1981) however do include feedback in their definition and explain that the purpose of feedback should be to identify the appropriate strategies to implement for meeting specific goals, not to assess degree of implementation of a specific strategy (p. 170). For the purposes of this study, coaching will refer to the process of cycles of observation and assessment with feedback, regardless of the intent or purpose of the feedback.

Coaches can be from outside or within the school. Within the school, the coaching process can occur between a teacher and an administrator or it can be a process of two teachers working together, which is known as peer coaching (Guskey, 2000). Specifically, peer coaching can be defined as “a form of collaborative inquiry, which prompts teachers to initiate new roles as peer coaches in which they plan, demonstrate and practice new models of teaching” (Reiman & Peace, 2002, p. 51).

There are several benefits associated with implementing coaching as an approach to professional development, both for the coach and the teacher being observed (Guskey, 2000; Reiman & Peace, 2002). The coach gains experience through observing another professional and the person being observed gains practice with developing new skills and receives constructive feedback. This process helps break down the practice of teaching in isolation (Guskey, 2000; Van Driel, Beijaard, & Verloop, 2001) and promotes a more collaborative approach to both teaching and learning (Guskey, 2000).

For coaching to be successful, there are several guidelines to follow. First, performance evaluations must remain separate from the learning process (Guskey, 2000; Van Driel et al., 2001), and the process must be implemented in an agreed-upon systematic manner (Van Driel et al., 2001). For peer coaching, the interactions must also be based on equality (Van Driel et al., 2001). One disadvantage of this approach is that it requires a significant amount of time and commitment from both parties and both must be willing to coordinate schedules (Guskey, 2000).

*Consultation.* Several different models of consultation exist, but all incorporate problem solving (Zins & Erchul, 2005) and have in common an emphasis on, “problem-solving expertise of the consultee within a triadic relationship (consultee-consultant-child)” (Kratochwill, Elliot, & Callan-Stoiber, 2005, p. 583). In school consultation a consultant (either from within or outside of the school) works directly with a classroom teacher to produce changes in instructional practices that result in better outcomes for students.

The problem-solving consultation process involves initiating a relationship, identifying and analyzing the problem, developing and/or selecting an intervention, and

implementing and evaluating the intervention (Kratochwill et al., 2005; Zins & Erchul, 2005). This process has two main goals: (a) to provide methods for changing a child's behavioral, academic, or social problem(s), and (b) to improve a consultee's skills so the consultee can prevent or respond effectively to future problems or similar problems in other children (Kratochwill et al., 2005, p. 584). One drawback of implementing the consultation approach to professional development is that although it has been proven effective at obtaining the goal of changing a child's behavioral, academic, or social problem(s), research has yet to consistently indicate that it is effective at influencing a teacher's ability to successfully handle future problems (Kratochwill et al., 2005).

*Study Groups.* This approach involves the participation of all school staff working together to solve a wide-ranging, common problem. The focus concern is broken down into smaller parts, each of which is addressed by small groups. These groups meet regularly to address the chosen aspect of the larger problem. The groups usually work together for the duration of the school year and often rotate the role of leader among members. The small groups then have the opportunity to share their findings with the larger group (Guskey, 2000).

The benefit of this approach is that it can facilitate collaboration between staff members as they work together toward reaching a common goal. In order for these efforts to be successful, the groups must be carefully structured, well trained, and well supervised (Guskey, 2000). Potential limitations to this approach include problems with group dynamics such as finding a balance in amount of involvement for all members. In addition, problems associated with conducting effective research may result in opinion-driven as opposed to research-driven discussions (Guskey, 2000).

*Individually Guided Activities.* This approach entails educators choosing their own goals and selecting activities that will best help them achieve these goals. Sparks and Loucks-Horsley (1989 as cited in Guskey, 2000) have identified four steps inherent in self-guided professional development: “(a) identification of a need or interest, (b) development of a plan to meet the need or interest, (c) learning activities, and (d) assessment of whether the learning meets the identified need or interest” (p. 27). The effectiveness of this approach is based on the premise that, “individuals can best judge their own learning needs and are capable of self-directed and self-initiated learning. It also assumes that individuals are more motivated to learn when they initiate and plan their own learning activities” (Guskey, 2000, p. 27).

Advantages of this approach are flexibility and increased opportunity for choice and accommodation for individual interests (Guskey, 2000). Possible disadvantages of this approach are that it is dependent on the above assumption, it requires sustained motivation and self-direction, and requires the ability to engage in self-analysis and effective decision making.

*Inquiry/Guided Action Research.* This approach to professional development is a process that involves educators choosing a focus problem and conducting research on relevant issues pertaining to the chosen topic. Once research is conducted, action is taken toward solving the problem and these efforts and outcomes are then documented (Guskey, 2000). There are many variations of inquiry/guided action research. It can be solely an individual process or can be supported by a group, which is referred to as “collaborative guided inquiry.” In collaborative guided inquiry, the group may share a common goal or interest and/or provide a forum for discussion and sharing of results, but

the focus remains on the individual's exploration as it applies to their specific interests and needs (Van Driel et al., 2001).

This approach is described as informal, subjective, and self-reflective (Briscoe & Wells, 2002). The process varies in the type of problem explored, the methods of exploration, the reasons behind or goal of the exploration, and the way in which the process and outcomes are interpreted and reflected upon. Despite these variations, the goal of this process is to provide relevant results that can be applied to meet the individual's needs (Van Driel et al., 2001).

Advantages of this approach are that it provides educators with the opportunity to develop and improve their research and problem-solving skills (Guskey, 2000) and it allows teachers to construct their own applicable knowledge (Briscoe & Wells). It provides a sense of ownership and control (Christenson, 2004, Van Driel et al., 2001) which can serve as a great source of motivation (Briscoe & Wells, 2002). One disadvantage is that these types of research activities often require a significant amount of time (Guskey, 2000).

### *Adult Learning Theory and Elements of Strong Intervention*

Though a specific guiding theoretical framework for effective professional development has not been discovered in the research to date, research has been conducted on how adult learning is best facilitated. Research conducted by Oja (1980, as cited in, Trotter, 2006) found that elements included in adult learning as it applies to successful professional development are: "(a) use of concrete experiences; (b) continuously available supervision and advising; (c) encouragement of adults to take on new and

complex roles, and (d) the use of support and feedback when implementing new techniques” (p. 12).

In addition, research has been conducted to determine what elements make interventions successful. Professional development can be defined as an intervention because the purpose of professional development activities is to improve knowledge and skills in a specified area. Specific elements of strong interventions, where intervention is defined as “doing something different to solve some perceived problem,” are described by Lentz, Allen, and Ehrhardt (1996, p.120). The authors describe strong interventions as those that, “are ecological in nature, naturalistic in scope, contain elements from the research base that are predictive for success, and incorporate the constructs of social validity in a practical manner” (p. 119). Specifically, strong interventions are those that provide: (a) frequent opportunities to respond; (b) contingencies for accuracy and performance; (c) use of effective direct instruction procedures; (d) error correction and feedback; and (e) goal setting and progress monitoring (Lentz et al., 1996). These elements relate closely with those identified as principles of effective professional development (Guskey, 2000; Kinnucan-Welsh et al., 2006) and those inherent in adult learning theory.

## Chapter III

### Method

#### *Data Collection*

This review of present research on approaches to professional development was conducted using historical research methods. Data were obtained through searches of the PsychINFO and ERIC databases. Searches were restricted to studies published between the years 1995-2005. Prior to collecting research, an outline was developed to organize the data and one was completed for each article that met the final inclusion criteria. The outline appears in Appendix A.

In searching the ERIC database, each of the following terms were entered and were combined with limits of the specified date range, English language, journal article, and “teacher,” which was searched in the database’s thesaurus and included Middle School Teachers, or Secondary School Teachers, or Elementary School Teachers. The following results were obtained: Professional Development (147); Coaching (3); In-Service Training (0); On-The-Job-Training (0); Faculty-Development (5); Continuing-Education (1); Professional Growth Programs (0); Peer Mentoring (0); Consultation-Programs (0); Self-Directed Learning (0); Study Groups (1); Individually-Guided Activities (0); Inquiry Research (0); Guided Action Research (0); Collaborative Learning (0); and Seminars (1).

In searching the PsychINFO database, the following terms were searched and combined with the limits of the specified date range, English language, empirical study

(methods), journal, and the term “teacher,” which was searched in the database’s thesaurus to include Middle School Teachers, or Junior High School Teachers, or Elementary School Teachers, or High School Teachers. The following results were obtained: Peer Mentoring (0); Self-Directed Learning (1); Study Groups (6); Individually Guided Activities (0); Guided Action Research (0); Inquiry Guided Research (0); Collaborative learning (14); Professional Development (69); In-Service Training (3); Faculty Development (0); Staff development (69); Career Development (2); Seminar (14); Consultation (54); and Coaching (29).

All 419 results were exported into the online data management system Refworks®. Duplicates of articles were removed and the remaining articles were reviewed. To fit within the purpose and scope of the present study, several inclusion criteria were applied. In general, only studies that pertained to the professional development of in-service educators teaching core academic subjects were included. Specifically, studies pertaining to the professional development of pre-service teachers and in-service teachers of physical education, foreign languages, and arts and technical electives were excluded. Additionally, articles conducted outside of the United States were excluded. This decision was made based on the lack of knowledge on differences in educational policy and procedures in foreign countries. After these exclusions were made, 197 articles remained.

These 197 articles were then reviewed and compared to the following inclusion criteria:

1. Empirical study (ERIC results) and clear description of methodology.

Control group not required.

2. Teacher participation in professional development as primary focus of the study (independent variable).
3. Goal of professional development clearly stated as change in behavior, knowledge, pedagogy, and/or skills for instruction in core academic subjects as it relates to academic achievement for students and specified goal used as outcome variable (dependent variable).
4. Specific outcome measures identified.
5. Professional development approach clearly described and is one of the six identified in this study (training, coaching, consultation, study groups, individually guided activities, or inquiry/guided action research).

Upon review of each article, the first criteria identified as not present was noted and the article was removed from the pool. Citations of these articles and the missing criteria resulting in exclusion are presented in Appendix B. This review process resulted in 35 studies that met all five criteria. Studies were categorized by approach and are presented in the results section (see Table 1). These studies were then reviewed a second time in order to identify whether the elements of strong interventions (i.e., frequent opportunities to respond, contingencies for accuracy and performance, use of effective direct instruction procedures, error correction and feedback, and goal setting and progress monitoring) were incorporated in the professional development activities.

#### *Inter-rater Agreement*

Twelve studies (34% of the final sample) were reviewed by a second, independent rater in order to determine the reliability of the review for elements of strong interventions. Inter-rater agreement was calculated as the percentage of the five elements

agreed to be present or absent by both independent reviewers. The mean inter-rater agreement for the 35 studies was 88.3% ( $SD = 19.9$ ).

## Chapter IV

### Results

#### *Description of Studies*

Descriptive characteristics of the 35 identified studies are presented in Appendix C. The majority of the studies (51%) implemented a training approach. Next in frequency were studies that implemented coaching as the primary approach (31%). This was followed by studies implementing a consultation approach (11%) and studies implementing an inquiry/guided action research approach (6%). None of the identified studies utilized a study group approach or individually guided activities.

As was identified in the inclusion criteria, all participants in each study included K-12 core academic teachers. Grade levels and academic subjects taught varied by study. Eighty-six percent of the studies' participants included teachers at the elementary level (K-6). Only four studies (11%) included participants at the high-school level, and only one study (3%) included participants that taught Grades 7-8. Additionally, four studies (11%) included special education and other special services staff and only two studies (6%) involved principals or administrators in the professional development activities.

Thirty-one percent of the studies identified an outcome associated with reading. One hundred percent of these studies included participants at the elementary level. Studies that identified an outcome associated with mathematics made up 37% of the studies. Participants included teachers at the elementary (69%), high school (23%), and included the one study that involved participants teaching Grades 7-8. Seventeen percent

of the studies identified an outcome associated with science and 100% of these studies included participants at the elementary level. One study (16%) also included participants that taught at the high school level. Seven of the studies focused on change in knowledge, skills, and behaviors targeted at improving classroom instruction in general.

### *Methodological Characteristics*

*Participant Selection.* Less than half of the studies in the final sample specifically identified the method of participant recruitment and selection. In those that did, the methods varied. In several of the studies, participants volunteered to participate. Additionally, some studies noted that specific schools or individual participants were selected based on pre-determined characteristics.

*Research Designs.* All of the studies in the final sample identified measures to determine the impact of the professional development activities for teacher participants. Specifically, 34% used qualitative measures, 31% used quantitative measures and 34% used both quantitative and qualitative measures to determine the impact of the professional development activities on the stated goal(s).

Although all studies identified measures to determine the degree of impact on a stated goal, not all of the identified measures were directly related to the identified goal. Where multiple goals were identified, not all identified measures for each. Of the studies that used a combined method, four (25%) did not report results for the quantitative measures. Additionally, few studies reported outcomes for all of the measures identified.

Of the studies that used quantitative measures, only five studies used a comparison group. Though it was not one of the inclusion criteria, the use of a control group increases the internal validity of experimental research. The majority of studies

used a pre- post- design (pre-experimental research) for the identified measures. The most common measurements used were questionnaires for satisfaction or demonstration of change in knowledge or attitudes. Two of the studies used coded and quantified classroom observation data as an outcome measure.

Most common among the studies that used a qualitative approach were field notes and logs from direct observations, interviews, and teacher journals or open-ended questionnaires. Several of the studies used recording procedures to document conversations in workshops and discussions. Often the results of these observations were not formally reported. Additionally, two of these studies identified informal observations and informal conversations with teachers as the identified measures.

Nine of the studies also identified measures of the effect of teachers' participation in the professional development activities on student variables. All studies used quantitative measures directly linked to the identified goal. Common assessments implemented were curriculum-based measures and sub-tests of standardized achievement tests. Additionally, two studies used measures created by the research staff.

*Data Analyses.* The majority of the studies that used qualitative measures reported general observations related to the identified goal. Frequently, summaries of journal entries or comments made during the activities were reported. Often results were reported in a case study format, using one to three identified participants. These results were often reported as verbatim verbal responses of the participants, describing their experiences in the professional activity.

As previously mentioned most studies that included quantitative measures also utilized a pre- post design. Common statistical analyses used were various forms of

ANOVA procedures and t-tests. Two studies reported mean changes with no further analyses and four reported mean changes within a multiple-baseline single case design. One study employed the use of a frequency count method. Of particular importance is that few studies reported effect sizes. The reporting of effect sizes has become increasingly expected in research and is important to demonstrate the treatment effect and account for effects of sample size (Urdan, 2005).

#### *Narrative Analyses of Outcomes by Approach*

*Training.* Eighteen studies implemented training activities as the approach to professional development. Stated goals included change in instructional and assessment practices, acquisition of new knowledge and skills, and enhancing existing knowledge and pedagogy. The frequency and duration of the training activities ranged from daily to monthly and one day to three years. Several studies implemented follow-up activities and included hands-on activities, small group discussion, and some included modeling of procedures.

Most of the studies that implemented training activities reported positive outcomes on at least one of the measures, with five reporting positive outcomes on all identified measures. Three of the studies reported results that could be summarized only as differing levels of change. Some studies reported no significant results on one or more of the measures, though none reported an absence of significant results on all of the measures. One study reported small effect sizes. Only three studies reported student outcomes. One study reported significant positive results and the other two reported varying results between treatment groups on different measures.

*Coaching.* Eleven of the studies implemented coaching as the professional development approach. All of the stated goals included gaining new knowledge and/or skills and one was identified as building on existing knowledge. The majority of the coaching activities involved a pre-training session where instruction was provided. Three of the studies implemented peer coaching, one used a supervision model where the principal acted as coach, and the remaining studies employed research staff as coaches. Duration of coaching ranged from two sessions to three years. Two studies reported an unspecified frequency and duration as the coaching was implemented per teacher request.

Overall, the studies reported positive outcomes for teacher participants. Four qualitative studies and one quantitative study reported that teachers implemented instructional strategies as intended. One suggested that teachers gained new knowledge and one reported varying levels of change. Two studies reported significant positive results between groups on identified measures. One of these was a control group comparison and the other was a comparison of peer- and principal-coaching conditions. Results of the latter indicated that the peer coaching group out performed the principal coaching group significantly on two measures. Additionally, one study was conducted and reported follow-up data which indicated that some level of change remained across participants four years later.

Reported student outcomes were also positive in most cases. Two of the three studies reported significant improvements in the target behavior and one also reported large effect sizes. One study reported mixed outcomes with improvement varying by student, instructional method implemented and treatment phase.

*Consultation.* Four studies implemented consultation as the approach to professional development. Three of the four identified a goal of implementing academic interventions for referred students with accuracy. Outcomes for teacher participants associated with consultation activities were mixed. The studies that measured satisfaction reported positive results overall. One study that used qualitative measures indicated that teachers experienced personal and professional benefits as a result of participation. One reported significant changes in levels of implementation, with the group receiving performance feedback outperforming the other two groups. Two of the studies that used a multiple-baseline design indicated varying levels of intervention implementation across teachers, noting that implementation did increase during the treatment phases as compared to baseline, but varied in sustainability. Student outcomes also varied. The two studies that reported student outcomes reported varying levels of change across students and phases.

*Individually/Guided Action Research.* Only two studies implemented individually/guided action research. One study used a group approach and one was a single participant case study. Both employed qualitative measures and outcomes could be described only as varying levels of change across participants. Neither study reported student outcomes.

#### *Evidence of the Elements of Effective Intervention by Approach*

All 35 studies that met the final inclusion criteria were examined to determine the degree to which five elements of strong interventions (Lentz et al., 1996) were incorporated. The results are presented in Appendix D. The most frequent element incorporated was Element 1: Frequent opportunities to respond. Defined as multiple

opportunities to practice or demonstrate knowledge or skills, this element was incorporated in 100% of the studies. All included either multiple workshop sessions, multiple opportunities to engage in discussions or activities within the sessions, follow-up sessions, and/or simulated or direct practice of skills. None of the studies implemented professional development activities that relied on a one-time workshop with no opportunities to engage in practice or demonstrate knowledge or skills.

Element 3: Use of effective direct instruction procedures was second in frequency and was incorporated in 55% of the studies examined. Effective direct instruction procedures were defined as active learning tasks or modeling procedures. The most common procedure implemented was the use of video or live modeling.

The next most frequently implemented element was Element 4: Error Correction and Feedback. This was included at least in part, in 52% of the studies. In studies that had more than one treatment condition, not all conditions were provided this element. This element was present in all of the studies implementing coaching, as error correction and feedback is in the definition of this approach. This element also appeared in some training studies and was included in three of the four studies implementing consultation as the approach.

Element 2: Contingencies for accuracy and performance and Element 5: Goal setting and progress monitoring were not common in the studies reviewed. Contingencies for accuracy and performance are defined as any consequences, either positive or negative for participation or lack of participation in the professional development activities and the identification of set criteria for performance. Only one study included this element in full. This study provided three graduate level academic credits to those

participants who completed the professional development training. The criterion in this case would be completing the training objectives at a passing level to receive credit for the course. Two other studies provided contingencies for performance, one provided participants with a stipend and one provided an invitation to a special event to display skills learned. Neither identified criteria for accuracy. One study utilized goal setting through actions plans, but did not describe progress monitoring methods.

## CHAPTER V

### Discussion

With increased standards for accountability and legislation such as *No Child Left Behind* which mandates that funding for professional development be spent on “research-based interventions,” in addition to the ever growing base of research on best practices in instruction, school districts are investing a great deal of time and money on professional development activities for teachers. The purpose of this investigation was to examine the quantity and quality of available research on six prevalent approaches to professional development for educators. The results of the present investigation indicate some strengths and some considerable weakness in both the quantity and quality of current research.

With regard to the quantity of available research, the results of this study indicate that outcomes-based research is limited. Using search terms entered into two well-established data bases, hundreds of “hits” resulted. With the first round of inclusion criteria implied, the results were reduced to 197 studies. These 197 were then compared against five inclusion criteria. The inclusion criteria allowed for empirical studies (data collected) with changes in knowledge, skill, or behavior of the target participants (in-service, K-12, core academic teachers) as the independent variable, that clearly identified: the goal (s); outcome measure(s) (data collection procedures); and the professional development activities employed.

With these criteria imposed, only 35 studies (17.8%) were included in the final sample for further review. In reviewing the excluded studies (see Appendix C) 18% were excluded due to a non-empirical design. Additionally, 13% were excluded due to the lack of a clearly stated goal related to change in behavior, knowledge, pedagogy, or skill in instruction targeted at core academic instruction. Although a few were excluded due to a focus on behavioral variables of students, others did not have a clear focus on improving knowledge or skill toward improved instructional practices. In fact, the majority (56%) were excluded due to the primary focus of the study being somewhere besides teacher participation as the independent variable. If the goal of professional “interventions” is to improve teacher knowledge and/or skill, why is the majority of available research focusing elsewhere? On the positive side, only one study reviewed did not specifically identify outcome measures.

The 35 studies in the final sample were also examined for quality based on a review of their methodological characteristics. Several weaknesses in research design were noted, including a lack of consistency between the stated goals and outcome measures used, and overall weaknesses in the reporting of results. Of the studies that employed quantitative outcome measures, most used a pre-experimental design, with a very small minority that employed the use of a control group. There were also significant weaknesses noted in the method of participant recruitment and selection. The identified weaknesses in research design indicate that the internal validity of the current research is lacking. In addition, several of the studies used a qualitative approach utilized informal conversations or other similarly subjective and informal outcome measures. Although

this method of reporting provides a more detailed, personalized account, it does not allow for generalization of results (external validity).

The studies in the final sample were also examined to determine which elements of effective interventions were included in the professional development activity as a measure of the quality of the projects. In this review, although none of the studies included more than three elements of effective interventions in full, only three studies in the final sample included a single element. The majority of studies included at least two elements and approximately one-third included three.

Most commonly incorporated was frequent opportunities to respond, which was present in 100% of the studies in the final sample. None of the studies implemented professional development activities that relied on a one-time workshop with no opportunities to engage in practice or demonstrate knowledge or skills. This is a promising finding, considering that it has been suggested that these types of “sit and get” activities are not effective at producing or sustaining change (Klingner, 2004). Also frequently incorporated were effective direct instruction procedures and error correction and feedback. Contingencies for accuracy and performance, and goal setting and progress monitoring were not common elements in the professional development studies reviewed. The lack of these elements is an indication that the quality of professional development activities is in need of improvement, as both are essential for participant motivation and program accountability.

Of the 35 studies in the final sample, the most common approaches employed were coaching and training. Studies utilizing a consultation approach were not well represented in this study due to the fact that the majority of studies reviewed maintained a

focus on change in student behavioral variables, which was not the focus of the present investigation. In addition, although they are common approaches implemented in schools today, none of the studies focused on study groups or individually-guided activities in this review.

In general, positive outcomes for teacher participants were reported in studies implementing both training and coaching. One of the studies on coaching indicated that peer coaching was more effective than supervision on some of the measures. Outcomes on studies implementing consultation varied and outcomes for studies using the individually/guided action research approach are difficult to determine due to the outcome measures used and reported. Coaching and consultation included the most student outcomes (by percent) associated with teacher participation in professional development activities, with coaching being associated with more identifiable positive outcomes.

Despite the positive outcomes reported, at this time it can not be clearly determined which approaches are effective, or if one is more effective than others due to the nature of the present research. As such, a clear distinction as a “research-based intervention” is difficult to identify for any of the professional development approaches investigated. Therefore, the quantity and quality of research on professional development needs to improve in order to establish a sound research base with a focus on outcomes. This is essential in order for school districts to make informed decisions on how to invest their resources with the goal of best preparing teachers to maximize their effectiveness and meet the professional obligations related to the goal of improving student achievement.

*Limitations of Study and Suggestions for Future Research*

To fit within the scope of the present study, specific search terms and limits were entered into the two databases searched in an effort to reduce the number of articles that would not fit within the intended purpose. Imposing these specified limits may have reduced the number of studies that fit within the inclusion criteria. Also, additional methods of searching, such as following trails of citations within sources were not conducted. Future research should explore the use of other related search terms and include studies from sources that are not peer-reviewed (e.g., dissertation abstracts, technical reports).

Finally, although the intent of the present study was descriptive in nature, it would be beneficial for future studies to utilize statistical analyses (meta-analytic approach) in determining effectiveness of approaches to professional development as the quantity and quality of empirical research improves, which is a strong suggestion for future research. Although the data were presented and described, it is difficult to determine the overall effectiveness of each identified approach. At this time, due to the nature of the available research, a narrative analysis was necessary.

## APPENDIX A

## Data Collection Outline

Citation:

PD Goal:

Participants:

PD Approach: (Coaching, Consultation, Study Groups, etc.)

Elements of Strong Interventions (Lentz, Allen, & Ehrhardt, 1996):

- ☐ Frequent Opportunities to Respond
- ☐ Contingencies for Accuracy and Performance
- ☐ Use of Effective Direct Instruction Procedures (Prompts, Cues, Models)
- ☐ Error Correction and Feedback
- ☐ Goal Setting and Progress Monitoring

Outcome/Effectiveness:

Satisfaction:

## APPENDIX B

## Excluded Studies

Citation	Criteria 1	Criteria 2	Criteria 3	Criteria 4	Criteria 5
Alderman & Gimpel (1996)			x		
Anderson (2000)	x				
Annetta & Minogue (2004)		x			
Aram, Breck, & Saunders (2002)	x				
Bailes (2001)		x			
Betten, Allen, & Waddell (2000)	x				
Blanton, Westbrook, & Carter (2005)		x			
Brighton (2003)		x			
Broaddus & Bloodgood (1999)			x		
Brooke (2005)	x				
Buck (2002)		x			
Bunte & LoGuidice (1997)	x				
Canedo & Woodward (2000)	x				
Chazan, et al. (1998)					x
Coburn (2005)					x
Collopy (2003)					x
Colton & Sheridan (1998)			x		
Conca, Schecter, & Castle (2004)			x		
Couchenour & Dimino (1999)	x				
Crawford (2004)		x			
Cunningham, Stanovich, & Stanovich (2004)		x			
Daniel & Stallion (1996)		x			
Daniels (2002)	x				
de Mesquita & Zollman (1995)		x			
Deering, et al. (2003)	x				
Delfino (1998)	x				
Dickson & Irving (2002)		x			
Dole, Steven, Warren, & Cooper (1999)					x
Dozier (1995)	x				
Draper, White, O'Shaughnessy, Flynt, & Jones (2001)			x		
Eisenman, Hill, Bailey, & Dickison (2003)			x		
Emmer & Gerwels (2002)		x			
Erb (1997)		x			
Erchul, Raven, & Whicard (2001)		x			

Ertmer & Hruskocy (1999)					x
Everett, Tichenor, & Whicard (2001)					x
Falvo (2003)					x
Fermanich (2002)		x			
Fink (2000)	x				
Firestone, Camilli, Yurecko, Monfils, & Mayrowetz (2000)		x			
Flowers, Mertens, & Mulhull (2002)		x			
Frank (2001)		x			
Fuchs, Fuchs, Karns, Hamlet, & Katzaroff (1999)		x			
Gallager-Polite (2001)	x				
Garmston (1996)		x			
Glazer (1995a)		x			
Glazer (1995b)		x			
Goddard, Hoy, & Hoy (2000)		x			
Graham, Harris, Fink, & MacArthur (2001)		x			
Grisham & Brink (2003)		x			
Guah (2003)		x			
Guha (2001)		x			
Gutierrez (2002)		x			
Harachi, Abbott, Catalano, Haggerty, & Fleming (1999)			x		
Hawkes (2000)			x		
Helms (1999)	x				
Hill (2004)		x			
Hobbs (1999)	x				
Impara & Plake (1997)		x			
Impara & Plake (1998)		x			
Jackson & Leroy (1998)		x			
Jaramillo (1998)					x
Jarrett & Burnley (2003)			x		
Jimenez, Gersten, & Rivera (1996)		x			
Johnson, Wallace, & Thompson (1999)	x				
Jones & Lungaro (2000)		x			
Joyner & Reys (2000)	x				
Kahle, Meece, & Scantlebury (2000)		x			
Karchmer (2000)		x			
Karchmer (2001)		x			
Kealey, Peterson, Gaul, & Dinh			x		

(2000)					
King, Shumow, & Lietz (2001)		x			
Kitano & Pederson (2002)		x			
Laguardia, Brink Wheeler, Grisham, Peck (2002)		x			
Lambert (1999)		x			
Lane (2003)		x			
Lane, Pierson, & Givner (2004)		x			
Lee (2004)		x			
Lehman, Warfield, Palm, & Wood (2001)					x
Levitt & Manner (2001)	x				
Levitt (2002)		x			
Lieberman & Grolnick (1996)		x			
Lillehoj, Spoth, & Trudeau (2002)			x		
Lindsay, Sugai, & De Pry (2002)		x			
Lockledge & Gallavan (1999)		x			
Mahon (1999)		x			
Mamlin & Harris (1998)		x			
Marlow, Inman, & Shwery (2005)		x			
Martens, Kelly, & Diskin (1996)			x		
Martin, Seagraves, Thacker, & Young (2005)		x			
McPike (1997)		x			
Meskill & Mossop (2000)		x			
Michie (1998)		x			
Milner (2002)		x			
Moreno (2001)	x				
Napoli (2004)					x
Nathan & Knuth (2003)					x
Newman-Carlson & Horne (2004)			x		
Newton (2002)	x				
Noell, Duhon, Gatti, & Connell (2002)			x		
Noori (1996)		x			
Norton, McRobbie, & Cooper (2000)		x			
Otwell & Mullins (1997)			x		
Parish (1995)	x				
Pedersen (2003)		x			
Petzko (2004)		x			
Pianfetti (2001)	x				
Pisecco, Huzinec, & Curtis (2001)		x			
Reaux, Ehrich, McCreary, Rowland, & Hood (1998)		x			

Recesso (2002)	x				
Reese (2002)			x		
Reiman & Peace (2002)			x		
Remillard & Geist (2002)		x			
Remillard (2000)					x
Ringwalt, Ennett, Vincus, & Simons-Rudolph (2004)					x
Roe (2004)		x			
Roth (1998)					x
Rothstein-Fisch, et al. (2003)		x			
Rubinson (2002)		x			
Ruby (2002)		x			
Saab (2001)	x				
Sanacore (1996)	x				
Sanacore (1996)	x				
Schottle & Peltier (1996)			x		
Scribner (2003)		x			
Shamburg (2004)		x			
Siegel (2005)		x			
Simonsson (2004)		x			
Singh & Shifflette (1996)		x			
Skott (2001)		x			
Smedley (1995)		x			
Smith & Hudelson (2001)	x				
Smith & Smith (2000)		x			
Smith & Strickland (2000)		x			
Smith, Desimone, & Ueno (2005)		x			
Snelbecker, et al. (1995)		x			
Snell & Janney (2000)					x
Stevenson (2005)					x
Stockall & Gartin (2002)					x
Sullivan & Wright (2002)		x			
Sweeney, Bula, & Cornett (2001)					x
Taylor, Campbell, & Long (2001)		x			
Thompson, Warren, & Carter (2004)		x			
Thornton (2001)	x				
Tichenor, Everett, Heins, & McLeon (2003)					x
Toolin (2004)					x
Trimble (2003)		x			
Valencia & Au (1997)		x			
Viggiani (2002)		x			
Webster, Knotek, Babinski, Rogers, & Barnett (2003)			x		

Wheelan & Kesserling (2005)		x			
Wickstrom, Jones, LaFleur, & Witt (1998)			x		
Wilcox (1997)		x			
Wilkerson, Manatt, Rogers, & Maughan (2000)		x			
Wilson, Gutkin, Hagen, & Oats (1998)		x			
Wineburg & Grossman (1998)	x				
Wood, et al. (1995)		x			
Young & Lee (2005)		x			
Ysseldyke, et al. (2003)		x			
Zins & Ponti (1996)			x		
Zorfas & Rivero (2005)				x	

## APPENDIX C

Table 1. Descriptive Characteristics of Studies by Approach

Coaching Reference	Goal/Target Behavior	Participants	Description	Outcome Measures	Results
Baker & Smith (1999)	Develop & implement research-based reading instruction	Glendale: N = 6 Lincoln: N = 13 Kindergarten, Title I, ELD, educational assist., SLP, principal.  School decision for grade level of implementation. Teachers required to participate.	Three year project. Researchers worked with teachers and presented examples of research-based curricula. Provided coaching if requested. Frequency and duration varied by location and teacher.	Teacher: Qualitative & quantitative measures of implementation and teacher impressions (interviews, classroom observations, & satisfaction survey). Student: Quantitative measures of phonemic awareness, alphabetic principle, language development, & literacy knowledge.	Teacher: Qualitative data provide evidence that instructional practices were implemented and sustained at varying levels. Student: ANOVA results indicate significant improvement for phonemic awareness and large effect sizes for both intervention groups at Glendale. Data indicate varying levels of improvement on other measures.
Bos, Mather, Narr, & Babur (1999)	Integrate explicit, (structured language approach) instruction into reading	Treatment Group: N = 11 Comparison Group: N = 17 (K-2 <sup>nd</sup> grades, ESL, Spec. Ed., remedial	2.5 weeks of instructional courses. Utilized video models implementing strategies. Participants kept	Teacher: Quantitative & qualitative measures of change in attitude and knowledge (The Teacher Attitudes of	Teacher: Repeated measures ANOVA results indicate significant positive change in teacher attitude toward explicit,

curriculum.	reading) Volunteered to participate. Selected based on availability of student outcome data.	journals and developed implementation plans. Coaching provided by project staff. Monthly follow-up meetings.	Early reading and Spelling [Deford, 1985] & Structure of Language adapted from [Lerner, 1997; Moats, 1994; & Rath, 1994], teacher ratings of course). Student: Quantitative measures of change in reading achievement (informal test of letter-sound knowledge and 3 measures from Woodcock-Johnson Tests of Achievement III)	structured language approach; no significant difference between groups on this measure; and no significant change in attitude toward implicit, whole-language approach; significant difference in knowledge about the structure of language; no significant difference between groups on this measure; consistent ratings of very valuable and extremely valuable on teacher ratings of course. Student: Two-way mixed design ANOVA results indicate significant time x group interactions; students with teachers in treatment group made greater gains across measures than students of teachers in control group.
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Dickson & Bursuk (1999)	Implement a tiered model for preventing reading failure. Teachers choose and implement a method for instruction on phonological awareness.	N = 5 (1 <sup>st</sup> grade, Title I, Spec.Ed.)  Decision made by principal and teachers to target 1 <sup>st</sup> grade reading instruction.	Varying amounts of pre-training on segmenting and blending instruction. Varying amounts of coaching and feedback provided by Spec. Ed. Teacher or project staff.	Teacher: Qualitative measures of level of implementation (interviews & classroom observations). Student: Quantitative measures of early literacy skills (Test Phonological Awareness-Early Elementary, Word Attack subtest of WRMT-R, and several DIBELS measures).	Teacher: Qualitative data indicate that teachers implemented chosen instructional methods and reported no difficulty with implementation. Student: mixed results on improvement in early literacy skills between phases of instruction, instructional method implemented, and tiers of interventions implemented ranging from negative to high, positive effect sizes.
Devlin-Scherer, Devlin-Scherer, Wright, Roger & Meyers (1997)	Change teachers' in-class behaviors to resemble classroom behaviors of teachers shown to have high achieving students.	Teacher Study Group (TSG): N = 97 Principal Study Group (PSG): N = 65 (Elementary & High School) 33 principals and supervisors.	TSG reviewed results of classroom observations (feedback) completed by principals in peer groups with a trainer & then completed peer observations. PSG reviewed results of classroom observations individually with the principal & then	Teacher: Quantitative measures of change in classroom behavior (Stallings Observation System [SOS]: compares classroom behavior with the classroom behaviors of teachers with high-achieving students on 49 variables, also	Teacher: On the SOS measures, both groups made changes in the desired direction on 39 variables, 18 were significant. ANOVA results indicate changes in the desired direction on 4 of the aggregate variables, with the TSG outperforming the PSG significantly on 2.

Fernandez (2005)	Teachers to develop pedagogical content knowledge & learn how to reason mathematically during instruction.	N = 4 (2 <sup>nd</sup> - 5 <sup>th</sup> grades) Volunteered to participate.	principal engaged in follow-up activities with the teachers.	measured performance on 5 aggregate variables suggested by research.	Teacher: Qualitative data suggest that participation allowed teachers to develop new pedagogical knowledge & provided opportunity to practice responding to unexpected challenges in teaching a lesson.
			Pre-training sessions provided by researchers. Teacher discussion groups on planning lessons (8 hrs. over several weeks). Two cycles of peer coaching (observe, feedback, teach/observe lesson again, feedback) with some participation by researchers.	Teacher: Qualitative measures of change in content knowledge & mathematical reasoning during instruction (discussions in feedback meetings videotaped and transcribed)	
Franke, Carpenter, Fennema, Ansell, & Behrend (1998)	Teachers to build on existing knowledge of student thought processes & implement Cognitively Guided Instruction (CGI) in mathematics instruction.	N = 3 (1 <sup>st</sup> - 2 <sup>nd</sup> grades) Chosen from a larger sample of 21 volunteer participants based on representative levels of change.	Pre-training workshops (frequency & duration unspecified) utilizing video models of students solving math problems. Followed by discussion & problem-solving. Informal	Teacher: Qualitative measures of changes in knowledge & instruction (interviews, observations, & conversations, & informal interactions). Coding scheme used to measure changes.	Teacher: Qualitative data provide evidence of teacher change at different levels.

observations by & conversations with research staff. Classroom observations by mentor teachers followed by conversations about assessment & lesson planning.

Franke, Carpenter, Levi, & Fennema (2001)

Determine degree of change sustained 4 years after participation in professional development.

N = 22  
Out of 26 that had participated in the larger professional development project between the years 1990-1993.

Teacher: Quantitative & qualitative measures of sustained change (interviews and coded classroom observations).

Teacher: Qualitative data provide evidence that all 22 teachers implemented Cognitively Guided Instruction to some degree at follow-up.

Gersten, Morvant, & Brengelman (1995)

Teachers to implement research-based practices in reading/language arts instruction & recognize the link between teaching behaviors & student

N = 12 (1<sup>st</sup>-6<sup>th</sup> grades)  
All volunteered to participate. 2 peer coaches selected by principal.

Cycles of peer coaching (process of observation, feedback, & planning) provided to general education classroom teachers by trained special education teachers & a member of the

Teacher: Qualitative measures of teacher change in instructional practice (audio taped meetings between teachers & coaches, logs & field notes of observations, semi-structured teacher

Teacher: Qualitative data provide evidence of teacher change at different levels.

performance.

interviews).

research team.  
Duration and frequency of coaching varied by participant, ranging from 3-30 weeks.

Hollingsworth, Johnson, & Smith (1998)

Teachers to increase knowledge, skills, & implementation of interdisciplinary active learning strategies.

Participant Group:  
N = 19  
Comparison Group:  
N = 19  
(2<sup>nd</sup> – 6<sup>th</sup> grades)

Workshops utilized live models of lessons being taught. Participants first observed & provided feedback on lessons taught. After whole-group & small-group training, during 2<sup>nd</sup> week were observed and provided verbal & written feedback on lessons taught. Were given post-workshop activities to implement in classroom. Participants invited to present their work at a convention during the year.

Teacher: Results of pooled variance t-tests indicate that the participant group perceived their knowledge and interdisciplinary learning skills to be significantly greater than the comparison group. No significant difference was found between groups on perceived implementation. Correlated t-tests indicate significant differences in the desired direction for participants on all three measures.

Jackson, Parratore, Chard, & Garnick (1999)	Implement & sustain "Early Intervention Project" for reading.	N = 8 (2 <sup>nd</sup> grade) 7 of the 8 required to participate in 120 hours of professional development for recertification.	Formal & informal meetings with researchers throughout the project. Provision of structured lesson plans & instructions for intervention implementation. Coaching provided by research staff.	Teacher: Qualitative measures of fidelity of intervention and implementation and perceived effectiveness of intervention (3 formal classroom observations, frequent informal observations, weekly teacher logs of instructional activities, interviews). Student: Quantitative measures of literacy skills (DIBELS probes, running records, & locally developed district-wide measure).	Teacher: Qualitative data indicate that teachers implemented the intervention as intended, reported the intervention was generally effective & reported that most students made progress. Student: data indicate increases in mean blending scores; mean accuracy scores on primer-leveled text; an increase in number of children approaching grade-level norms as evidenced by running records; and an increase in use of word-recognition strategies.
Kohler, Crilley, & Schiller (1997)	Implement new teaching approaches in mathematics instruction.	N = 4 (elementary) Asked to participate by Director of Instruction & Curriculum.	All-day in-service on direct instruction approach and integrated instructional	Teacher: Quantitative measures (multiple baseline single-case design) of	Teacher: Results indicate that teachers implemented instructional changes more in peer coaching

approach (IIA).  
 Baseline phase: all teachers implemented approach independently. Peer coaching phase: (staggered application for single-case design) 7 cycles of observations, discussion & performance feedback with suggestions for improvement.

implementation of integrated activities, observation of instructional processes, content of peer coaching processes, & satisfaction with integrated approach.

phase than in baseline & instructional changes occurred more on elements that were routinely discussed in coaching sessions; the content of coaching processes varied across teachers; instructional processes varied across teachers and indicated that processes were associated with instructional elements; varying levels of satisfaction were reported.

Consultation Reference	Goal/Target Behavior	Participants	Description	Outcome Measures	Results
Babinski & Rogers (1998)	Facilitate professional growth of beginning teachers.	N = 5 (3 <sup>rd</sup> -5 <sup>th</sup> grades)	12 consultee-centered consultation sessions focused on the problem solving process. Process involved taking turns presenting problems and group members helping each other through the steps of	Teacher: Qualitative measures of participants' impressions of the groups measured by individual interviews and written feedback.	Teacher: Qualitative data indicate overall participant satisfaction. Specifically, participants identified personal and professional benefits of social and emotional support, problem-solving skills, and constructing a personal

the problem solving process. Facilitators present to assist with process.

identity.

Noell, Witt, Gilbertson, Ranier, & Freeland (1997)	Implement reinforcement based intervention as intended for students referred for academic performance.	N = 3 (3 <sup>rd</sup> grade teachers and referred students) Selected based on referral concern.	First phase, consultation only (explanation of student assessment results, explanation of intervention, presentation of intervention effectiveness data, ) then added daily performance feedback (3-5 minute meeting each morning to present process and outcome data of intervention, discussion of steps missed as evidenced by review of student permanent products, student progress data, and suggestions for improvement) followed by	Teacher: Quantitative measure (multiple baseline, across participants design) of treatment integrity by review of permanent products generated by student completing each step in intervention. Student: Quantitative measure of percent correct on daily assignments in target academic area determined by analogue assessment.	Teacher: Data indicate that all teachers implemented the intervention with integrity for 2-4 days during consultation-only phase, then performance fell. All teachers increased treatment integrity after daily performance feedback was introduced. Differing levels of change and sustained implementation through the maintenance phase. Student: Differing levels of change in performance across phases. One student maintained performance levels across all phases, two increased performance from pre-
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Noell, Witt, LaFleur, Mortenson, Ranier, & LeVelle (2000)	Implement peer tutoring intervention for reading comprehension with accuracy.	N = 5 (elementary level & the students they referred)	Teacher training phase (description of intervention and intervention materials provided, first session observed by consultant and performance feedback and error correction provided when needed). No further contact during baseline. When intervention integrity data stabilized at low levels or trended downwards, daily follow up meetings (no data shared) were held. This was followed by daily meetings with added performance feedback (student outcome data and intervention implementation data). One participant	maintenance phase.	treatment to maintenance.
			Teacher: Quantitative measures of accuracy of implementation through permanent products. Student: Quantitative measure of performance on reading comprehension assessment.	Teacher: Results reveal varying degrees of implementation accuracy across conditions. 2 of the 5 improved implementation in follow up phase, 4 of the 5 improved after performance feedback was added, and 1 of the 5 improved after a discussion of an upcoming meeting. Student: Student performance varied across conditions, with performance increasing during participation in peer tutoring intervention.	

also took part in discussion about an upcoming meeting with parents and principal after low levels of implementation in both treatment phases. Final follow up session 4 weeks after conclusion of intervention.

Noell, Witt, Slider, Connell, Gatti, Williams, et al. (2005)	Implement intervention plans as designed for students referred for academic, behavioral, or combination of concerns.	N = 45 (K-5 <sup>th</sup> grades and students they referred)	Behavioral Consultation. Three different weekly follow-up procedures compared: brief interviews (Weekly), interviews emphasizing commitment to implementation (CE), and interviews with performance feedback (PFB).	Teacher: Quantitative measures of treatment integrity measured by permanent products generated by student completing each step in intervention. Teacher perceptions measured by the Intervention Rating Profile-15 (IRP-15; Martins, Witt, Elliot, & Darveaux, 1985) and the Consultant Rating Profile (CPR), developed by	Teacher: ANOVA results indicate significant differences between groups on level of implementation with the PFB group outperforming the other two groups; no significant difference between groups on perception of implementation, with generally high ratings given; no significant differences between groups on ratings of intervention acceptability with
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authors. generally high ratings given; and no significant differences between groups on ratings of consultants, with overall high rating given. Student: ANOVA results indicate significant differences between groups for student behavior change, with the PFB group exhibiting greater change; teacher ratings of severity, manageability, and tolerability of student behavior indicate lower mean ratings post-treatment with small effect sizes.

Student: Quantitative direct pre- & post-measure of target behavior, teacher ratings of severity, manageability, and tolerability of student behavior pre- & post-intervention.

Training Reference	Goal/Target Behavior	Participants	Description	Outcome Measures	Results
Borko, Mayfield, Marion, Flexer, & Cumo (1997)	Design and implement classroom-based performance assessments	N= 14 (3 <sup>rd</sup> grade from 3 different schools) Schools selected based on	Year-long weekly workshops conducted by educational researchers including written activates,	Teacher: Qualitative measures of change in assessment practices through interviews and coded	Teacher: Authors report teachers at all three schools made significant changes in their ideas and practices about

compatible with their instructional goals in mathematics and literacy.	willingness on part of district to wave standardized testing in schools for two years, central office personnel participation; and curriculum guidelines consistent with national guidelines; teachers included on volunteer basis.	manipulatives, and small-group discussion	transcripts of workshops.	<p>mathematics assessment and instruction, incorporated problem-solving activities, viewed student explanation as more central and developed scoring rubrics for open-ended tasks. No changes in commitment to the idea of a single correct answer were noted and most did not develop systems for keeping observational records.</p>
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<p>Borko, Davinroy, Bliem, &amp; Cumbo (2000).</p> <p>Teacher change in mathematics and literacy instruction and assessment.</p>	<p>N = 2 (participated in workshops in Borko et al., 1997 study)</p> <p>Chose to participate through the second year &amp; selected because of active participation in project and commitment to exploring change.</p>	<p>Monthly observations of math and literacy lessons and informal workshop sessions. Feedback provided after observations.</p>	<p>Teacher: Qualitative measure of change in mathematics instruction and assessment, and change in literacy instruction and assessment through classroom observation, written notes during informal workshops and teacher interviews.</p>	<p>Teacher: Qualitative data provide evidence of teacher change at different levels.</p>
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Caulfield-Sloan & Ruzicka (2005)	Teachers use higher-order questioning strategies in third grade science instruction.	Experimental Group: N = 14 Control Group: N = 13	One workshop. Participants viewed a video model of use of higher order questioning strategies in a science lesson. Participants were given a check sheet to record observations and comments and discussed these during the training. Participants were instructed to practice these skills after the workshop. Participants were observed teaching lessons.	Teacher: Qualitative measure of change in questioning strategies used through pre- and post-workshop classroom observations. Student: Quantitative measure of higher-order thinking responses obtained through scores on an open-ended rubric assessment.	Teacher: Qualitative data provide evidence that teachers in the experimental group increase the amount of higher-order questioning strategies and that these strategies elicited higher-order responses from students. Student: Rubric scores indicate that students of teachers in the experimental group had higher mean rubric scores than those of teachers in the control group. Chi-square analyses were also conducted and indicate that the differences in performance (frequencies of low and high scores on rubrics) between the groups was not due to chance.
Desjean-Perrotta & Buehler, (2000)	Increase science content knowledge.	N = 20 (elementary level)	Week-long workshops conducted in summer. Included hands-on activities,	Teacher: Quantitative and qualitative measures of perception of	Teacher: Specific quantitative data not formally reported. Authors report that data

Espinosa & Chen (1996)	Teacher to create more "constructivist" classrooms and use developmentally appropriate (multi-age) student grouping for instruction. Increase use of technology in the classroom.	N = 28 (K-6 <sup>th</sup> grades, mix of single- and multi-age classrooms; Spec. Ed, Phys. Ed., & Multimedia Specialist)	Three-hour workshops, 1 per month for the duration of the school year. Small groups based on grades taught. Components of workshops: "group networking time" presentation and discussion of topics; "team time" principals worked with teachers to make action plans; "technology training" introduction of	small group work and discussion, and expeditions to field sites. Participants kept journals to record reflections about process. Monthly follow-up meetings.	growth in content knowledge. Classroom observations and interviews to measure transfer of knowledge to classroom.	collection overall revealed that participants had met and exceeded project objectives (pre- and post-test data indicate content knowledge rose from 37% to as high as 209%). Classroom observations revealed teacher change in instructional practices.
					Teacher: Qualitative and quantitative measures of classroom quality, knowledge and attitudes about multi-age grouping, and technology use through The Primary Implementation Profile (PIP) Form (High/Scope, 1989), teacher interviews, and teacher journals.	Teacher: PIP results indicate all classrooms made significant improvement in physical environment, daily routine, and adult-child interactions, multi-age classrooms made significant improvement in daily routine, adult-child interactions, multi-age grouping and overall scale. Results indicate significant differences between single-age and multi-age classrooms on daily routine and total score scales. Teacher

technology terms and  
technology use.

interview data indicate  
fewer concerns about  
multi-age grouping post  
training; increase in  
computer use for  
professional  
development; and  
change in types of  
concerns expressed  
about technology use.  
Teacher journal data  
indicate differences in  
grade level taught and  
number of times a  
software package was  
tried (lower grade taught  
= more times tried) and  
number of times logged  
on to on-line  
information network  
(higher grade taught =  
more times logged on).

Hamilton & Richardson (1995)	Teachers to examine their beliefs and	Jones School: N = 7 Sumpter School: N = 5 (4 <sup>th</sup> -6 <sup>th</sup> )	Facilitator guided staff meetings for discussion of current	Teacher: Qualitative measures of change in beliefs and	Teacher: Qualitative data provide evidence of teacher change at
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practices in relation to current research on reading instruction.	grades) Schools chosen based on history of willingness to change and the absence of any other professional development program in place.	research and reflection on practices. Video recording of teacher behavior in the classroom then viewed by teacher and team of researchers to reflect on performance and identify areas for further consideration.	practice. Pre- and post-participation interviews; interviews with school principals pre- and post-participation regarding their observations of teachers; review of video-taped group sessions.	different levels with participants at Sumpter moving through the identified stages of change at a faster pace.
Hartshorne, R. (2005)	Increase teachers' science content knowledge.	Traditional: N = 19 Hypermedia: N = 19 Control: N = 19 (elementary teachers)	Three, weekly 2-hour workshops. Material related to sections on state-wide assessment with poor student performance. Two types of workshops presented, one contained materials in a workshop manual (traditional), one contained web-based resources in the Elementary Level Lessons in Physical Science (ELLIPS)	Teacher: ANCOVA results reveal significant increases in science content knowledge in both treatment groups over the control group; no significant differences between the treatment groups.

hypermedia  
environment  
(hypermedia).

Jasper & Taube (2004)	Enhance teachers' mathematical problem-solving skills.	N = 16 (3 <sup>rd</sup> -5 <sup>th</sup> grades)	Fifteen, 3-hour workshops conducted during summer. Included modeling of problem-solving strategies, small-group problem-solving practice, and whole-group discussions of 10 problem-solving strategies presented.	Teacher: Quantitative measure of problem-solving skills pre- and post-training. Qualitative measure of perceptions of implementation and impacts of implementation on student achievement.	Teacher: Paired t-test results indicate significant improvement in problem-solving skills. Qualitative data indicate improvement in problem-solving on open-ended items of pre- and post-test measure. Qualitative data provide evidence of teacher change in implementation and impact on student achievement at different levels.
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Lee, Hart, Cuevas, & Enders (2004)	Enhance elementary teachers' knowledge, beliefs, and practices related to science inquiry, science content, and content-specific teaching	N = 53 (3 <sup>rd</sup> -4 <sup>th</sup> grades, at six elementary schools). Schools selected based on demographic diversity criteria, all teachers at all schools included.	Instructional units and four full-day workshops including modeling how to implement instructional units, self-reflection, and shared feedback on experiences	Teacher: Qualitative and quantitative measures of change in knowledge, beliefs, and practices through focus group interviews, a questionnaire, and classroom observations.	Teacher: t-test results indicate significant differences in teacher beliefs on pre- and post-tests measuring the importance of science inquiry, knowledge of science inquiry (third and fourth grade); and science content
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strategies with students from diverse cultural and linguistic backgrounds.

knowledge (third grade). All had small effect sizes. Results indicate that there were no significant changes in instructional practice in any of the science constructs.

Gearhart, Saxe, Seltzer, Schlackman, Carter, Ching, Nasir, et al. (1999)	Implement curriculum units to increase student conceptual understanding of fractions. Increase knowledge of mathematics and assessment.	Integrating Mathematics Assessment (IMA) Group: N = 9 Support Group (SUPP): N = 7 Traditional (TRAD) N = 5 (elementary level mathematics teachers) Participants solicited through mailings. Volunteered and agreed to participate for 1 year and had history of using texts or state-adopted problem-solving units.	IMA: Five day summer workshop, 13 bi-weekly meetings in evenings and weekends during year. Engaged in hands-on learning activities, presented video models or written samples of student work, small group discussion and problem-solving guided by researchers. SUPP: No facilitator support (participated only to ensure same lessons as in IMA were focus), participants designed PD agenda: 9	Teacher: Quantitative measures of integrated assessment, conceptual issues with problem-solving procedures, and opportunities to for understanding concepts linked to uses of numerics through videotaped and coded lessons. Student: Quantitative measures of student learning on pre- and post test of knowledge of fractions. Test broken into computation and	Teacher: ANOVA results for Conceptual/Assessment Opportunity indicated significant differences between IMA-TRAD and SUPP-TRAD, with IMA and SUPP classrooms providing greater opportunities. ANOVA results for Numerics Opportunities indicated significant differences between IMA and SUPP; and SUPP and TRAD classrooms. SUPP classrooms had lower ratings than TRAD classroom, and IMA classrooms had higher ratings than SUPP
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TRAD members assigned based on use of skills-based text, assignment to IMA and SUPP by stratified random assignment procedure.	meetings, 1 full-day session, 8 monthly evening meetings. Discussion and sharing of ideas about curriculum units. TRAD: no professional development activities.	problem-solving components.	classrooms. Student: Evidence of relationship between Opportunity to Engage in Conceptual analysis and scores on problem-solving post-test with greater opportunities associated with higher scores. No relationship found between Conceptual/Assessment or Numerics opportunities and computation post-tests.
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Saxe, Gearhart, & Nasir (2001). Follow-up of Gearhart, et al. (1999)

IMA: 9  
SUPP: 8  
TRAD: 6

same

Student: Quantitative measure of understanding of fractions through pre- and post-test broken into computation and conceptual items.

Student: Within group measures show an increase on pre- and post-test mean scores in all classrooms on both components. ANCOVA results on conceptual scale indicated an effect for group with IMA classrooms having higher means than both SUPP and TRAD classrooms. ANCOVA

results for computation scale did not reveal an effect for group.

Lachance & Confrey (2003)	Build a professional community among math teachers to enable discussions about reforms to be made in courses they teach.	N= 13 (out of 18 total participants; high school mathematics) School chosen for participation based on 100% of math faculty agreeing to participate.	Two-week full-time class sessions, one follow-up session, structured as a 3-credit graduate course. Activities included working on problems from higher-level pre-calculus course with multi-media resources that overlapped with material to be taught in classrooms.	Teacher: Qualitative and quantitative measures of changes in teacher relationships and reaction to workshops through interviews, surveys, evaluation forms, portfolios of work samples, written reflections, and video monitoring of workshop sessions.	Teacher: Quantitative data indicate an overall positive response to the workshop with an average rating of 4.22 on a 5-point scale of 35 items; authors reported responses indicate improvement in professional relationships; Qualitative data also suggest perceived improvement in professional relationships.
McCutchen, Abbott, Green, Beretvas, Cox, Potter, et al. (2002)	Increase explicit instruction in phonological and orthographic awareness.	Experimental Group: N = 24 Control Group: N = 20 (K-1 <sup>st</sup> grades) Recruited through letters of invitation sent to principals of schools. Matched characteristics	Two-week, full day workshops. Three follow-up workshops throughout the school year. Instruction, hands-on activities and practice, group discussion. Participants formulated lesson plans and activities	Teacher: Quantitative measures of knowledge through pre- and post-test scores on the Informal Survey of Linguistic Knowledge (Moats, 1994; Moat & Lyon, 1996); Cultural	Teacher: Results from pre- and post-test scores on Moats survey indicate that teachers in experimental group increased their phonological knowledge; ANOVA results from kindergarten observations revealed

between groups.	related to phonological awareness, orthographic awareness, comprehension and reading-writing connections. Put in a portfolio format, each participant received a copy to use in the upcoming school year. Classroom observation and student assessment data shared with teachers.	Literacy Test (Riverside Publishing, 1989). Quantitative measures of teacher practice of skills in classroom through coded, structured classroom observation. Student Measures: Quantitative measures of kindergarten student learning through administrations of the Test of Phonological Awareness (TOPA) (Torgesen & Bryant, 1994); the Metropolitan Readiness Tests (MRT6) (Nurss & McGuavran, 1995); Gates-MacGinitie Reading Tests (MacGinitie & MacGinitie, 1989). Additional first grade measures of	that teachers in the experimental group spent significantly more time on explicit phonological activities; no significant differences were found between groups on comprehension instruction or on orthographic instruction activities; ANOVA results from first grade observations indicated that time spent on phonological activities decreased for both groups; experimental group teachers spent significantly more time on comprehension activities; and no significant difference between groups on time spent on orthographic activities. Results of Cultural Literacy Test were similar between groups. Student Outcomes: Kindergarten data
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spelling sub-test of Wechsler Individual Achievement Test (WIAT) (Wechsler, 1991) and a comprehension measure developed by authors of present study.

revealed no significant differences between groups on phonological awareness, listening comprehension and word reading measures, but did reveal significant differences between groups on the orthographic fluency measure, with the experimental group performing higher. First grade data revealed significant differences between groups on the phonological awareness, reading comprehension, reading vocabulary, spelling, and composition fluency measures with the experimental group performing higher. No significant difference was found between groups on the orthographic fluency measure.

Melber & Cox-Peterson (2005)	Increase science content and process knowledge, increase classroom science activities, increase awareness of museum resources.	N = 54 (elementary and secondary science)	Workshops conducted during the summer. Model A: 3-day workshop conducted at museum. Time split between "hands-on" activities and self-guided exploration of museum. All participants received instructional materials and instructional strategies to transfer activities to the classroom. Model B: 2-day workshop, one day at museum and one day at field site. Both included "hands-on" activities. Created classroom activities and explored model classroom activity ideas. Provided with instructional materials for classroom. Model C: 2-day workshop,	Teacher: Quantitative and measures of perceived content and process knowledge, enhanced instruction and classroom activities, knowledge of museum resources and satisfaction through questionnaires. Qualitative measures of changes in instruction and satisfaction through open-ended questionnaires and interviews.	Teacher: Results indicate significant changes in perceived content knowledge across all topics in all three models. Models B and C results indicate significant increase in process knowledge. Participants also reported significant knowledge gains in instructional strategies and classroom activities across all three models. Participants in Model A reported significant increase in knowledge of museum resources available to teachers. Satisfaction ratings indicate that participants gave higher mean satisfaction ratings to workshops than "most" workshops previously attended. All rated hands-on activities as most beneficial component. Follow-up questions 4-6 months
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<p>both at field site. Participated in hands-on activities and received materials to guide classroom instruction.</p>		<p>post-participation revealed participants reported applying instructional strategies and changing instruction in some way. Follow-up questions 2- years later revealed that participants still found workshops more helpful than other workshops attended.</p>	
<p>Nichols, Zellner, Rupley, Willson, Kim, Mergen, et al. (2005)</p>	<p>Increase knowledge and implementation of instructional reading strategies.</p>	<p>N = 33 (K-2<sup>nd</sup> grades) Seven of the 33 randomly selected to participate in follow-up study 3 years later.</p>	<p>Workshops conducted during the summer. Four weeks, total of 120 hours. Morning sessions consisted of whole-group presentations and small group work on constructing lessons. Afternoon sessions included guided instruction and supervised practice in applying reading strategies presented.</p>
<p>Teacher: ANOVA</p>	<p>Quantitative measures of familiarity with and reported and predicted use of instructional strategies through Reading Instructional Features Questionnaire (RIFQ) (Nichols, et al., 1998)</p>	<p>revealed varying degrees of reported implementation of instructional strategies.</p>	<p>Teacher: ANOVA results on reported use of the 14 instructional strategies presented indicate significant differences on 11. Follow-up interviews revealed varying degrees of reported implementation of instructional strategies.</p>
<p>administered pre- and post-training. Qualitative measures through individual</p>	<p>administered pre- and post-training. Qualitative measures through individual</p>	<p>administered pre- and post-training. Qualitative measures through individual</p>	<p>administered pre- and post-training. Qualitative measures through individual</p>

interviews three years post study.

Peressini & Knuth (1998)	Integrate discrete mathematics content into curricula.	N = 1 (selected for case study format; chosen out of 14 high school mathematics teachers who participated in the DMP)	The Discrete Mathematics Project (DMP). Two week summer workshop, online support, 4 follow-up sessions during school year, classroom observations. Workshop included problem-solving activities focused on participants as students/learners and teachers and large group discussion.	Teacher: Qualitative and quantitative measures of knowledge and implementation through survey, video of sessions, participant journals, training evaluation, post-test of discrete mathematics knowledge and classroom observations collected from all participants.	Teacher: Qualitative data presented on 1 case study participant. These data provide evidence of teacher change at different levels. Some observations indicated teaching strategies were implemented as presented in the workshop, some observations indicated strategies were not implemented. Quantitative data not specifically reported.
Stephens & Hartman (2004)	Increase knowledge about specific educational technologies and their application to instruction of mathematics to increase student understanding of concepts.	Cohort 1 (2000-2001): N = 17 Cohort 2 (2001-2002): N = 11 (secondary mathematics, varied teaching and technology experience)	"Teaching Mathematics With Technology Project". Two-week long workshop conducted in summer. Six after school follow-up workshops focused on one technology in detail. Cohort 1, online forum	Teacher: No specific measure for increased knowledge about specific educational technologies. Observation of participation in on-line forum.	Teacher: Observation of participation in on-line forum indicates that 5 out of 17 participants in Cohort 1 posted responses to the first prompt. No postings after that. Data indicate that Cohort 2 did exhibit increased participation over Cohort 1. Reported

Establish an online forum for teachers to communicate with each other as a means of continued professional development through inquiry and collaboration about topics in mathematics.	introduced at first follow up session, Cohort 2, first introduced at first summer workshop. Prompts provided by project staff to facilitate responses/discussion.	active participation in summer workshop activities and minimal participation during follow-up overall.
Swafford, Jones, & Thornton (1999)	Enhance pedagogy and mathematics content knowledge to impact instruction.	
	N = 48 (4 <sup>th</sup> -8 <sup>th</sup> grades) Volunteered to participate.	
	Three year program. Four-week courses in summer focus on mathematics content. Used problem-solving format and modeling. Eight hour seminars reviewing research on student cognition. Six half-day seminars on practices identified in Nations Council of Teachers of Mathematics (NCTM) standards discussed and	Teacher: Results reveal significant differences in content knowledge in all areas from pre-test to post-test; significant differences were found on perceptions of pedagogical knowledge on all 5 items relating to professional knowledge, 4 out of 5 items relating to confidence in teaching, and all 5 items relating to effectiveness in teaching mathematics from pre-test to post-test; significant

implementation suggestions provided. Between sessions, participants collaborated and videotaped and reflected on 2 lessons taught, kept a reflective journal.

differences were found in perceptions of classroom processes on problem-solving items, mathematical thinking and reasoning items, mathematical connections items, and on 2 out of 3 communication items. Qualitative data provide evidence of teacher change at different levels.

# Inquiry/Guided Action Research

Reference	Goal/Target Behavior	Participants	Description	Outcome Measures	Results
Christenson (2004)	Conduct research on and increase amount and quality of environmental education in the classroom.	N = 5 (elementary level) Part of larger professional development project, the Educators Collaborative Change	Year long, weekly meetings. Participants reviewed research on topic. Discussed how to fit ideas into the existing curriculum guidelines.	Teacher: Qualitative measures of attitudes toward teaching environmental issues, social studies, and science; views on multiple perspectives, school	Teacher: Qualitative data provide evidence of teacher change at different levels.

<p>Professional Development Site (ECC-PDS; Johnson, 1997). Chose to work together on this topic and agreed to allow researcher to document process.</p>	<p>Participants created lesson plans based on research and discussions, implemented plans and discussed implementation at next meeting.</p>	<p>district benchmarks, and benefits to students, through questionnaire, coding of discussions at meetings; participant journals; classroom observations.</p>
<p>Briscoe &amp; Wells (2001)</p>	<p>Develop research plan to investigate the use of portfolios as a means to assess science processes in student learning.</p>	<p>Teacher: Qualitative data provide evidence of teacher change at different levels.</p>
	<p>Action research involving problem-solving and reflection on practices. Weekly meetings and discussions with coauthor (professor of methods course) on process.</p>	<p>Teacher: Qualitative measures of change through field notes of meetings, participant journal, and excerpts from action research report.</p>

## APPENDIX D

### Elements of Strong Interventions Featured in Studies of Professional Development by Approach

	Frequent Opportunities to Respond	Contingencies for Accuracy & Performance	Use of Effective Direct Instruction Procedures	Error Correction & Feedback	Goal Setting & Progress Monitoring
<b>Training</b>					
Borko, Davinroy, Bliem, & Cumbo (2000)	X			X	
Borko, Mayfield, Marion, Flexer, & Cumo (1997)	X		X		
Caulfield-Sloan & Ruzicka (2005)	X		X		
Desjean-Perrotta & Buehler, (2000)	X		X		
Espinosa & Chen (1996)	X		X		
Gearhart, Saxe, Seltzer, Schlackman, Carter, Ching, Nasir, Fall, Bennett, Rhine, & Sloan (1999)	X		X		
[Saxe, Gearhart, & Nasir (2001) was a follow-up study]					
Hamilton & Richardson (1995)	X			X	
Hartshorne (2005)	X				
Jasper & Taube (2004)	X		X		
Lee, Hart, Cuevas, & Enders (2004)	X		X		
Lachance & Confrey (2003).	X	X	X		
McCutchen, Abbott, Green, Beretvas, Cox, Potter, et al. (2002)	X		X	X	
Melber & Cox-Peterson (2005)	X		X		

Nichols, Zellner, Rupley, Willson, Kim, Mergen, et al. (2005)	X		X		
	Frequent Opportunities to Respond	Contingencies for Accuracy & Performance	Use of Effective Direct Instruction Procedures	Error Correction & Feedback	Goal Setting & Progress Monitoring
Peressini & Knuth (1998)	X		X		
Stephens & Hartmann (2004)	X		X		
Swafford, Jones, Thornton, Stump, & Miller (1999)	X		X		
Coaching					
Baker & Smith (1999)	X		X	X	
Bos, Mather, Narr, & Babur (1999)	X		X	X	
Dickson & Bursuk (1999)	X			X	
Devlin-Scherer, Devlin-Scherer, Wright, Roger, & Meyers (1997)	X			X	
Fernandez (2005)	X			X	
Franke, Carpenter, Fennema, Ansell, & Behrend (1998)	X		X	X	
[Franke, Carpenter, & Levi, & Fennema (2001) was a follow-up study]					
Gersten, Morvant, & Brengelman (1995)	X			X	
Hollingsworth, Johnson, & Smith (1998)	X	X	X	X	
Jackson, Paratore, Chard, & Garnick (1999)	X		X	X	
Kohler, Crilley, & Shearer, & Good (1997)	X			X	
Consultation					
Babinski & Rogers (1998)	X				
Noell, Witt, Gilbertson, Ranier, & Freeland (1997)	X			X	

Noell, Witt, LaFleur, Mortenson, Ranier, & LeVelle (2000)	X					X	
Noell, Witt, Slider, Connell, Gatti, Williams, et al. (2005)	X					X	
Inquiry/Guided Action Research							
Briscoe & Wells (2001)	X		X				
Christenson (2004)	X						

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