Characteristics and Consequences of Adult Learning Methods and Strategies

Carol M. Trivette
Carl J. Dunst
Deborah W. Hamby
Chainey E. O'Herin

Abstract

The effectiveness of four adult learning methods (accelerated learning, coaching, guided design, and just-in-time training) constituted the focus of this research synthesis. Findings reported in *How People Learn* (Bransford et al., 2000) were used to operationally define six adult learning method characteristics, and to code and analyze the relationship between the six characteristics and the study outcomes (learner knowledge, skills, attitudes, and self-efficacy beliefs). The synthesis included 79 studies using either randomized controlled trials or comparison group designs (N = 3,152 experimental group participants and N = 2,988 control or comparison group participants). Results showed that all six adult learning method characteristics were associated with positive learner outcomes, but that learning methods and practices that more actively involved learners in acquiring, using, and evaluating new knowledge and practice had the most positive consequences. Results also showed that the adult learning methods were most effective when used with a small number of learners (< 30) for more than 10 hours on multiple occasions. Implications for professional training and technical assistance are described.

Introduction

The manner in which the characteristics of four different adult learning methods were associated with the acquisition and mastery of new knowledge or practice is the focus of this research synthesis. The four methods are *accelerated learning* (Meier, 2000; Molnar, 2001), *coaching* (Hargreaves & Dawe, 1990; Leat, Lofthouse, & Wilcock, 2006), *guided design* (Coscarelli & White, 1986; Wales & Stager, 1978), and *just-in-time training* (Davis, 2005; Rosen, 2005). Findings described in *How People Learn* (Bransford et al., 2000; Donovan, Bransford, & Pellegrino, 1999), a research review on the science of learning, were used to develop criteria that were used as the standards against which the four adult learning methods and strategies were judged.

The research synthesis was guided by a characteristics/consequences framework that relates variations in the presences of operationally-defined features of a practice to variations in study outcomes (Dunst & Trivette, in press; Dunst, Trivette, & Cutspec, 2007; Dunst, Trivette, & Watson, 2009). The focus of analysis is unpacking, disentangling, and identifying those characteristics of a practice that *matter most* in terms of explaining the relationship between the independent and dependent variables in studies constituting the focus of analysis. The process is similar to that proposed by Lipsey (1993) for unbundling the components or elements of an intervention or treatment to isolate the active ingredients of a method or procedure. The yield is a better understanding of the conditions that best explain *how* and in *what* manner an intervention or practice exerts an effect in one or more outcomes.

Background

Adult learning refers to a collection of theories and methods for describing the conditions under which the processes of learning are optimized (Merriam, 2001; Trotter, 2006; Yang, 2003). Knowles (1984) used the term *andragogy* to describe the assumptions of adult learning: Readiness-to-learn, self-directedness, active learner participation, and solution-centered. Nearly all adult learning methods and strategies include at least several of these elements. The four adult learning methods constituting the focus of this research synthesis include, to different degrees, the characteristics that Knowles et al. (1998) as well as others (Trotter, 2006; Yang, 2003) consider the principles of adult learning. The four methods were selected for analysis because they all have received considerable attention and their effectiveness has been assessed using either randomized controlled trials or comparison group designs.

Adult Learning Methods

Each adult learning method constituting the focus of analysis includes similar features as well as elements unique to each strategy. The following are brief descriptions of the four adult learning methods.

Accelerated learning. First called suggestopedia (Lozanov, 1978), this adult learning method includes procedures for creating a relaxed emotional state, an orchestrated and multi-sensory learning environment, and active learner engagement in the learning process (Meier, 2000). A relaxed emotional state includes relaxation and breathing exercises, suggestion, and a positive learning atmosphere. An orchestrated environment includes imagery, dramatic readings, instructional videos, and peripherals (posters and visual displays). Active learning includes plays or skits, role playing, practice exercises, group activities, and journal writing. Accelerated learning is considered a holistic adult learning method that is intended to promote creation (and not consumption), enhance retention, and quicken the learning process.

Coaching. "Coaching is a…method of transferring skills and expertise from more experienced and knowledgeable practitioners…to less experienced ones" (Hargreaves & Dawe, 1990, p. 230). This adult learning method includes procedures for joint planning and goal setting, coach information sharing and modeling, learner information gathering and practicing, analysis of and reflection on the learner's experiences, and coach feedback (Leat et al., 2006). Coaching is a learner driven process facilitated by a coach's encouragement and use of his or her knowledge and skills to promote learner understanding and use of newly acquired knowledge and skills (Gallacher, 1997). Coaching is conceptualized as a cyclic process that improves knowledge and skills, self-confidence, and collegial relationships as a result of ongoing coaching episodes.

Guided design. Guided design was developed to promote critical thinking and self-directed learning (Hancock, Coscarelli, & White, 1983). This adult learning method is characterized by a decision-making and problem solving process that includes procedures for using real world problems for mastering learning content using small-group or team processing and facilitator guidance and feedback (Wales & Stager, 1978). The procedure was first used to teach decision making skills to engineering students (Colvin, Kilmer, & Smith, 1972) but is now widely used in a number of fields that involve decision-making and problem solving (e.g., Goldberg & Shuman, 1984b; Turner & Bechtel, 1998; Yang, He, & Drueckhammer, 2001). The benefits of this adult learning method include higher-order problem solving and meta-cognitive thinking abilities.

Just-in-time training. Just-in-time training includes a number of different methods and strategies used in the context of real-life challenges and in response to learner requests for guidance or mentoring (Beckett, 2000). This adult learning method provides individualized, tailored training in response to a request specific to an immediate concern or need (Redding & Kamm, 1999). According to Brandenburg and Ellinger (2003), just-in-time training is "often conceived as anywhere, anytime learning that is just enough, just for me, and just in time" (p. 309). The key characteristics of this adult learning method include access to or provision of information needed to improve performance or complete a task, on-the-job use of the information or guidance, and the availability of input from a mentor, supervisor, or coach on an as-needed basis (Bersin & O'Leonard, 2005). The primary outcome of just-in-time training is context specific improvement of knowledge and performance.

How People Learn

Examination of the characteristics of the four adult learning methods finds that they share common features as well as have elements unique to each strategy. The extent to which the characteristics of the methods and strategies rather than the procedures per se account for learner outcomes was the focus of this research synthesis. This was accomplished by using the features of adult learning identified by Donovan et al. (1999) in a research review of how people acquire, learn, and master new material and information as benchmarks for developing operationally defined characteristics that were used to evaluate the effectiveness of the adult learning methods.

The research review conducted by Donovan et al. (1999) identified three key elements of the "science of learning." These were: (1) New material and information is more easily learned when it is related to existing learner knowledge and is relevant to the learner, (2) mastery of new material and information requires application of the knowledge in the context of a conceptual, procedural, or practical framework, and ongoing monitoring of learning and self-assessment of progress facilitates deeper understanding and continued application of new knowledge or practice. According to Bransford et al. (2000), teachers, trainers, instructors, etc. play a "critical role in assisting learners to engage their understanding, building on learners' understanding, correcting misconceptions, and observing and engaging with learners during the process of learning" (p. 238). These conditions, in various forms, define the key features and elements of the four adult learning meth-

ods constituting the focus of this research synthesis.

The Donovan et al. (1999) findings were used to identify six adult learning method characteristics, two for each adult learning element, and to code the studies in this research synthesis using these characteristics to determine the extent to which the presence of the characteristics were related to variations in study outcomes. Table 1 shows the characteristics that were the focus of analysis. The three main features were planning, application, and deep understanding. Planning included the methods and procedures for both: (1) Introducing new knowledge, material or practices and (2) illustrating and demonstrating the use of the knowledge, material or practices. Application included the methods and procedures for both: (1) Learner applied use of the knowledge, material or practices and (2) the evaluation of the outcome or consequence of application. Deep understanding included the methods and procedures for: (1) Engaging the learner in reflection on his or her learning experience and (2) self-assessment of knowledge and application mastery as a foundation for identifying new learning opportunities. The six characteristics are almost identical to those described by Graham and Wedman (1989) as the key features of effective adult learning practices.

A number of analyses were performed to identify which adult learning method characteristics and practices were associated with variations in learner outcomes. First, we assessed the extent to which the different adult learning method characteristics were related to the study outcomes. Second, the particular types of practices for each adult learning method characteristic were analyzed to determine which kinds of practices for each characteristic were related to the study outcomes. For example, six different practices were used for *Introducing New Information*, and the relative effectiveness of each of the practices was assessed in terms of the study outcomes. (The same was done for each of the adult learning method characteristics.) Third, we determined whether the relationships between the adult learning method characteristics and practices differed as a function of a number of moderator variables (e.g., length of training).

The main focus of analysis was the identification of those characteristics that could be used to inform changes and improvements in inservice training opportunities of adult learners being introduced and taught new knowledge or new practices. The characteristics identified as most important, however, have broad-based applicability to other types of learning or training.

Search Strategy

Studies that investigated the effectiveness of the four adult learning methods were identified by four searches, one for each method. Table 2 lists the search terms used to locate studies of each adult learning method. The terms used to identify studies of each adult learning method are ones that have at different times been used interchangeably to describe the learning methods. The search terms were used with *train*, *learn*, *educate*, or *instruct* as Boolean conditions. In each of the searches, the term *adult* was also used as a Boolean condition to limit the studies to adult learners.

Several searches had additional delimiters. For example, the Boolean NOT operator was used with coaching to screen out studies involving sports, athletics, personal trainer, and other types of practices that use some type of a coach. Similarly, the NOT operator was used with just-in-time training to screen out studies that included inventory, management, debugger, and other terms that involve the use of the phrase *just-in-time* to describe practices but were not adult learning methods.

Table 1

Characteristics of the Adult Learning Methods That Were the Focus of Analysis

Features/Characteristics	Definition
Planning	
Introduce	Engage the learner in a preview of the material, knowledge or practice that is the focus of instruction or training.
Illustrate	Demonstrate or illustrate the use or applicability of the material, knowledge or practice for the learner
Application	
Practice	Engage the learner in the use of the material, knowledge or practice.
Evaluate	Engage the learner in a process of evaluating the consequence or outcome of the application of the material, knowledge or practice.
Deep Understanding	
Reflection	Engage the learner in self-assessment of his or her acquisition of knowledge and skills as a basis for identifying "next steps" in the learning process.
Mastery	Engage the learner in a process of assessing his or her experience in the context of some conceptual or practical model or framework, or some external set of standards or criteria.

Table 2

Search Terms Used to Identify Studies of the Adult Learning Methods

Accelerated Learning	Coaching	Guided Design	Just-in-Time Training
Accelerated Learning	Coaching	Guided Design	Just in Time
Suggestopedia	Mentoring	Learning Strategies	Just-in-Time
Accelerative Learning	Co-Coaching	Participant Decision Making	Personnel Development
Active Learning	Collaborative Training	Problem Solving	Career Development
Hyperlearning			Employee Development
Superlearning			
Brain Compatible Learning			
Brain Compatible Teaching			

Sources

ERIC (Educational Resources Information Center), Psychological Abstracts (PsychInfo), Academic Search Elite, Business Source Elite, World CAT, Social Sciences Citation Index, InfoTRAC Expanded Academic ASAP, Medline, OCLC PapersFirst, and Dissertation Abstracts were searched to identify studies. These were supplemented by searches of Ingenta, Google Scholar, ABI/IFORM Global, the Cochrane Databases, and an EndNote library maintained by the Puckett Institute.

Hand searches of the reference sections of all retrieved journal articles, book chapters, and books were examined to identify additional studies. Journals dedicated to the adult learning methods were also reviewed to identify studies (e.g., *Journal of Accelerated Learning and Teaching; Coaching: An International Journal of Theory, Research and Practice*). Websites dedicated to the adult learning methods were also reviewed to identify additional studies (e.g., International Alliance for Learning; National Center for Guided Design). We also conducted Social Science Citation Index author searches of seminal papers and studies by individuals who either developed the different adult learning methods or are leaders in the use of the methods to identify additional investigations. These individuals included, but were not limited to, Georgi Lozanov and David Meier (accelerated learning), Joyce Showers and Frank Kohler (coaching), Samuel Colvin and Charles Wales (guided design), and DeLayne Hudspeth and Laura Dorsey (just-in-time training).

Inclusion Criteria

Studies were included if the: (1) Participants were adult learners (defined as post high school age), (2) sufficient information was included to code the use of the different adult learning method characteristics, (3) the adult learning method was compared to some control or contrasting condition, and (4) either a randomized controlled trial or comparison group design was used to evaluate the effectiveness of the adult learning methods.

Exclusion criteria. Studies were excluded if the participants were elementary or secondary school students, insufficient information was included about specific elements of the adult learning procedures, and pre-experimental or single participant research designs were used. Single participant design studies were excluded because they were only used for evaluating the effectiveness of coaching. A research synthesis of coaching that includes both group and single participant design studies is in the process of being completed.

Search Results

Seventy-nine (79) studies were located in 66 research reports. An investigation was considered a separate study in a single research report if two or more intervention groups in any one investigation examined the effects of different adult learning method characteristics. Thirty-two (32) studies investigated accelerated learning, 23 investigated coaching, 16 investigated guided design, and 8 investigated just-in-time training. Fifty-eight (58) of the studies used randomized control designs and 21 used non-equivalent comparison group designs.

Study Participants

Appendix A shows the study participants (learners), the settings in which the adult learning methods were implemented, and the knowledge or skill areas that were the focus of instruction or training. The 79 studies included 3,152 experimental group participants and 2,988 control or comparison group participants.

The learners included classroom teachers, student teachers, undergraduate students, graduate students, medical personnel, counselors, English-as-a-second-language learners, and business personnel (e.g., sales and customer service personnel). The settings in which the adult learning methods were implemented included college classrooms; elementary, junior and high schools; special education classrooms; hospitals and private physician practices; and various business and work settings. The learner outcomes in the studies included teaching practices, foreign language learning, nursing and medical practices, science and engineering, mathematics and statistics, economics, and rare vocabulary, among other outcomes.

Adult Learning Method Characteristics

Appendix B shows the length of training and the particular practices coded for each of the six adult learning method characteristics. The length of training ranged from one to over 100 hours. One third of the studies evaluated training provided between 1 and 10 hours, one third of the studies evaluated training between 11 and 40 hours, and one third of the studies evaluated training of more than 40 hours. The largest majority of studies (85%) provided training on multiple occasions, although the exact number of sessions was generally not reported.

Coding of the adult learning method characteristics showed that 76 studies included the introduction of some type of knowledge, material or practices, and 37 studies included the demonstration or illustration of some type of knowledge, material or practice. Fifty-eight (58) studies included some type of learner application, and 31 studies included some type of learner evaluation of their use of the knowledge, material or practices. Thirty-three (33) studies included some type of learner reflection, and 29 studies included some type of learner self-assessment of mastery.

Planning. Sixteen (16) different practices were used to introduce new knowledge or practices to the study participants which were subsequently grouped into six categories: (1) Class lectures, (2) warm-up exercises and pre-class quizzes, (3) self-instruction and out-of-class activities, (4) dramatic readings, (5) imagery, and (6) a combination of dramatic readings and imagery. There were 15 different methods used to illustrate or demonstrate application which were subsequently grouped into four categories: (1) Real life demonstrations, and real life demonstrations and role playing, (2) role playing (simulations, skits, plays), (3) instructional videos, and (4) learner informed lecture content. The latter included instructor incorporation of learner experiences into class lectures or the inclusion of results from pre-class exercises for illustrating the targeted content.

Application. Sixteen (16) different practices were used to engage the learners in the application of newly acquired information or material which were subsequently grouped into five categories: (1) Real life use of the knowledge or practice, (2) role playing (simulations, skits, plays), (3) real life demonstrations and role playing, (4) problem solving activities, and (5) games/writing exercises. Eight (8) different methods were used to have learners evaluate the consequences of application which were grouped into two categories: (1) Instructor assessment, review, and feedback on the learners' application and (2) learner review and self-assessment. The latter included either individual or group review and assessment of learner use of the targeted information, material, or practice.

Understanding. Four (4) different methods were used to engage learners in reflection on knowledge acquisition and practice application which were organized into three categories: (1) Performance improvement reviews, (2) journaling and behavioral suggestions, and (3) group reflection on instructor feedback. Performance improvement reviews involved joint learner and instructor discussions of learner application for the purpose of deciding "next steps" in the learning process. Journaling and behavioral suggestions involved strategies for engaging learners in self-reflection on their learning as a way of focusing their attention to "next steps." Group reflection involved learner processing of instructor feedback on application to promote deeper understanding of the learning topic.

Learner mastery was determined by: (1) self-assessment of personal strengths (and weaknesses) and (2) evaluation of learner performance against a set of standards or practice criteria. Both methods involved the same type of learner judgments of their own knowledge and performance in the context of some framework against which application was assessed. Self-assessment of learner strengths and weaknesses was done either individually or as a group in response to instructor feedback as a basis for self-assessing learner mastery. Learner assessment of mastery used *a priori* established standards or competencies as criteria against which learner knowledge and performance was assessed.

Study Outcomes

The outcomes listed in Appendix A (and also Appendix C below) were organized into four categories: (1) Knowledge, (2) skills, (3) learner attitudes, and (4) self-efficacy beliefs. Knowledge included learner mastery of course content, second language learning, memorization, job requirements, medical procedures, and other content. Skills included learner teaching methods, computer use, medical procedures, interviewing skills, job performance, and practitioner intervention capabilities. Learner attitudes included evaluation of the learning experience and satisfaction with the learning procedures. Class attendance and completion of the learner intervention were used as proxy measures of learner attitudes. Self-efficacy included learner judgments of their competence and confidence in their own abilities and perceived control in the ability to produce intended outcomes. Both standardization and investigator-developed measures were used to assess learner outcomes.

Synthesis Findings

Cohen's *d* effect sizes for the mean difference in the post-test study outcomes between the experimental groups and the control or comparison groups were used for assessing the effectiveness of the adult learning methods. The average Cohen's *d* was computed for each of the six adult learning method characteristics as well as type of practice for each characteristic to ascertain which characteristics and practices accounted for the largest between group differences. The average sizes of effect and the 95% confidence intervals for the mean effect sizes were used for substantive interpretation. A confidence interval not including zero indicates that the average effect size is significantly greater than zero at the .05 level (Hedges, 1994).

Appendix C includes the complete list of studies, the research designs, the comparisons that were made, the outcomes that constituted the focus of analysis, and the Cohen's

d for each outcome measure. The average effect size and 95% confidence interval (CI) for all studies and outcomes combined was .58 (CI = .45-.70). Each of the four adult learning methods were associated with positive post-test outcome differences between the experimental and control or comparison groups. The average effects sizes and 95% confidence intervals for the individual adult learning methods was .86 (CI = .41-1.31) for just-in-time training, .68 (CI = .47-.90) for coaching, .67 (CI = .39-.95) for guided design, and .35 (CI = .20-.51) for accelerated learning.

Omnibus Findings

Figure 1 shows the average effect sizes and 95% confidence intervals for each of the six adult learning method characteristics. What is shown is the average sizes of effects for all practice characteristics combined and for all outcomes measures combined.

Each of the adult learning method characteristics was moderately to highly related to the study outcomes. The average effect sizes for the six adult learning method characteristics ranged between .58 and .85, which indicates that there was one-half to one standard deviation difference between the experimental and control or comparison groups on the post-test outcome measures. The pattern of results show that the more actively involved the learners were in judging the consequences of their learning experiences (evaluate, reflection, & mastery), the stronger the relationship between the adult learning method characteristics and the study outcomes. The latter indicates the relative importance of active learner participation in learning new knowledge or practice, and learner engagement in judging his or her experience in learning and using new material.

Adult Learning Method Characteristics

Table 3 shows the results for the different practices used for each adult learning method characteristic. All of the methods, except a combination of imagery and dramatic readings for introducing new information, were significantly related to the study outcomes. The effects of the different adult learning method practices, however, were not the same as evidenced by the variability in the average effect sizes and 95% confidence intervals for the different practices for each adult learning method characteristic.

Introduction of the learning topic. Two methods proved to be the most effective in terms of introducing new knowledge, material or practices to the learners: (1) Out-of-class activities and self-instruction and (2) warm-up exercises and pre-class quizzes. Both practices actively involved learners in some type of exercise or task prior to instructor presentation or explanation of the learning topic as a means of introducing new information or practice. Classroom lectures were also significantly related to the study outcomes but not as strongly as active learner participation in having them introduced to the learning topic. Dramatic readings and imagery, either alone or in combination, had considerably smaller effects or no effect on learner outcomes.

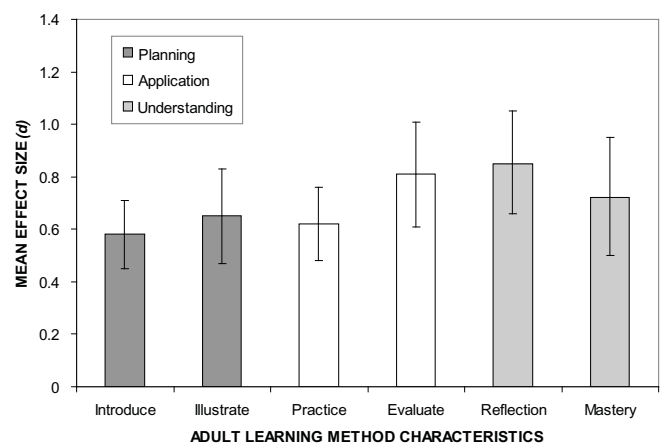*Illustrating the learning topic.* Two methods for illustrat-

Figure 1. Average effect size and 95% confidence intervals for the relationship between the six adult learning method characteristics and the study outcomes.

ing the use of new knowledge, material or practices were most strongly related to the study outcomes: (1) Instructor use of role playing or simulations and (2) incorporating learner input into demonstrating the applicability of the new knowledge, material or practices. A combination of real life demonstrations and role plays also proved to be an effective strategy for illustrating the learning topic. Passively watching an instructional video was effective but not nearly as effective as strategies more actively involving the learners in the illustrations.

Practicing the use of the learning topic. A combination of real life application and role plays proved to be the most effective method for engaging learners in the use of the newly-learned knowledge, material or practice. Problem solving tasks, real life application, and some type of learning game or writing exercises also proved to be highly effective for engaging learners in application. Role plays, simulations or skits were also significantly related to the study outcomes but not as strongly as the other methods for engaging learners in application.

Evaluating the consequences of application. The two methods for engaging learners in the evaluation of the consequences of their use of the new knowledge, material or practices proved equally effective: (1) Assessing learner strengths and weaknesses related to the application experience and (2) reviewing learner solutions to problems or answers to quizzes about their experiences.

Reflection on learner acquisition. Engaging the learner in a process of determining the next steps in learning targeted knowledge or practice was most effective (performance improvement). Engaging learners in journaling about their newly acquired knowledge and skills or positive learner feedback were also effective strategies for learner reflection. Group reflection on instructor feedback or peer feedback was an effective method of reflection as well.

Learner assessment of mastery. Actively involving learners in some type of self-assessment of their mastery of the learning topic or having learners use a set of standards or external criteria for assessing their learning were both strongly

Table 3
Effect Sizes for the Different Adult Learning Method Characteristics and Practices

Characteristics / Practices	Number		Mean Effect (*d*) Size	95% Confidence Interval
	Studies	Effect Sizes		
Introducing Information				
Pre-class exercises	9	9	1.02	.63-1.41
Out of class activities/self-instruction	12	20	.76	.44-1.09
Classroom/workshop lectures	26	108	.68	.47-.89
Dramatic readings	18	40	.35	.13-.57
Imagery	7	18	.34	.08-.59
Dramatic readings/imagery	4	11	.15	-.33-.62
Illustrate/Demonstrate				
Learner input	6	6	.89	.28-1.51
Role playing/simulation	20	64	.87	.58-1.17
Real life example/real life + roleplaying	6	10	.67	.27-1.07
Instructional video	5	49	.33	.09-.59
Practicing				
Real life application + role playing	5	20	1.10	.48-1.72
Problem solving tasks	16	29	.67	.39-.95
Real life application	17	83	.58	.35-.81
Learning games/writing exercises	9	11	.55	.11-.99
Role playing (skits, plays)	11	35	.41	.21-.62
Evaluation				
Assess strengths/weaknesses	14	48	.96	.67-1.26
Review experience/make changes	19	35	.60	.36-.83
Reflection				
Performance improvement	9	34	1.07	.69-1.45
Journaling/behavior suggestion	8	17	.75	.49-1.00
Group discussion about feedback	16	29	.67	.39-.95
Mastery				
Standards-based assessment	13	44	.76	.42-1.10
Self-assessment	16	29	.67	.39-.95

related to the study outcomes for assessing their performance.

Learner Outcomes

The average effect size between the adult learning methods (taken together) and all outcomes measures combined was $d = .58$, CI = .45-.70. The influences of the adult learning method characteristics on the four different outcome measures found that learner skill acquisition ($d = .66$, CI = .43-.88) and learner attitudes were most strongly related to the practices ($d = .68$, CI = .40-.96), followed by learner knowledge ($d = .49$, CI = .29-.69) and learner self-efficacy beliefs ($d = .47$, CI = .28-.65).

Figure 2 shows the average sizes of effects and 95% confidence intervals for the relationships between the six adult learning method characteristics and the four types of learner outcomes. In every analysis except one (learner evaluation and self-efficacy beliefs), the different adult learning method characteristics were significantly related to the measures in the four categories of study outcomes. Close inspection of
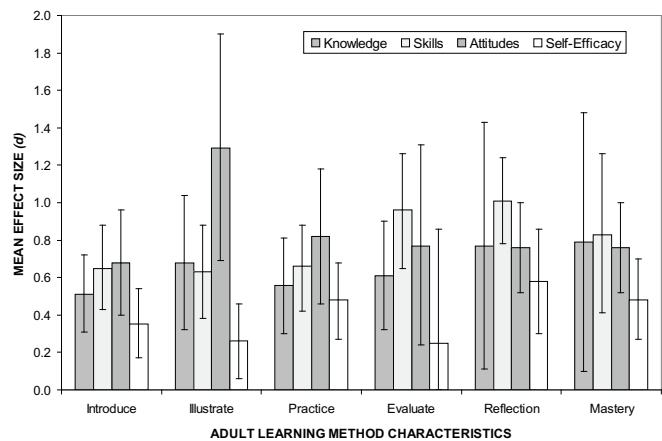

Figure 2. Average effect sizes and 95% confidence intervals for the relationships between the six adult learning method characteristics and four categories of study outcomes.

the findings, however, shows that the different adult learning method characteristics were differently related to the four study outcomes.

In almost every set of analyses, the six adult learning method characteristics were more strongly related to learner knowledge, skills, and attitudes compared to learner self-efficacy beliefs. Instructor illustration or demonstration of the targeted knowledge or practice was most strongly related to learner attitudes, whereas both learner evaluation of and reflection on the targeted knowledge or practice was more strongly related to learner skill acquisition compared to the other adult learning method characteristics.

Combined Influences of the Adult Learning Method Characteristics

The extent to which the simultaneous presence or use of the different adult learning method characteristics was differentially related to the study outcomes was determined by summing the number of characteristics per study and relating variations in this measure to learner outcomes. The presence of a characteristic was limited to only those practices that had effect sizes of .66 or higher (Table 3) in order to include those practices that were most strongly associated with positive learner consequences. The average number of characteristics per study was 2.18 (SD = 1.63, Range = 0 to 5) using this metric.

Figure 3 shows the results for the relationship between the number of practice characteristics and the learner outcomes. The patterns of findings are both clear and illuminating. The more adult learning method characteristics that were used, the larger the sizes of effects between the practices and the study outcomes. Studies where none or only one characteristic was used had little or no effect on learner outcomes. Studies that included 2, 3, or 4 characteristics were associated with an average effect size of about .75. In those cases where 5 of the 6 adult learning method characteristics were used, the average effect size was almost 1.25. The latter indicates that there is value-added benefits of adult learning methods that included multiple characteristics.

Moderators of the Effects of the Adult Learning Methods

Whether the relationships between the adult learning method characteristics were moderated by study, learner, setting, or intervention variables was assessed by constituting contrasting moderator variable groups and examining the sizes of effects of the independent and dependent measures for each moderator group. The study variables that were examined included research design and study sample size. One learner variable was examined: College students vs. non-college students (practitioners and English language learners). The effect of setting was examined by comparing the use of the adult learning methods in college classrooms vs. work settings. One intervention variable was examined as a moderator: Length of the learning experience.

Table 4 shows the result of the analyses. The relationships between the adult learning methods and the study out-
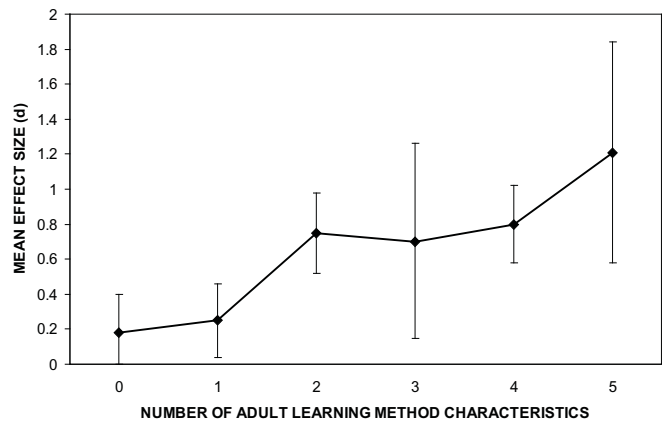
Figure 3. Average effect sizes and 95% confidence interval for the relationship between the number of the different adult learning method characteristics included in a study and the learner outcomes.

comes were all significantly related to learner benefits regardless of moderator variable. The strength of the relationships, however, were either similar or different depending on the moderator. The differences in the research designs, types of study, settings, and the learners constituting the focus of investigation did not influence the relationship between the independent and outcome variables. The relationship between the independent and dependent variables did differ as a function of both study sample size and length of training or instruction. The adult learning methods were more effective when used with a relatively small number of learners where the learning experience occurred for 10 or more hours.

Discussion

The extent to which the characteristics of four different adult learning methods were associated with improved learner outcomes was the focus of the research synthesis presented in this paper. Findings described in *How People Learn* (Bransford et al., 2000; Donovan et al., 1999) were used to operationally define six adult learning method characteristics and to code the use or presence of each characteristic in the studies included in the research synthesis (see also Graham, 1989). Results showed that all six characteristics were associated with more positive learner outcomes, and that adult learning method practices that more actively involved learners in using, processing, and evaluating their knowledge and skills as part of learning and mastering new information or practices were most effective. The optimal benefits of the adult learning methods were realized when the majority of the adult learning method characteristics were simultaneously used in an intervention, the intervention was implemented with a small number of learners, and the learning experience was implemented for more than 10 hours on different occasions.

The findings reported in this paper, taken together, are consistent with the *science of learning* described by Brans-

Table 4
Moderators of the Relationships Between the Adult Learning Method Characteristics and the Study Outcomes

Moderators	Number		Mean Effect (*d*) Size	95% Confidence Interval
	Studies	Effect Sizes		
Research Design				
Randomized Studies	58	175	.56	.41-.71
Comparative Group Studies	21	39	.64	.46-.82
Type of Study				
Published	43	81	.67	.41-.93
Unpublished	36	133	.52	.39-.64
Sample Size				
Small (9 to 34)	21	88	.76	.52-1.00
Medium (35 to 75)	30	74	.46	.28-.64
Large (76 to 300+)	25	49	.37	.21-.53
Learners				
College Students	46	83	.49	.33-.65
Practitioners	33	131	.63	.45-.81
Setting				
Classroom	62	167	.55	.41-.69
Work	15	42	.50	.33-.67
Length of Training				
1 to 10 Hours	24	57	.30	.10-.50
11 to 40 Hours	28	101	.73	.52-.95
40+ Hours	25	49	.66	.49-.82

ford et al. (2000) and Donovan et al. (1999). The findings are also consistent with the basic tenets of most adult learning theories (e.g., Knowles et al., 1998; Merriam, 1987; Trotter, 2006; Yang, 2003). Results from the research synthesis extend previous theory and research by isolating *what matters most* in terms of adult learning and the *conditions under which* the benefits of adult learning methods are likely to be optimally effective. According to Bransford et al. (2000), one difference between novice and expert learners is the ability to understand new knowledge or practice in the context of some conceptual or operational framework which leads to deeper understanding of the knowledge or practice. This is often not an explicit part of how training is implemented or instruction is provided, yet the indicators of deep understanding examined in this research synthesis were found to be the particular characteristics most strongly associated with learner outcomes (Table 3). Indeed, engaging learners in a process of self-assessment of their performance using some type of conceptual or operational framework proved to be a practice that resulted in the largest sizes of effects between the adult learning method characteristics and the learner outcomes.

A finding from the research synthesis that is not explicit but deserves comment is the fact that the results contradict tenets of some theories of learning and some adult learning methods that emphasize learner discovery as a key element of the learning process (e.g., Denis, 2008; Hanft, Rush, & Shelden, 2004; Ozuah, 2005; Quay, 2003); namely learner self-discovery in the absence of instructor guidance or feed-

back, a characteristic of individualistic constructivism (Smith & Ragan, 1999). According to Bransford et al. (2000),

> A common misconception [of] "constructionist" theories of knowing (that existing knowledge is used to build new knowledge) is that teachers should never tell [learners] anything directly, but, instead, should always allow them to construct knowledge for themselves. This perspective confuses a theory of pedagogy (teaching) with a theory of knowing…. There are times when [instructor guided learning] can work extremely well. (p. 11)

The latter was found to be the case in this research synthesis where the use of practices by instructors that facilitated learner knowledge acquisition and mastery helped learners assess their learning experience or judge their experience against some set of standards or criteria. Both practices proved an important element of optimal learner outcomes. Learners are not likely to become experts without instructors engaging them in a process of evaluating their experiences in the context of some framework, model, or operationally defined performance standards or expectations (e.g., Henry, McTaggert, & McMillan, 1992; Otis-Wilborn, Winn, & Ford, 2000). Learner discovery in the absence of guided instruction would therefore appear misguided.

It is also worth noting which adult learning method practices were not effective or were only minimally effective. Imagery and dramatic readings, alone or in combination, were generally ineffective for introducing new information

or practice to learners, and (passively watching) instructional videos was not the most effective approach for illustrating or demonstrating the application of new information or practice. The former (imagery and dramatic readings) are clearly not warranted as part of adult learning, whereas the latter (instructional videos) are perhaps effective when used in combination with other methods of illustration (e.g., learner input).

Implications for Practice

This research synthesis was conducted with the aim of identifying those adult learning method characteristics that could be used to inform changes and improvements in inservice training opportunities. The findings clearly have direct implications for this purpose. The results also have implications for other kinds of instruction with both adults and children. The implications for inservice training include the following:

- The six adult learning method characteristics constituting the focus of investigation provide guidance and structure for developing effective training and technical assistance programs and practices. The most effective training is likely to include learner experiences and opportunities in each of the three main components of adult learning (planning, application, and deep understanding–Table 1).
- The more adult learning method characteristics that are incorporated into a training program or practice, the more likely the learning experiences will have optimal positive benefits (Figure 3). The six characteristics each provide a different vantage point for promoting learner acquisition, use, and evaluation of new knowledge, material, or practice.
- The common element of adult learning methods that are most effective is *active learner participation* in the learning process. This is consistent with both the basic tenets of adult learning theory as well as research showing that active participation in learning new knowledge or practice has value-added benefits.
- Training opportunities are likely to be most effective if they include multiple learning experiences, large doses of learner self-assessment of their experiences, and instructor facilitated learner assessment of his or her learning against some set of standards or criteria (Table 3). The more opportunities a learner has to acquire and use new knowledge or practice, the more frequently those opportunities occur, and the more the learner is engaged in reflection on those opportunities using some external set of standards, the greater the likelihood of optimal benefits.
- To the extent possible, the training provided to learners should include a small number of participants where the training is provided on multiple occasions (Table 4). The fewer the number of learners, the more likely the instructor can give the necessary attention to the largest majority of learners. The more occasions the training is provided, the more opportunities for processing, reflection, and assessment of mastery.

These, as a minimum, are indicated as the focus of training based on the results reported in this paper.

The type of professional development (training, technical assistance, etc.) suggested by the findings in this research synthesis would necessitate changes in both the organization of training and the ways in which learners are involved in training opportunities. On the one hand, the results indicate that professional development includes multiple opportunities to learn and master new knowledge, material, and practices, and that any one opportunity includes varied experiences to learn, practice, and process the target of training. On the other hand, the results indicate that learners be as actively involved as possible in all aspects of the training experiences.

Further implications for professional development have to do with the role teachers and trainers play in promoting learning. Professional development as currently practiced falls along a continuum from one-time didactic workshops to discovery and experiential learning. Findings from our research synthesis "point to" a middle ground where professional development personal structure learning opportunities where learners are provided guidance, feedback, support, etc. to develop deeper understanding of the focus of learning. Findings reported in *How People Learn* (Bransford et al., 2000; Donovan et al., 1999) as well as elsewhere (e.g., Kirschner, Sweller, & Clark, 2006) indicate, as was found in our research synthesis, that guiding but not directing learning can promote and facilitate mastery of new knowledge or practice.

References

Anderson, L. D., & Render, G. F. (1987). The effects of Superlearning on retention/hypermnesia of rare English words in college students. *Journal of the Society for Accelerative Learning and Teaching, 12*(1, 2), 3-13. (ERIC Document Reproduction Service No. ED362045).

Baker, R. G. (1983). The contribution of coaching to transfer of training: An extension study. *Dissertation Abstracts International, 44*(11), 3260 (UMI No. 8403713).

Bartley, R. (1997). The effects of access to test item pools on student achievement and student study habits. *Dissertation Abstracts International, 58*(02), 0368A (UMI No. 9722593).

Bass, J. A. F. (1985). The effects of the suggestive-accelerative learning and teaching method and a structural analysis method on vocabulary learning. *Dissertation Abstracts International, 47*(01), 0135A. (UMI No. 8606022).

Beckett, D. (2000). Just-in-time training as anticipative action and as inferential understanding. In C. Symes (Ed.), *Working knowledge: Productive learning at work: Proceedings [of the] international conference*. Sydney, New South Wales, Australia: University of Technology, Research Centre for Vocational Education and Training.

Benedict, J. O., & Anderton, J. B. (2004). Applying the just-in-time teaching approach to teaching statistics. *Teaching of Psychology, 31*, 197-199.

Bersin, J., & O'Leonard, K. (2005). Performance support systems. *T + D, 59*(4), 67-69.

Best, J., & Ilyin, D. (1976). *Structure test: English language*. Rowley, MA: Newbury House.

Bing-You, R. G., Bertsch, T., & Thompson, J. A. (1998). Coaching medical students in receiving effective feedback. *Teaching and Learning in Medicine, 10*, 228-231.

Bodine, B. (1978). Development of biochemistry activities and laboratory experiences for nursing students based on clinical cases and using the guided design approach. *Dissertation Abstracts International, 39*(08), B3804. (UMI No. 7902809).

Bowman, C. L., & McCormick, S. M. (2000). Comparison of peer coaching versus traditional supervision effects. *Journal of Educational Research, 93*, 256-261.

Bradner, D. A. (1996). Accelerated learning methodology applied to a corporate training program. *Dissertation Abstracts International, 57*(06), 2318A. (UMI No. 9635313).

Brandenburg, D. C., & Ellinger, A. D. (2003). The future: Just-in-time learning expectations and potential implications for human resource development. *Advances in developing human resources, 5*, 308-320.

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

Bullard, B. D. (1986). Linear communications and signal processing: A guided-design approach. *Dissertation Abstracts International, 48*(03), A0634. (UMI No. 8713582).

Byrnes, H., Buck, K., & Thompson, I. (1989). *The ACTFL Oral Proficiency Interview: Tester training manual.* New York: American Council on the Teaching of Foreign Languages.

Cain, D. W., Rudd, L. C., & Saxon, T. F. (2007). Effects of professional development training on joint attention engagement in low-quality childcare centers. *Early Child Development and Care, 177*, 159-185.

Campbell, C. M. (1984, April). *Guided design in foreign language education: Its potential as a viable model, method, and conversation strategy.* Paper presented at the Annual Meeting of the Central States Conference on the Teaching of Foreign Languages, Chicago, IL. (ERIC Document Reproduction Service No. ED255058).

Campbell, C. M. (1986). The effects of guided design instruction on foreign language learning (Doctoral dissertation, Purdue University, 1986). *Dissertation Abstracts International, 47*(09), 3292A.

Caux, P. (1995). Accelerated learning in a beginning college-level French class at the University of Houston. *Journal of Accelerative Learning and Teaching, 20*, 1-26.

Ciba Foundation Symposium 33. (1975). *Parent-infant interaction.* Amsterdam: Associated Scientific.

Clerici-Arais, M., Maier, M., & Simkins, S. (2003, January). *Using just-in-time teaching techniques in the principles of economics course: A preliminary report.* Paper presented at the Allied Social Science Association Meetings, Washington, DC.

Coker, J. G., & Coker, H. (1982a). *Classroom observations keyed for effectiveness research: Observer training manual* (Rev. ed.). Atlanta: Georgia State University/ Carroll County Teachers Corps Project.

Coker, J. G., & Coker, H. (1982b). *Classroom observations keyed for effectiveness research: User's manual.* Atlanta: Georgia State University/ Carroll County Teachers Corps Project.

Colvin, S. T., Kilmer, D. A., & Smith, J. E. (1972). Guided design in environmental education. *Engineering Education, 62*, 907-908.

Confer-Owens, V. A. (1992, November). *Effectiveness of suggestive-accelerative learning techniques in teaching underprepared college freshmen.* Paper presented at the 21st annual meeting of the Mid-South Educational Research Association, Knoxville, TN. (ERIC Document Reproduction Service No. ED355236).

Coscarelli, W. C., & White, G. P. (1982). Applying the ID process to the guided design teaching strategy. *Journal of Instructional Development, 5*(4), 2-6.

Coscarelli, W. C., & White, G. P. (1986). *The guided design guidebook: Patterns in implementation.* Morgantown, WV: National Center for Guided Design.

Craven, H. H. (1990). The relationship of peer coaching to the frequency of use of effective instructional behaviors in inservice teachers in three selected junior high schools. *Dissertation Abstracts International, 51*(05), 1491A. (UMI No. 9028508).

Davis, N. (2005). Just in time support for educational leadership. In T. J. van Weert (Ed.), *Education and the knowledge society: Information technology supporting human development* (pp. 271-277). Boston: Kluwer Academic.

Denis, D. L. (2008). *Essential coaching.* Unpublished master's thesis, University of Pennsylvania, Philadelphia, PA. Retrieved January 23, 2009, from http://repository.upenn.edu/od_theses_msod/14/.

Dipamo, B., & Job, R. F. S. (1990). An evaluation of SALT (suggestive-accelerative learning and teaching) techniques. *Australian Journal of Educational Technology, 6*, 36-55.

Dipamo, B., & Job, R. F. S. (1991). A methodological review of studies of SALT (Suggestive-accelerative learning and teaching) techniques. *Australian Journal of Educational Technology, 7*, 127-143.

Dolan, J. G. (1999). A method for evaluating health care providers' decision making: The Provider Decision Process Assessment Instrument. *Medical Decision Making, 19*, 38-41.

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

Du Babcock, B. (1986). The effectiveness of the suggestopedic approach in teaching English as a second language to adult learners. *Dissertation Abstracts International, 47*(08), 2926A. (UMI No. 8624331).

Du Babcock, B. (1988). Suggestopedia: A suggestive-accelerated teaching technique in teaching English as a second language to adult learners. *Journal of the Society for Accelerative Learning and Teaching, 13*, 123-144.

Dunst, C. J., & Trivette, C. M. (in press). Using research evidence to inform and evaluate early childhood intervention practices. *Topics in Early Childhood Special Education.*

Dunst, C. J., Trivette, C. M., & Cutspec, P. A. (2007). *Toward an operational definition of evidence-based practices* (Winterberry Research Perspectives Vol. 1, No. 1). Asheville, NC: Winterberry Press.

Dunst, C. J., Trivette, C. M., & Watson, A. (2009). *Procedural manual for conducting a practice-based research synthesis*. Asheville, NC: Winterberry Press. (in preparation).

Earl, G. B. (1993). A comparison of accelerated learning and lecture methods on managerial retention and training transfer. *Dissertation Abstracts International, 54*(04), 2254B. (UMI No. 9324332).

Eastman, V. (1993). The effects of music and imagery on learning and attitudes in an industry training class. *Journal of the Society for Accelerative Learning and Teaching, 18*(3-4), 305-340. (ERIC Document Reproduction Service No. ED386910).

Educational Testing Service. (2008). *Test of English as a foreign language*. Princeton, NJ: Author.

Edwards, J. L. (1993). The effect of cognitive coaching on the conceptual development and reflective thinking of first year teachers. *Dissertation Abstracts International, 54*(03), A895-896. (UMI No. 9320751).

Edwards, J. L., Green, K. E., Lyons, C. A., Rogers, M. S., & Swords, M. E. (1998, April). *The effects of cognitive coaching and nonverbal classroom management on teacher efficacy and perceptions of school culture*. Paper presented at the annual meeting of the American Educational Research Association, San Diego, CA. (ERIC Document Reproduction Service No. ED439113).

Edwards, J. L., & Newton, R. R. (1995, April). *The effects of cognitive coaching on teacher efficacy and empowerment*. Paper presented at the annual meeting of the American Educational Research Association, San Francisco, CA. (ERIC Document Reproduction Service No. ED388654).

Gallacher, K. K. (1997). Supervision, mentoring, and coaching: Methods for supporting personnel development. In P. J. Winton, J. A. McCollum, & C. Catlett (Eds.), *Reforming personnel preparation in early intervention: Issues, models, and practical strategies* (pp. 191-214). Baltimore: Brookes. (ERIC Document Reproduction Service No. ED409664).

Garcia, Y. L. (1984). A suggestopedic study in second language acquisition using Hispanic non-English speaking adult learners. *Journal of the Society for Accelerative Learning and Teaching, 9*, 271-275.

Gattellari, M., Donnelly, N., Taylor, N., Meerkin, M., Hirst, G., & Ward, J. E. (2005). Does 'peer coaching' increase GP capacity to promote informed decision making about PSA screening? A cluster randomised trial. *Family Practice, 22*, 253-265.

Gavrin, A., Watt, J. X., Marrs, K., & Blake, R. E., Jr. (2004). Just-in-time teaching (JITT): Using the web to enhance classroom learning. *Computers in Education Journal, 14*(2), 51-60.

Gibson, S., & Dembo, M. H. (1984). Teacher efficacy: A construct validation. *Journal of Educational Psychology, 76*, 569-582.

Goker, S. D. (2006). Impact of peer coaching on self-efficacy and instructional skills in TEFL teacher education. *System, 34*, 239-254.

Goldberg, F. M., & Shuman, J. C. (1984a). Using guided design in a physical science course. *Journal of College Science Teaching, 13*, 350-355.

Goldberg, F. M., & Shuman, J. C. (1984b). Using guided design to help students learn about the energy problem. *Journal of College Science Teaching, 14*, 122-127.

Goldsmith, D., Davis, R. B., & Safran, C. (2000). Using just-in-time education to enhance the outcomes of care. In V. K. Saba (Ed.), *Nursing informatics 2000: One step beyond: The evolution of technology and nursing* (pp. 88-95). Auckland, New Zealand: Adis International.

Goldsmith, M., Lyons, L., & Freas, A. (2000). *Coaching for leadership: How the world's greatest coaches help leaders learn*. San Francisco: Jossey-Bass.

Graham, S. W. (1989). Enhancing the appeal of teletraining. *Journal of Instructional Technology, 16*, 183-191.

Hancock, B. W., Coscarelli, W. C., & White, G. P. (1983). Critical thinking and content acquisition using a modified guided design process for large course sections. *Educational and Psychological Research, 3*, 139-149.

Hancock, B. W., Jr. (1981). The effect of guided design on the critical thinking ability of college level administrative science students (Doctoral dissertation, Southern Illinois University, 1981). *Dissertation Abstracts International, 42*, 4275.

Hanft, B. E., Rush, D. D., & Shelden, M. L. (2004). *Coaching families and colleagues in early childhood*. Baltimore: Brookes.

Hargreaves, A., & Dawe, R. (1990). Paths of professional development: Contrived collegiality, collaborative culture, and the case of peer coaching. *Teaching and Teacher Education, 6*, 227-241.

Hedges, L. V. (1994). Fixed effects models. In H. Cooper & L. V. Hedges (Eds.), *The handbook of research synthesis* (pp. 285-299). New York: Russell Sage Foundation.

Henry, G. T., McTaggert, M. J., & McMillan, J. H. (1992). Establishing benchmarks for outcome indicators: A statistical approach to developing performance standards. *Evaluation Review, 16*, 131-150.

Hepner, F. S. (1989). Effects of guided design with and without teacher support on the accuracy in formulating nursing care plans and clinical problem solving by student nurses (Doctoral dissertation, University of Georgia, 1989). *Dissertation Abstracts International, 50*, 2336.

Hoggard, P. E. (1980). A guided design approach to teaching general chemistry. *Journal of Chemical Education, 57*, 299.

Hosack-Curlin, K. (1988, April). *Measuring the effects of a peer coaching project*. Paper presented at the annual

meeting of the American Educational Research Association, New Orleans, LA. (ERIC Document Reproduction Service No. ED303883).

Howard, J. R. (2004). Just-in-time teaching in sociology or how I convinced my students to actually read the assignment. *Teaching Sociology, 32*, 385-390.

Hunt, D. E., Butler, L. F., Noy, J. E., & Rosser, M. E. (1978). *Assessing conceptual level by the paragraph completion method*. Toronto: Ontario Institute for Studies in Education.

Hunter, M. (1983). Script taping: An essential supervisory tool. *Educational Leadership, 41*(3), 43.

Hursh, D. E., VanArsdale, C. B., Medio, F. J., McAvoy, R., & Wales, C. E. (1980). The effects of guided design on decision-making skills. In C. E. Wales (Ed.), *Proceedings for a national conference on teaching decision-making: Guided design* (pp. 6.1-6.5). Morgantown, WV: University of West Virginia.

Kirschner, P. A., Sweller, J., & Clark, R. E. (2006). Why minimal guidance during instruction does not work: An analysis on the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. *Educational Psychologist, 41*, 75-86.

Knowles, M. S. (Ed.). (1984). *Andragogy in action*. San Francisco: Jossey-Bass.

Knowles, M. S., Holton, E. F., III, & Swanson, R. A. (1998). *The adult learner: The definitive classic in adult education and human resource development* (5th ed.). Houston, TX: Gulf.

Landers, R. R. (1975). Evaluation of guided design in a technology course. *Dissertation Abstracts International, 36*(04), 2122A. (UMI No. 7521928).

Leat, D., Lofthouse, R., & Wilcock, A. (2006). Teacher coaching: Connecting research and practice. *Teaching Education, 17*, 329-339.

Lipsey, M. W. (1993). Theory as method: Small theories of treatments. *New Directions for Program Evaluation, 57*, 5-38.

Loucks, S. F., Newlove, B. W., & Hall, G. E. (1975). *Measuring levels of use of the innovation: A manual for trainers, interviewers, and raters*. Austin: University of Texas, Research and Development Center for Teacher Education.

Lozanov, G. (1978). *Suggestology and Suggestopedia: Theory and practice*. San Diego, CA: Lozanov Learning Institute of San Diego.

McGinty, R. L. (1988). *Robert's rules for optimal learning: Model development, field testing, implications!* Unpublished manuscript. (ERIC Document Reproduction Service No. ED296660).

Meier, D. (2000). *The accelerated learning handbook: A creative guide to designing and delivering faster, more effective training programs*. New York: McGraw Hill.

Merriam, S. B. (1987). Adult learning and theory building: A review. *Adult Education Quarterly, 37*, 187-198.

Merriam, S. B. (Ed.). (2001). *The new update on adult learning theory*. San Francisco: Jossey-Bass.

Metcalf, K. (1989). *An investigation of the efficacy of a research-based regimen of skill development on the instructional clarity of preservice teachers*. Unpublished doctoral dissertation, Ohio State University, Columbus, OH.

Meyer, J. (1997). Computerized slideshows: A modern extension of accelerated learning techniques. *Journal of Accelerated Learning and Teaching, 22*(3/4), 3-32.

Miller, W. R., & Mount, K. A. (2001). A small study of training in motivational interviewing: Does one workshop change clinician and client behavior? *Behavioral and Cognitive Psychotherapy, 29*, 457-471.

Miller, W. R., Yahne, C. E., Moyers, T. B., Martinez, J., & Pirritano, M. (2004). A randomized trial of methods to help clinicians learn motivational interviewing. *Journal of Consulting and Clinical Psychology, 72*, 1050-1062.

Molnar, D. (2001). *Accelerated learning*. Retrieved July 4, 2001 from http://online.nwtc.tec.wi.us/abyrne/html/courses/ptsb/accelerated.htm.

Moreno-Montalvo, M. M. (1987). Developing communicative competence through Suggestopedia techniques: An exploratory project with first year college ESL students. *Dissertation Abstracts International, 49*(01), 0084A. (UMI No. 8804267).

Newsome, G. G., & Tillman, M. H. (1990). Effects of guided design and lecture teaching strategies on knowledge recall and on problem-solving performance of student nurses. *Nursing Diagnosis, 1*(3), 89-96.

O'Connor, R., & Korr, W. S. (1996). A model for school social work facilitation of teacher efficacy and empowerment. *Social Work in Education, 18*(1), 45-51.

Otis-Wilborn, A. K., Winn, J. A., & Ford, A. (2000). Standards, benchmarks, and indicators. *Teaching Exceptional Children, 32*(5), 20-28.

Ozuah, P. O. (2005). First, there was pedagogy and then came andragogy. *Einstein Journal of Biology and Medicine, 21*, 83-87.

Peterson, J. E. (1995). A study of accelerated learning techniques in management skills training using videoconferencing as a delivery system (Doctoral dissertation, University of Oklahoma, 1996). *Dissertation Abstracts International, 57*, 1443.

Pierce, T., & Miller, S. P. (1994). Using peer coaching in preservice practica. *Teacher Education and Special Education, 17*, 215-223.

Portes, P. R., Best, S. M., Sandhu, D., & Cuentas, T. (1992). Relaxation training effects on anxiety and performance. *Journal of the Society for Accelerative Learning and Teaching, 17*(1&2), 117-148.

Preziosi, R. C. (1995, December 12). *A study comparing traditional versus accelerated learning instructional methods in productivity management education* (HS12-12-95). Ft. Lauderdale, FL: Nova Southeastern University.

Prichard, A. (1990). A SALT pilot study in college developmental mathematics. *Journal of the Society for Accelerative Learning and Teaching, 15*(1,2), 37-44. (ERIC Document Reproduction Service No. ED347789).

Pugach, M., & Johnson, L. J. (1995). Unlocking expertise

among classroom teachers through structured dialogue: Extending research on peer collaboration. *Exceptional Children, 62*, 101-110.

Purdom, D. M. (1984). A design for planning instruction. *Florida Journal for Supervision and Curriculum Development, 2*(2), 5-9.

Quay, J. (2003). Experience and participation: Relating theories of learning. *Journal of Experiential Education, 26*, 105-116.

Redding, J. C., & Kamm, R. M. (1999). Just-in-time staff development: One step to the learning organization. *NASSP Bulletin, 83*(604), 28-34.

Robinett, E. A. (1976). The effects of Suggestopedia in increasing foreign language achievement (Doctoral dissertation, Texas Tech University, 1975). *Dissertation Abstracts International, 36*, 7217A.

Rosen, D. (2005). Just-in-time instruction: Supporting teacher education candidates developing technology skills. *Technology and Teacher Education Annual, 2*, 1221-1223.

Schiffler, L. (1986). Music in teaching French by Suggestopaedia. In R. Freudenstein & C. V. James (Eds.), *Confidence through competence in modern language learning: Selection of papers from the world conference of the International Federation of Modern Language Teachers* (CILT Reports and Papers 25) (pp. 117-128). London, UK: Centre for Information on Language Teaching and Research. (ERIC Document Reproduction Service No. ED346733).

Schuster, D. H. (1976). A preliminary evaluation of the suggestive-accelerative Lozanov method in teaching beginning Spanish. *Journal of Suggestive-Accelerative Learning and Teaching, 1*, 41-47.

Sears, J. T. (1973, March). *Measurement of affective behavior changes in students in an innovative engineering course: Final report*. Morgantown, WV: West Virginia University (ERIC Document Reproduction Service No. ED073948).

Shaw, K. D. (1980). Guided design in the microcomputer and accounting systems course: An experimental approach. In C. E. Wales (Ed.), *Proceedings for a national conference on teaching decision-making: Guided design* (pp. 21.1-21.8). Morgantown, WV: University of West Virginia.

Showers, B. (1982, December). *Transfer of training: The contribution of coaching*. Eugene: University of Oregon, College of Education, Center for Educational Policy and Management (ERIC Document Reproduction Service No. ED231035).

Showers, B. (1984, October). *Peer coaching: A strategy for facilitating transfer of training*. Eugene: University of Oregon, College of Education, Center for Educational Policy and Management (ERIC Document Reproduction Service No. ED271849).

Simkins, S., & Maier, M. (2004). Using just-in-time teaching techniques in the principles of economics course: Draft [Electronic version]. *Social Science Computer Review, 22*, 444-456.

Simmons, J. M., Sparks, G. M., Starko, A., Pasch, M., & Col-

ton, A. (1989). *Pedagogical language acquisition and conceptual development taxonomy of teacher reflective thought: Interview and questions format*. Ypsilanti, MI: Collaboration for the Improvement for Teacher Education, Eastern Michigan University.

Slunt, K. M., & Giancarlo, L. C. (2004). Student-centered learning: A comparison of two different methods of instruction. *Journal of Chemical Education, 81*, 985-988.

Smith, P. L., & Ragan, T. J. (1999). *Instructional design* (2nd ed.). Upper Saddle River, NJ: Prentice-Hall.

Snyder, S. (1980). Guided design in nursing: An effective teaching process. In C. E. Wales (Ed.), *Proceedings for a national conference on teaching decision-making: Guided design* (pp. 28.1-28.6). Morgantown, WV: University of West Virginia.

Soodak, L. C., & Podell, D. M. (1996). Teacher efficacy: Toward the understanding of a multi-faceted construct. *Teaching and Teacher Education, 12*, 401-411.

Sparks, G. M. (1986). The effectiveness of alternative training activities in changing teaching practices. *American Educational Research Journal, 23*, 217-225.

Spielberger, C. D., Gorusch, R. L., & Lushene, R. E. (1970). *STAI manual for the State-Trait Anxiety Inventory ("self-evaluation questionnaire")*. Tallahassee, FL: Consulting Psychologists Press.

Stahl, N. A., Brozo, W. G., Smith, B. D., Henk, W. A., & Commander, N. (1991). Effects of teaching generative vocabulary strategies in the college developmental reading program. *Journal of Research and Development in Education, 24*, 24-32.

Stallings, J. (1979). *How to change the process of teaching reading in secondary schools*. Menlo Park, CA: Stanford Research Institute International.

Stein, B. L., Hardy, C. A., & Totten, H. L. (1982). The use of music and imagery to enhance and accelerate information retention. *Journal of the Society for Accelerative Learning and Teaching, 7*, 341-355.

Streufert, E. H. C. (1985). The effects of coaching, a follow-up component of inservice training, on transfer of training to teacher competency, teacher performance, and student outcomes. *Dissertation Abstracts International, 45*(10), 3044A.

Trotter, Y. D. (2006). Adult learning theories: Impacting professional development programs. *Delta Kappa Gamma Bulletin, 72*(2), 8-13.

Turner, S. L., & Bechtel, G. A. (1998). The effectiveness of guided design on ethical decision making and moral reasoning among community nursing students. *Nursing-Connections, 11*(1), 69-74.

Wales, C. E., & Stager, R. A. (1978). *The guided design approach*. Englewood Cliffs, NJ: Educational Technology Publications.

Weil, M., Gullion, C., & Cole, D. (1971). *The teacher's innovator skills and strategies interaction system*. Unpublished manuscript.

Wynn, M. J. (1987). Student teacher transfer of training to the classroom: Effects of an experimental model. *Dis-*

sertation Abstracts International, 47(08), 3008A. (UMI No. 8627238).

Yang, B. (2003). Toward a holistic theory of knowledge and adult learning. *Human Resource Development Review, 2*, 106-129.

Yang, W., He, H., & Drueckhammer, D. G. (2001). Computer-guided design in molecular recognition: Design and synthesis of a glucopyranose receptor. *Angewandte Chemie, 40*, 1714-1718.

Zeiss, P. A. (1984). A comparison of the effects of Super-Learning techniques on the learning of English as a second language. *Journal of the Society for Accelerative Learning and Teaching, 9*(2), 93-101. (ERIC Document Reproduction Service No. ED267610).

Authors

Carol M. Trivette, Ph.D., and Carl J. Dunst, Ph.D., are Co-Directors and Research Scientists at the Orelena Hawks Puckett Institute in Morganton and Asheville, North Carolina. Deborah W. Hamby, M.P.H., is a Research Analyst and and Chainey E. O'Herin, B.A., is a Research Assistant at the Puckett Institute.

Appendix A

Number of Study Participants and Learner Characteristics and Outcomes

Study	Sample Size[a]		Adult Learning Method[c]	Learner Description	Setting	Learner Outcome
	E	C				
Anderson & Render (1987) Study 1	56	54	AL	Undergraduate students	College classroom	Rare vocabulary
Anderson & Render (1987) Study 2	23	54[b]				
Anderson & Render (1987) Study 3	26	54[b]				
Anderson & Render (1987) Study 4	20	54[b]				
Baker (1983)	4	7	CH	Teachers	Junior high school	Teaching models
Bartley (1997)	24	26	JIT	Undergraduate students	College classroom	Microcomputers
Bass (1985) Study 1	19	20	AL	Undergraduate students	College classroom	Rare vocabulary
Bass (1985) Study 2	19	20[b]				
Benedict & Anderton (2004)	56	67	JIT	Undergraduate students	College classroom	Statistics
Bing-You et al. (1998)	36	41	CH	Medical students	Hospital	Effective feedback from residents/doctors
Bodine (1978)	75	62	GD	Undergraduate students	College classroom	Biochemistry
Bowman & McCormick (2000)	16	16	CH	Pre-service teachers	Elementary school	Instructional strategies and pedagogical models
Bradner (1996)	36	26	AL	Customer service	New employee orientation workshop	Telephone customer service
Bullard (1986)	12	11	GD	Undergraduate students	College classroom	Electrical engineering
Cain et al. (2007)	24	24	CH	Teachers	Preschool	Joint attention techniques
Campbell (1984)	18	18	GD	Undergraduate students	College classroom	French
Campbell (1986)	69	61	GD	Undergraduate students	College classroom	Spanish
Caux (1995)	12	11	AL	Undergraduate students	College classroom	French
Clerici-Arias et al. (2003)	42	42	JIT	Undergraduate students	College classroom	Economics
Coscarelli & White (1982)	321	228	GD	Undergraduate students	College classroom	Production/operation management
Craven (1990) Study 1	9	4	CH	Teachers	Junior high school	Effective instructional practices
Craven (1990) Study 2	5	4[b]				
Dipamo & Job (1990, 1991)	12	12	AL	Undergraduate students	College classroom	Rare vocabulary
Du Babcock (1986, 1988) Study 1	20	320	AL	ESL students	Community college classroom	English as a Second Language
Du Babcock (1986, 1988) Study 2	14	320[b]				
Earl (1993)	33	31	AL	Managers	Managerial workshop	Management skills
Eastman (1993)	41	40	AL	Accountants	Industry training class	Tax reporting
Edwards (1993)	16	19	CH	Teachers	Preschool, elementary, junior high or secondary school	Cognitive coaching
Edwards et al. (1998)	240	100	CH	Teachers	Elementary, junior high or secondary school	Cognitive coaching
Edwards & Newton (1995)	44	88	CH	Teachers	Public school	Cognitive coaching

Study	Sample Size[a]		Adult Learning Method[c]	Learner Description	Setting	Learner Outcome
	E	C				
Garcia (1984	40	40	AL	ESL students	Community classroom	English as a Second Language
Gattellari et al. (2005)	135	140	CH	Physicians	Medical office	PSA screening practices
Gavrin et al. (2004)	NR	NR	JIT	Undergraduate students	College classroom	Physics
Goker (2006)	16	16	CH	Teachers	Not reported	Instructional practice
Goldberg & Shuman (1984a)	53	80	GD	Undergraduate students	College classroom	Physical science
Goldberg & Shuman (1984b)	57	41	GD	Undergraduate students	College classroom	Physical science
Goldsmith et al. (2000)	98	97	JIT	Patients	Hospital	Pain management
Hancock et al. (1981, 1983)	321	228	GD	Undergraduate students	College classroom	Production management
Hepner (1989)	21	20	GD	Undergraduate students	College classroom	Nursing
Hoggard (1980)	30	NR	GD	Undergraduate students	College classroom	Chemistry
Hosack-Curlin (1988)	12	12	CH	Teachers	Elementary school	Writing process instruction
Howard (2004)	60	112	JIT	Undergraduate students	College classroom	Sociology
Hursh et al. (1980)	26	24	GD	Undergraduate students	College classroom	Engineering
Landers (1975)	27	15	GD	Undergraduate students	College classroom	Engineering
McGinty (1988)	16	19	AL	Undergraduate students	College classroom	Administrative policy business
Meyer (1997) Study 1	20	11	AL	Undergraduate students	College classroom	Criminal justice – American courts system
Meyer (1997) Study 2	14	6	AL	Undergraduate students	College classroom	Research methods and statistics
Miller et al. (2004) Study 1	33	23	CH	Counselors	Human services and health office	Motivational interviewing technique
Miller et al. (2004) Study 2	34	23[b]				
Miller et al. (2004) Study 3	26	23[b]				
Moreno-Montalvo (1987)	31	28	AL	ESL students	College classroom	English as a Second Language
Newsome & Tillman (1990)	25	25	GD	Undergraduate students	College classroom	Nursing
O'Connor & Korr (1996)	9	9	CH	Teachers	Elementary school	Teacher ability to address students' need
Peterson (1996)	24	18	AL	Managers	Cost management workshop	Cost management
Pierce & Miller (1994)	14	15	CH	Pre-service teachers	Special education classroom	Teaching practices
Portes et al. (1992)	81	74	AL	Undergraduate students	College classroom	Education psychology & mathematics
Preziosi (1995) Study 1	33	37	AL	Graduate students	College classroom	Management productivity/ improvement
Preziosi (1995) Study 2	35	34				

Appendix A, continued

Study	Sample Size[a] E	C	Adult Learning Method[c]	Learner Description	Setting	Learner Outcome
Prichard (1990)	28	21	AL	Undergraduate students	College classroom	Math
Pugach & Johnson (1995)	95	96	CH	Teachers	Not reported	Classroom problem solving
Robinett (1976) Study 1	66	18	AL	Undergraduate students	College classroom	Spanish
Robinett (1976) Study 2	14	18[b]				
Schiffler (1986) Study 1	18	18	AL	Undergraduate students	College classroom	French
Schiffler (1986) Study 2	11	11	AL	Undergraduate students	College classroom	French
Schuster (1976)	19	32	AL	Undergraduate students	College classroom	Spanish
Sears (1973)	16	19	GD	Undergraduate students	College classroom	Thermodynamics kinetics
Shaw (1980)	21	NR	GD	Undergraduate students	College classroom	Not reported
Showers (1982)	9	8	CH	Teachers	Junior high school	Teaching models
Showers (1984)	10	5	CH	Teachers	Junior high school	Teaching models
Simkins & Maier (2004)	18	19	JIT	Undergraduate students	College classroom	Macroeconomics
Slunt & Giancarlo(2004)	66	185	JIT	Undergraduate students	College classroom	Organic chemistry
Snyder (1980)	33	20	GD	Undergraduate students	College classroom	Medical surgical procedures
Sparks (1986)	6	6	CH	Teachers	Junior high school	Time use
Stahl et al. (1991) Study 1	20	20	AL	Undergraduate students	College classroom	Rare vocabulary
Stahl et al. (1991) Study 2	20	20[b]				
Stein et al. (1982)	18	24	AL	Graduate students	College classroom	Rare vocabulary
Streufert (1985)	13	16	CH	Teachers	Elementary school	Reading program refresher
Wynn (1987)	11	11	CH	Pre-service teachers	Elementary school	Teaching methods
Zeiss (1984)	7	7	AL	ESL students	College classroom	English as a Second Language

[a] E = Experimental group and C = Control or comparison group.

[b] Indicates that the same control or comparison group was used as the contrast for the different experimental groups.

[c] AL = Accelerated learning, CH = Coaching, GD = Guided design, and JIT = Just-in-time training.

Appendix B

Adult Learning Method Practice Characteristics

Study	Length of Training (Hrs)	Planning		Application		Understanding	
		Introduce	Illustrate	Practice	Evaluate	Reflection	Mastery
Anderson & Render (1987)	< 1	Dramatic reading	NR[a]	NR	NR	NR	NR
Baker (1983)	26	Lecture	Role play	Real life	Discussion of strengths and weaknesses	Performance improvement	NR
Bartley (1997)	48	Quizzes to probe knowledge prior to lecture	NR	NR	NR	NR	NR
Bass (1985)	11	Imagery and dramatic reading	NR	Learner participation in word games or creative writing	Learners check their own quiz answers	NR	NR
Benedict & Anderton (2004)	48	Quizzes to probe knowledge prior to lecture	Answers from quizzes incorporated into class lectures	NR	NR	NR	NR
Bing-You et al. (1998)	2	Lecture	Instructional video	Role play and real life	NR	NR	Skills based assessment
Bodine (1978)	8	Lecture	NR	Realistic problem-solving situations	Review solution that group or individual provided and make corrections to proposed solution	Group reflection on feedback	Group assesses feedback received from instructor
Bowman & McCormick (2000)	21	Lecture	Role play	Role play and real life	NR	Performance improvement	Skills based assessment
Bradner (1996)	64	Dramatic reading and peripherals	Real life	Skits, plays and role play	NR	NR	NR
Bullard (1986)	16	Learner self-instruction	NR	Realistic problem-solving situations	Review solution that group or individual provided and make corrections to proposed solution	Group reflection on feedback	Group assesses feedback received from instructor
Campbell (1984)	9	Learner self-instruction	NR	Realistic problem-solving situations	Review solution that group or individual provided and make corrections to proposed solution	Group reflection on feedback	Group assesses feedback received from instructor

Appendix B, continued

Study	Length of Training (Hrs)	Planning		Application		Understanding	
		Introduce	Illustrate	Practice	Evaluate	Reflection	Mastery
Campbell (1986)	48	Learner self-instruction	NR	Realistic problem-solving situations	Review solution that group or individual provided and make corrections to proposed solution	Group reflection on feedback	Group assesses feedback received from instructor
Caux (1995)	80	Peripherals	NR	NR	NR	NR	NR
Clerici-Arias et al. (2003)	50	Activity to complete and submit prior to lecture	Answers from quizzes incorporated into class lectures	Learner participation in guided discussion or activities based on responses to pre-class assignments	Discussions of strengths and weaknesses	NR	NR
Coscarelli & White (1982)	48	Learner self-instruction	Simulation	Realistic problem-solving situations	Review solution that group or individual provided and make corrections to proposed solution	Group reflection on feedback	Group assesses feedback received from instructor
Craven (1990) Study 1	16	Lecture	Instructional video	Real Life	Discussions of strengths and weaknesses	NR	NR
Craven (1990) Study 2	11	Lecture	Instructional video	Real life	NR	NR	NR
Dipamo & Job (1990, 1991)	< 1	Imagery	Real life	Learner participation in word games or creative writing	NR	NR	NR
Du Babcock (1986, 1988)	60	Dramatic reading and peripherals	Role play	Skits, plays and role play	Instructor provides mild evaluative statement of mistakes	NR	NR
Earl (1993)	3	Imagery	NR	NR	NR	NR	NR
Eastman (1993)	8	Imagery	NR	NR	NR	NR	NR
Edwards (1993)	9	NR	NR	Real life	NR	Performance improvement	Skills based assessment
Edwards et al. (1998)	150	NR	NR	Real life	NR	Performance improvement	Skills based assessment
Edwards & Newton (1995)	NR	NR	NR	Real life	NR	Performance improvement	Skills based assessment
Garcia (1984)	16	Dramatic reading	Role play	Skits, plays and role play	NR	NR	NR
Gattellari et al. (2005)	3	Lecture	NR	Real life	NR	NR	Skills based assessment

Appendix B, continued

Study	Length of Training (Hrs)	Planning		Application		Understanding	
		Introduce	Illustrate	Practice	Evaluate	Reflection	Mastery
Gavrin et al (2004)	48	Warm up exercise completed less than 12 hours prior to class	Answers from quizzes incorporated into class lectures	Learner participation in guided discussion or activities based on responses to pre-class assignments	NR	NR	NR
Goker (2006)	21	Lecture	Role play	Real life	Discussion of strengths and weakness	NR	NR
Goldberg & Shuman (1984a)	96	Lecture	Simulation	Realistic problem-solving situations	Review solution that group or individual provided and make corrections to proposed solution	Group reflection on feedback	Group assesses feedback received from instructor
Goldberg & Shuman (1984b)	13	Lecture	Simulation	Realistic problem-solving situations	Review solution that group or individual provided and make corrections to proposed solution	Group reflection on feedback	Group assesses feedback received from instructor
Goldsmith et al. (2000)	1	Information given to patient by nurse	NR	Access information on website	NR	NR	NR
Hancock (1981, 1983)	48	Learner self-instruction	NR	Realistic problem-solving situations	Review solution that group or individual provided	Group reflection on feedback	Group assesses feedback received from instructor
Hepner (1989)	12	Lecture	NR	Realistic problem-solving situations	Review solution that group or individual provided	Group reflection on feedback	Group assesses feedback received from instructor
Hoggard (1980)	48	Lecture	NR	Realistic problem-solving situations	Review solution that group or individual provided and make corrections to proposed solution	Group reflection on feedback	Group assesses feedback received from instructor
Hosack-Curlin (1988)	38	Lecture	Role play and real life	Role play and real life	Discussion of strengths and weakness	Journal writing	NR
Howard (2004)	48	Warm up exercise completed less than 12 hours prior to class	Answers from quizzes incorporated into class lectures	NR	NR	NR	NR

Study	Length of Training (Hrs)	Planning		Application		Understanding	
		Introduce	Illustrate	Practice	Evaluate	Reflection	Mastery
Hursh et al. (1980)	48	Learner self-instruction	NR	Realistic problem solving situations	Review solution that group or individual provided and make corrections to proposed solution	Group reflection on feedback	Group assesses feedback received from instructor
Landers (1975)	30	Lecture	NR	Realistic problem-solving situations	Review solution that group or individual provided	Group reflection on feedback	Group assesses feedback received from instructor
McGinty (1988)	36	Dramatic reading	NR	Skits, plays and role play	NR	Journal writing	NR
Meyer (1997) Study 1	2	Imagery and peripherals	Real life	Learner participation in word games or creative writing	Instructor provides mild evaluative statement of mistakes	NR	NR
Meyer (1997) Study 2	2	Imagery and peripherals	Real life	Learner participation in word games or creative writing	Instructor provides mild evaluative statement of mistakes	NR	NR
Miller et al. (2004) Study 1	13	Lecture	Role play	Role play	NR	NR	Standards based assessment
Miller et al. (2004) Study 2	18	Lecture	Role play	Role play and real life	NR	Behavior suggestions	Skills based assessment
Miller et al. (2004) Study 3	19	Lecture	Role play	Role play and real life	NR	Behavior suggestions	Standards based assessment
Moreno-Montalvo (1987)	39	Imagery, dramatic reading and peripherals	NR	Skits, plays and role play	NR	NR	NR
Newsome & Tillman (1990)	9	Learner self-instruction	NR	Realistic problem-solving situations	Review solution that group or individual provided	Group reflection on feedback	Group assesses feedback received from instructor
O'Connor & Korr (1996)	10	Lecture	NR	Real life	Discussion of strengths and weaknesses	Behavior suggestions	NR
Peterson (1996)	NR	Imagery, dramatic reading and peripherals	NR	Skits, plays and role play	NR	NR	NR
Pierce & Miller (1994)	65	Lecture	NR	Real life	NR	Performance improvement	Skills based assessment
Portes et al. (1992)	3	Imagery	NR	NR	NR	NR	NR
Preziosi (1995)	20	Peripherals	NR	NR	NR	NR	NR
Prichard (1990)	68	Dramatic reading	NR	NR	NR	NR	NR

Study	Length of Training (Hrs)	Planning		Application		Understanding	
		Introduce	Illustrate	Practice	Evaluate	Reflection	Mastery
Pugach & Johnson (1995)	7	Lecture	Instructional video	Real life	NR	Behavior suggestions	Skills based assessment
Robinett (1975)	25	Dramatic reading	NR	NR	NR	NR	NR
Schiffler (1986) Study 1	56	Dramatic reading	Role play	Role play	NR	NR	NR
Schiffler (1986) Study 2	56	Dramatic reading	Role play	Role play	NR	NR	NR
Schuster (1976)	32	Dramatic reading	Role play	Role play	NR	NR	NR
Sears (1973)	96	Learner self-instruction	NR	Realistic problem-solving situations	Review solution that group or individual provided	Group reflection on feedback	Group assesses feedback received from instructor
Shaw (1980)	48	Learner self-instruction	Simulation	Realistic problem-solving situations	Review solution that group or individual provided and make corrections to proposed solution	Group reflection on feedback	Group assesses feedback received from instructor
Showers (1982)	26	Lecture	Role play	Real life	Discussion of strengths and weaknesses	Performance improvement	NR
Showers (1984)	25	Lecture	Role play	Real life	Discussion of strengths and weaknesses	Performance improvement	NR
Simkins & Maier (2004)	48	Activity to complete and submit prior to lecture	Answers from quizzes incorporated into class lectures	NR	NR	NR	NR
Slunt & Giancarlo (2004)	48	Warm up exercise completed less than 12 hours prior to class	Answers from quizzes incorporated into class lectures	Learner participation in guided discussion or activities based on responses to pre-class assignment	NR	NR	NR
Snyder (1980)	48	Learner self-instruction	NR	Realistic problem solving situations	Review solution that group or individual provided and make corrections to proposed solution	Group reflection on feedback	Group assesses feedback received from instructor
Sparks (1986)	12	Lecture	Role play	Real life	Discussion of strengths and weaknesses	Behavior suggestions	NR
Stahl et al. (1991) Study 1	18	Imagery	NR	NR	NR	NR	NR

Appendix B, continued

Study	Length of Training (Hrs)	Planning		Application		Understanding	
		Introduce	Illustrate	Practice	Evaluate	Reflection	Mastery
Stahl et al. (1991) Study 2	18	Dramatic reading	NR	NR	Learners check their own quiz answers	NR	NR
Stein et al. (1982)	< 1	Dramatic reading	NR	NR	NR	NR	NR
Streufert (1984)	7	Lecture	Real life	Real life	NR	Performance improvement	Skills-based assessment
Wynn (1986)	30	Lecture	Instructional video	Real life	Discussion of strengths and weaknesses	Journal writing	NR
Zeiss (1984)	13	Dramatic reading	NR	NR	NR	NR	NR

[a] Not reported or described as a characteristic of the adult learning method.

Appendix C

Major Findings from the Studies of the Adult Learning Methods

Study	Adult Learning Method[a]	Type of Study[b]	Outcome Construct	Type of Measure	Outcome Measures	Cohen's *d* Effect Size
Anderson & Render (1987) Study 1	AL	RCT	Knowledge	Word to definition	Language posttest exam	-1.14
Anderson & Render (1987) Study 2	AL	RCT	Knowledge	Word to definition	Language posttest exam	-1.29
Anderson & Render (1987) Study 3	AL	RCT	Knowledge	Word to definition	Language posttest exam	-1.04
Anderson & Render (1987) Study 4	AL	RCT	Knowledge	Word to definition	Language posttest exam	-1.07
Baker (1983)	CH	RCT	Skills	Observational rating scale	Transfer of Training: Skills	1.77
					Transfer of Training: Appropriateness	1.64
					Transfer of Training: Comfort/familiarity	1.49
					Transfer of Training: Practice/frequency of use	1.18
			Skills	Teacher Innovator System (Weil, Gullion, & Cole, 1971)	Structuring skills	.86
					Information processing skills	1.05
					Feedback skills	.41
					Factual Information Processing	.41
					Conceptual Information Processing	1.07
					Theoretical Information Processing	.78
Bartley (1997)	JIT	RCT	Knowledge	Course content	Teacher constructed knowledge test	1.15
Bass (1985) Study 1	AL	RCT	Attitude	Listed Thought Procedure (Bass, 1985)[c]	LPT attitude scores	.24
			Knowledge	Word to definition	Language vocabulary exam	.45
Bass (1985) Study 2	AL	RCT	Attitude	Listed Thought Procedure (Bass, 1985)	LPT attitude scores	.15
			Knowledge	Word to definition	Language vocabulary exam	.44
Benedict & Anderton (2004)	JIT	RCT	Knowledge	Course content	Final exam	.38
Bing-You et al. (1998)	CH	RCT	Self-efficacy	Survey	How I am progressing	.38
					Enough information to improve my performance	.11
					How I compare to my peers	-.09
					Enough information to know I am a competent student	.54
					Effective in soliciting the feedback I need	-.13
					How to develop personal learning goals	.24
Bodine (1978)	GD	RCT	Attitude	Survey	Study attitudes toward college courses	.39
			Knowledge	Course content	Content knowledge exam	-.12
Bowman & McCormick (2000)	CH	RCT	Skills	Clarity Observation Instrument (Metcalf, 1989)	Frequency of clarity skills	1.78
					Quality of use of clarity skills	2.57
					Overall demonstration of clarity skills	2.36
			Knowledge	Observation	Knowledge of education theory	5.84
			Attitude	Rating Scale	Technical feedback	.79

Study	Adult Learning Method[a]	Type of Study[b]	Outcome Construct	Type of Measure	Outcome Measures	Cohen's *d* Effect Size
Bowman & McCormick (2000), continued	CH	RCT	Attitude	Rating Scale	Analysis of application	1.12
					Adaptation to students	.86
					Personal facilitation	.85
Bradner (1996)	AL	RCT	Knowledge	Course content	Test of job requirements	.77
				Observation rating	Customer service test	.44
			Skills	Course content	Computer usage exam	.47
Bullard (1986)	GD	RCT	Knowledge	Course content	Content laboratory knowledge exam	1.16
Cain et al (2007)	CH	RCT	Skills	Joint Attention Observation Coding System (Cain, Rudd, & Saxon, 2007)	Joint attention engagement bids	1.49
					Verbal events	-.82
					Focus-Follow-Talk™ statements	-1.50
					Joint attention support statements	-.92
					Questions	.19
					Teacher-directed statements	1.90
Campbell (1984)	GD	NRG	Knowledge	Course content	Content knowledge exam	.39
Campbell (1986)	GD	RCT	Knowledge	Modern Language Cooperation (Campbell, 1986)	Reading test	.13
				Foreign Language Test (Campbell, 1986)	Writing test	.51
				Course content	Content knowledge exam	.08
Caux (1995)	AL	RCT	Knowledge	Oral Proficiency Interview (Byrnes, Buck, & Thompson, 1989)	Oral language interview	.93
Clerici-Arias et al. (2003)	JIT	RCT	Knowledge	Course content	Exam score comparisons	.22
Coscarelli & White (1982)	GD	NRG	Knowledge	Course content	Content knowledge exam	.53
Craven (1990) Study 1	CH	RCT	Skills	COKER (Modified) (Coker & Coker, 1982a, 1982b)	Students initiate verbal interaction	.60
					Teacher amplifies and discusses student response	1.43
					Students are involved	1.77
					Prepares and/or uses various methods and techniques to present subject matter and encourages student participation	-.65
					Promotes positive self-image in students	2.06
					Is consistent and empathetic in the treatment of students	.34
					Practices good human relations	-.58
					Exhibits overall positive approach	-.03
					Stimulates group discussion and individual participation	.07
					Nurtures creativity and discovery	.90
					Helps learners develop positive attitude toward self, encourages confidence and self-respect	.97
					Seeks, accepts and uses student ideas as part of teaching procedures	1.77

Study	Adult Learning Method[a]	Type of Study[b]	Outcome Construct	Type of Measure	Outcome Measures	Cohen's d Effect Size
Craven (1990) Study 1, continued	CH	RCT	Skills	COKER (Modified) (Coker & Coker, 1982a, 1982b)	Motivates students to ask questions	-.13
					Uses questions that lead students to analyze, synthesize and think critically	.09
					Accepts varied student viewpoints and/ or asks students to extend or elaborate answers or ideas	.68
					Demonstrates proper listening skills	.84
					Provides feedback to learners on their cognitive performance	1.60
					Uses positive reinforcement patterns with students	.58
Craven (1990) Study 2	CH	RCT	Skills	COKER (Modified) (Coker & Coker, 1982a, 1982b)	Students initiate verbal interaction	.05
					Teacher amplifies and discusses student response	-.20
					Students are involved	-.13
					Prepares and/or uses various methods and techniques to present subject matter and encourages student participation	-.26
					Promotes positive self-image in students	-.71
					Is consistent and empathetic in the treatment of students	-1.15
					Practices good human relations	-1.22
					Exhibits overall positive approach	-.18
					Stimulates group discussion and individual participation	-.58
					Nurtures creativity and discovery	-.71
					Helps learners develop positive attitude toward self, encourages confidence and self-respect	2.09
					Seeks, accepts and uses student ideas as part of teaching procedures	-.50
					Motivates students to ask questions	-.48
					Uses questions that lead students to analyze, synthesize and think critically	-.48
					Accepts varied student viewpoints and / or asks students to extend or elaborate answers or ideas	-.37
					Demonstrates proper listening skills	.63
					Provides feedback to learners on their cognitive performance	.10
					Uses positive reinforcement patterns with students	.58
Dipamo & Job (1990, 1991)	AL	RCT	Knowledge	Paired associate nouns test	Word acquisition and retention test	-.64
Du Babcock (1986, 1988) Study 1	AL	NRG	Knowledge	English Language Test (Best & Ilyin, 1976)	Posttest language scroes	.32
Du Babcock (1986, 1988) Study 2	AL	NRG	Knowledge	English Language Test (Best & Ilyin, 1976)	Posttest language scores	1.42

Study	Adult Learning Method[a]	Type of Study[b]	Outcome Construct	Type of Measure	Outcome Measures	Cohen's *d* Effect Size
Earl (1993)	AL	NRG	Self-efficacy	Rating scale	Level of confidence score gains	.35
					Confidence level after 1 month	.40
			Attitude	Rating scale	Positive evaluations of the workshop	.89
			Knowledge	Course content multiple-choice test	Knowledge score test gains	.16
					Knowledge score retention after 1 month	-.10
			Skills	Case study	Accuracy of interpretation of case study posttest exam scores	.93
Eastman (1993)	AL	RCT	Knowledge	Course content	Posttest scores (multiple-choice items)	.15
				Hypothetical situation (provided missing information)	Transfer task scores	.29
			Attitude	Rating scale	Evaluation of course content	.58
					Overall attitude toward class	.48
					Overall rating of class	.52
Edwards (1993)	CH	NRG	Knowledge	Hunt Paragraph Completion Method (Hunt, Butler, Noy, & Rosser, 1978)	Conceptual growth	-.34
				Teacher Reflective Thought (Simmons, Sparks, Starko, Pasch, & Colton, 1989)	Reflective pedagogical thinking	-.53
Edwards et al. (1998)	CH	NRG	Self-efficacy	Teacher Efficacy Scale (Soodak & Podell, 1996)	Teacher efficacy	1.26
					Personal teaching efficacy	.09
					Outcome efficacy	1.29
Edwards & Newton (1995)	CH	NRG	Self-efficacy	Teacher Efficacy Scale (Gibson & Dembo, 1984)	Teacher efficacy	.70
					Personal teaching efficacy	.54
					Outcome efficacy	.61
Garcia (1984)	AL	NRG	Knowledge	Bilingual Syntax Measure II (Garcia, 1984)	Progress in English learning	.70
Gattellari et al. (2005)	CH	RCT	Knowledge	Survey	Questionnaire on evidence base for PSA screening	1.33
					Questionnaire on steps to help patient make informed decisions	1.04
			Self-efficacy	Survey	Rating of confidence in promoting informed decision making	1.20
				Provider Decision Process Assessment Instrument (Dolan, 1999)	Level of confidence in conflict situations	.42
Gavrin et al (2004)	JIT	NRG	Attitude	Attrition	Student attrition rate	1.76
Goker (2006)	CH	RCT	Skills	Clarity Observation Instrument (Metcalf, 1989)	Clarity of instructional skills	5.84

Study	Adult Learning Method[a]	Type of Study[b]	Outcome Construct	Type of Measure	Outcome Measures	Cohen's *d* Effect Size
Goker (2006), continued	CH	RCT	Attitude	Rating scale	Satisfaction with coaching	2.58
Goldberg & Shuman (1984a)	GD	RCT	Self-efficacy	Survey	Perceptions of decision making ability	.42
Goldberg & Shuman (1984b)	GD	RCT	Knowledge	Rating Scale	Knowledge of causes and solutions to energy problem	.05
			Self-efficacy	Rating Scale	Confidence in the ability to understand information about energy problems	-.04
Goldsmith et al. (2000)	JIT	RCT	Skills	Rating Scale	Level of pain	.37
Hancock (1981, 1983)	GD	RCT	Knowledge	Course content	Content knowledge exam	.56
Hepner (1989)	GD	RCT	Knowledge	Course content	Content recall exam	-.05
			Skills	Course content	Nursing plans exam	2.34
					Application test exam	.85
Hoggard (1980)	GD	RCT	Attitude	Frequency count	Dropout rate	1.42
Hosack-Curlin (1988)	CH	RCT	Skills	Observational rating scale	Teacher implementation of writing skills process	.37
				Levels of Use (Loucks, Newlove, & Hall, 1975)	Interview/writing process	1.11
Howard (2004)	JIT	NRG	Knowledge	Frequency count	Participation in reading of required material	1.10
Hursh et al. (1980)	GD	RCT	Knowledge	Course content	Course performance exam	2.98
			Attitude	Survey	Student attitudes towards course experience	.74
					Student attitudes towards course process	.35
Landers (1975)	GD	RCT	Knowledge	Course content	Content knowledge exam	.35
			Skills	Application	Performance projects	-.01
McGinty (1988)	AL	RCT	Knowledge	Cumulative class points	Participation, mid-term, and final exam	1.04
				Overall class grade	Numerical course grade	.38
Meyer (1997) Study 1	AL	NRG	Knowledge	Open-ended questions exam	Course posttest scores	1.29
Meyer (1997) Study 2	AL	NRG	Knowledge	Open-ended questions exam	Course posttest scores	1.17
Miller et al. (2004) Study 1	CH	RCT	Skills	Motivational Interviewing (MI) Skill Code (Miller & Mount, 2001)	Overall MI Spirit	.78
					Percent MI consistent behaviors	.83
Miller et al. (2004) Study 2	CH	RCT	Skills	Motivational Interviewing (MI) Skill Code (Miller & Mount, 2001)	Overall MI Spirit	.68
					Percent MI consistent behaviors	.59
Miller et al. (2004) Study 3	CH	RCT	Skills	Motivational Interviewing (MI) Skill Code (Miller & Mount, 2001)	Overall MI Spirit	1.12
					Percent MI consistent behaviors	.91
Moreno-Montalvo (1987)	AL	RCT	Knowledge	Oral interview	Language post-interview exam scores	.71
				Observation	Language skit presentation scores	1.37
				Course content	Course post test scores	.36

Study	Adult Learning Method[a]	Type of Study[b]	Outcome Construct	Type of Measure	Outcome Measures	Cohen's *d* Effect Size
Newsome & Tillman (1990)	GD	RCT	Knowledge	Course content	Content knowledge exam	.32
			Skills	Application	Accuracy of care plans	1.89
					Simulated preparing a care plan	1.25
O'Connor & Korr (1996)	CH	NRG	Self-efficacy	Survey	Self-efficacy	.36
Peterson (1996)	AL	RCT	Knowledge	Course content	Application of concepts	-.99
					Knowledge of cost management principles	-1.10
					Comprehension of concepts	-.01
			Attitude	Rating scale	Attitude about the learning method	-.04
Pierce & Miller (1994)	CH	RCT	Skills	Observational measure	Effective teaching behaviors	.03
Portes et al. (1992)	AL	RCT	Knowledge	Course content	Course final exam	-.02
	AL	RCT	Attitude	State-Trait Anxiety Inventory (Spielberger, Gorusch, & Lushene, 1970)	Trait anxiety	-.35
Preziosi (1995) Study 1	AL	NRG	Knowledge	Course content	Course posttest scores	1.16
Preziosi (1995) Study 2	AL	NRG	Knowledge	Course content	Course posttest scores	1.69
Prichard (1990)	AL	RCT	Knowledge	Course content	Course final exam (multiple-choice items test)	.66
Pugach & Johnson (1995)	CH	NRG	Skills	Frequency count	Frequency of referrals to special education	.47
			Self-efficacy	Teacher Efficacy Scale (Gibson & Dembo, 1984)	Personal and professional self-efficacy	.48
				Survey	Confidence	.65
Robinett (1976) Study 1	AL	RCT	Knowledge	Foreign language achievement	Course posttest exam scores	.64
			Attitude	Frequency count	Class absences	.63
Robinett (1976) Study 2	AL	RCT	Knowledge	Foreign language achievement	Course posttest exam scores	.85
			Attitude	Frequency count	Class absences	-.18
Schiffler (1986) Study 1	AL	RCT	Knowledge	Language exam	Language vocabulary score at 7th yr	.20
					Language structure score at 7th yr	.00
					Language vocabulary score at 8th yr	.00
					Language structure score at 8th yr	.08
				Language C-Test (Schiffler, 1986)	Language proficiency	.93
					Language Translation from new language	.97
					Language Translation into new language	.55
					Language Oral communication	.07
Schiffler (1986) Study 2	AL	RCT	Knowledge	Language exam	Language vocabulary score at 8th yr	.00
					Language structure score at 8th yr	.20
					Language vocabulary score at 9th yr	.63
					Language structure score at 9th yr	.61

Study	Adult Learning Method[a]	Type of Study[b]	Outcome Construct	Type of Measure	Outcome Measures	Cohen's d Effect Size
Schiffler (1986) Study 2, continued				Language C-Test (Schiffler, 1986)	Language proficiency	.71
					Language translation from new language	.18
					Language translation into new language	.49
					Language oral communication	1.79
Schuster (1976)	AL	RCT	Knowledge	Course content exam	Oral language final exam scores	.12
				Course content exam	Written language final exam scores	-.58
Sears (1973)	GD	NRG	Attitude	Achievement Anxiety Test (Sears, 1973)	Debilitating Anxiety	.50
					Facilitating Anxiety	.30
			Skills	Course content	Engineering Function Instrument exam	.33
Shaw (1980)	GD	RCT	Attitude	Frequency count	Course drop-out rate	1.07
Showers (1982)	CH	RCT	Skills	Observational rating scale	Transfer of training overall	1.40
Showers (1984)	CH	NRG	Skills	Observational rating scale	Transfer of training overall	1.80
				Teacher Innovator System (Showers, 1984a)	Factual information processing	.04
					Conceptual information processing	.50
					Theoretical information processing	.34
Simkins & Maier (2004)	JIT	RCT	Knowledge	Course content	Exam scores	1.27
Slunt & Giancarlo (2004)	JIT	RCT	Knowledge	Frequency count	Student taking chemistry pre-class quizzes	.64
Snyder (1980)	GD	RCT	Knowledge	Frequency count	Course "A" Grades	.72
Sparks (1986)	CH	NRG	Skills	Stallings Secondary Observation Instrument (Stallings, 1979)	Teaching behavior and academic interactions	-.14
Stahl et al. (1991) Study 1	AL	RCT	Knowledge	Basic Word Vocabulary Test (Stahl, Brozo, Smith, Henk, & Commander, 1991)	Language immediate learning scores	-.04
					Language delayed recall scores	.03
Stahl et al. (1991) Study 2	AL	RCT	Knowledge	Basic Word Vocabulary Test (Stahl et al., 1991)	Language immediate learning scores	.11
					Language delayed recall scores	.14
Stein et al. (1982)	AL	RCT	Knowledge	Vocabulary word to definition	Language immediate vocabulary retention exam	.47
					Language 1 week delayed retention exam	1.17
Streufert (1985)	CH	NRG	Skills	Interpretive Discussion Questionnaire (Streufert, 1985)	Teacher knowledge comprehension of specific reading program	.91
				Observational measure (Hunter, 1983)	Teacher performance	.85

Appendix C, continued

Study	Adult Learning Method[a]	Type of Study[b]	Outcome Construct	Type of Measure	Outcome Measures	Cohen's *d* Effect Size
Wynn (1987)	CH	RCT	Skills	Observational rating scale (Purdom, 1984)	Purdom-Wynn Observation Instrument (PWOI): Introduction	1.17
					PWOI: Content presentation	2.08
					PWOI: Follow up/Feedback	.96
					PWOI: management of student conduct	.44
Zeiss (1984)	AL	RCT	Knowledge	Test of English as a Foreign Language (Educational Testing Service, 2008)	Language abilities at 3 wks	1.46

[a]AL = Accelerated learning, CH = Coaching, GD = Guided design, and JIT = Just-in-time training.
[b]RCT = Randomized controlled trial or NRG = Non-randomized comparison group study.
[c]Outcome measures that include citations for the adult learning study indicate that the measure is included in the research report.