A Case Study Approach to Secondary Reanalysis of a Quantitative Research Synthesis of Adult Learning Practices Studies

Carl J. Dunst and Deborah W. Hamby
Orelena Hawks Puckett Institute
Asheville and Morganton, North Carolina, USA

Abstract. A secondary reanalysis of a quantitative research synthesis of four adult learning practices is described where a case study research methodology was used to identify which practices with which characteristics under which conditions were associated with the largest sizes of effects for different adult learner outcomes. Results showed that a case study approach was able to detect patterns of relationships among four adult learning practices (job-embedded learning, authentic learning opportunities, learner reflection, extended professional development supports) and adult learning outcomes that otherwise were not explicitly apparent from a quantitative analysis of the studies in the research synthesis. This was discerned from pattern matching and both literal and theoretical where studies including the adult learning practices had the largest effect sizes and those not including the practices had the smallest effect sizes.

Keywords: Case study methodology; meta-analysis; secondary reanalysis; adult learning practices; pattern matching; replication logic.

1. Introduction

This paper includes a description of how a case study research methodology was used to conduct secondary reanalysis of a research synthesis of four different adult learning practices to identify the characteristics of and conditions under which the adult learning methods and strategies were most effective in terms of changes and improvements in learner outcomes. According to Rossman, Yore, Hand, and Shelley (2009), secondary reanalysis of studies "with a common focus, method, or outcome" (p. 589) is analogous to a multiple case study where "consolidated results of…data from [different] studies with a similar research focus can afford greater discovery power" (p. 587).

The secondary reanalysis was motivated by the results from a metasynthesis of reviews of inservice professional development studies where remarkably similar results were found for quite varied types of inservice training with educators, teachers, and other school personnel (Dunst, Bruder, & Hamby, 2015). Findings

from the metasynthesis were used to recode and reanalyze data from a meta-analysis of adult learning practices to determine if a case study methodology could reveal generalized patterns of results that would otherwise remain hidden by only the quantitative analysis of the studies (Gibbert & Nair, 2013; Rossman et al., 2009). Generalized pattern of results refers to the extent to which the relationships between independent and dependent variables are systematically replicated in the different studies in the analyses of multiple case study data (Yin, 2014). The meta-analysis of the adult learning practices was one of 15 reviews in the metasynthesis of inservice professional development afforded preschool, elementary, and secondary educators.

1.1. Metasynthesis of Inservice Professional Development Review
The metasyntheses of inservice professional development reviews (Dunst et al., 2015) involved secondary reanalysis using replication logic (Hak & Dul, 2010b; Yin, 2014) and pattern matching (Hak & Dul, 2010a; Yin, 2014) to identify the common features of inservice professional development associated with changes and improvements in educator and student outcomes. The 15 research reviews included 550 studies of more than 50,000 early childhood intervention, preschool, elementary, and secondary education teachers, educators, and practitioners and the children and students with whom they worked.

A unique feature of each research review was researchers' attempts to identify which studies with which characteristics under which conditions were associated with optimal educator and student outcomes. Results from the metasynthesis showed that inservice professional development was most effective when it included job-embedded educator learning opportunities, active and authentic educator learning experiences, opportunities for the educators to reflect on their learning experiences, coach or mentor supports or performance feedback during the inservice training, extended follow-up supports to reinforce inservice learning, and inservice training and follow-up supports of sufficient duration and intensity to have discernible educator and student effects.

The results provided evidence for literal replication (Hak & Dul, 2010b; Yin, 2014) where the researchers independently came to the same or very similar conclusions about what matters most in terms of inservice professional development having optimal educator and student outcomes. Results showed that all 15 reviews included evidence for the benefits of job-embedded educator learning opportunities, all 15 reviews included evidence for the effectiveness of active and authentic educator learning experiences, 13 reviews included evidence for the effectiveness of extended follow-up supports, and 12 reviews included evidence for the effectiveness of sufficient dosage (duration and intensity) of inservice professional development. What was not able to be determined from the reviews was whether there was evidence for theoretical replication (Yin, 2014) since researchers did not describe or attempt to determine whether studies that had no effects or yielded equivocal results did not include the characteristics found to be effective in the studies with positive results. Theoretical replication would therefore need to be inferred rather than demonstrated which limits the generalizability of the findings (de Vaus, 2001;

Eisenhardt & Graebner, 2007; Gibbert & Nair, 2013). There was, however, one review in the metasynthesis that included sufficient information and data to conduct secondary reanalysis to ascertain theoretical as well as literal replication. This meta-analysis was the source of information and data for the secondary reanalysis described in this paper.

1.2. Adult Learning Practices Meta-Analysis

The adult learning practices that were the focus of secondary reanalysis were coaching (Fletcher & Mullen, 2012; Leat, Lofthouse, & Wilcock, 2006), guided design (Hancock, 1991; Selby & Tuttle, 1988), just-in-time training (Beckett, 2000; Rosen, 2005), and accelerated learning (Meier, 2000; Wlodkowski & Kasworm, 2003). The four adult learning practices are grounded in principles that emphasize a readiness to learn, autonomous learning, active learner participation in the learning process, critical thinking and reflection, and real-life relevance and application of learning content, material, or practice (Merriam, 2001; Trotter, 2006). The four practices, however, differ in terms of the methods and strategies that were used by professional development specialists to support and facilitate adult learning.

The meta-analysis included 57 randomized design studies of more than 4,000 adult learner participants. A content analysis of the studies of the four adult learning practices found that they could be categorized in terms of the patterns of practices shown in Table 1. Based on the different patterns of characteristics of the four adult learning practices, the outcomes associated with each adult learning practice at different levels of extended supports were expected to vary in terms of the sizes of effects for the relationships between the practices and outcomes. More specifically, coaching (which included job-embedded learning, authentic learning experiences, active learner reflection, and large doses of extended supports) was hypothesized to be associated with the largest adult learner benefits, whereas accelerated learning (which included none of the four adult learning practices used in the coaching studies in smaller doses) was hypothesized to be associated with the smallest adult benefits.

Table 1: Patterns of Professional Development Characteristics
of the Four Adult Learning Practices

Adult Learning Practices	Professional Development Characteristics			
	Job Embedded Learning	Authentic Learning	Learner Reflection	Extended Supports
Coaching	Yes	Yes	Yes	Yes
Coaching	Yes	Yes	Yes	No
Guided Design	No	Yes	Yes	Yes
Guided Design	No	Yes	Yes	No
Just-in-Time Training	No	Yes	No	Yes
Just-in-Time Training	No	Yes	No	No
Accelerated Learning	No	No	No	Yes
Accelerated Learning	No	No	No	No

The coaching studies were characterized by job-embedded learning opportunities, active and authentic learner experiences, and opportunities for learner reflection on their learning experiences. The guided design studies employed real world problems as authentic learning experiences to develop decision-making skills and instructor led group discussions for engaging learners in reflection on their learning experiences. The adult learning practice, however, was not job-embedded inasmuch as learning opportunities only took place in workshops or university classroom settings. The just-in-time training studies included active and authentic learning experiences specifically in response to learner requests for guidance or mentoring where the assistance was offered in non job-embedded settings (typically the mentors' offices or classrooms) and there was no explicit attempt to engage the learners in reflection on the use of mentors' guidance. None of the accelerated learning studies were job embedded, included authentic learning experiences, or learner reflection on their experiences. Rather, the studies included procedures for creating a relaxed emotional state (e.g., breathing exercises), imagery and dramatic readings, and skits or role playing for participants to learn content knowledge or practice.

1.3. Purpose of the Study
The purpose of the study described in this paper was to conduct secondary reanalysis of the Dunst et al. (2010a) meta-analysis of adult learning practices using the framework and results in the Dunst et al. (2015) metasynthesis to guide the reanalysis. The reanalysis was done in order to confirm or disconfirm both literal and theoretical replication (Yin, 2014) using pattern matching (Hak & Dul, 2010a) as an analytic strategy for determining if there was a match between an '"observed pattern' (a pattern of measured values) with an 'expected pattern' (a hypothesis), and deciding whether the patterns…result in [confirmation or] disconfirmation" of the hypothesized relationships (Hak & Dul, 2010a, p. 1). The metric for accomplishing this was the effect sizes for the relationship between the different combinations of practices shown in Table 1 and the adult learner outcomes and the patterns of those effect sizes. The goals were to determine whether (1) a case study research methodology could be applied to quantitative data (Rossman et al., 2009) and (2) to determine if there was value-added yield in terms of a better understanding of the types of adult learning methods and strategies that are related to optimal learner outcomes (de Vaus, 2001).

2. Method
2.1. Sources of Case Study Data
The sources of information and data for the secondary reanalysis of the four adult learning practices was the meta-analysis of the studies of the practices (Dunst et al., 2010a), supplemental tables and data on the different characteristics of the practices (Dunst, Trivette, & Hamby, 2010b), and other publications of findings from the meta-analysis relevant to the purposes of the study described in this paper (Dunst & Trivette, 2011, 2012). These various sources included all the necessary information to categorize the adult learning

practices in terms of the Table 1 characteristics and to compute the effect sizes for the relationships between the classified practices and study outcomes.

2.2. Professional Development Characteristics

Operational definitions of the four professional development characteristics were used on an *a priori* basis to categorize each of the adult learning practices as either including or not including each of the four characteristics in Table 1 and for determining how many studies of each adult learning practice included each characteristic.

2.2.1. Job-Embedded Learning Opportunities

Job-embedded adult learning opportunities were defined as professional development occurring in the work settings of the study participants whereas non job-embedded was defined as professional development occurring in workshops, college or university classrooms, or other non work settings (Croft, Coggshall, Dolan, Powers, & Killion, 2010). Fourteen of 15 coaching studies included job-embedded professional development whereas 3 of the 21 accelerated design studies, 1 of 6 just-in-time training studies, and none of the 13 guided design studies used job-embedded professional development practices.

2.2.2. Authentic Learning Experiences

Authentic adult learning experiences were defined as context-specific active learning opportunities that occurred or were representative of what learners would experience as part of real life problems or challenges (Firestone & Mangin, 2014). The operative used to characterize adult learning practices as authentic was active learner participation in acquiring knowledge or mastering skills directly applicable to learners' professions or practices. All 13 guided design studies, 14 of the 15 coaching studies, 4 of 6 of the just-in-time training studies included authentic learning opportunities, and none of the accelerated learning studies included these types of learning experiences.

2.2.3. Learner Reflection

Learner reflection was defined as an explicit effort by professional development specialists to engage adult learners in evaluation or assessment of their mastery of the content knowledge or practice learned as part of the learning opportunities and experiences afforded learners (Essuman, 2015). All 13 guided design studies, 10 of the 15 coaching studies, 2 of the 21 accelerated learning studies, and 1 of the 6 just-in-time training studies included some type of practice to engage learners in reflection on their learning experiences.

2.2.4. Extended Supports

 Extended supports were operationally defined in terms of the number of professional development hours afforded study participants. A median split of the hours of training was used to divide all 57 studies into those including less than 20 hours of professional development and studies of more than 20 hours of inservice training. A 4 Between Adult Learning Practices x 2 Between Hours of

Training ANOVA showed no differences in the hours of training afforded study participants for the four adult learning practices, F (3, 53) = 0.65, p = .645, but a significant between hours of training effect, F (1, 53) = 47.44, p = .001. The average hours of training afforded study participants in the low and high extended support groups was 8.43 (SD = 6.64) and 46.31 (SD = 17.22) respectively. The Cohen's d effect size for the between hours of training comparison was 2.85 which indicated a very large difference in how much professional development was afforded the study participants.

2.3. Adult Learner Outcomes
The study outcomes were categorized as either learner acquisition of content knowledge or skills, or learner attitudes toward or beliefs about the efficacy of the adult learning methods. Content knowledge included measures of mastering course or workshop content knowledge or on-the-job requirements. Learner skills included measures of proficiency in the use of teaching methods or job performance. Learner attitudes included measures of satisfaction with the adult learning practices or judgments of the value of the learning experiences afforded the study participants. Learner beliefs included measures of learner confidence or competence in terms of either learning content or skills having intended learner outcomes or benefits.

2.4. Methods of Analysis
The methods of analysis were guided by the thoughtful methodological discussions of de Vaus (2001) and Rossman et al. (2009) who have articulated procedures for combining quantitative and qualitative information and data to identify the relationships between independent and dependent study variables as part of reanalysis of quantitative research findings. The Cohen's d sizes of effect (Hedges, 2008) for the different combinations of adult learning practices characteristics shown in Table 1 at the two different levels of extended supports were examined for both dependent measures as well as for both measures combined to determine if expected patterns were supported by the obtained patterns (Hak & Dul, 2010a; Yin, 2014) and to confirm or disconfirm either or both literal and theoretical replication (Hak & Dul, 2010b; Yin, 2014).

3. Results
The average effect sizes for the four different adult learning practices at the two levels of extended supports for all learner outcomes combined are shown in Figure 1. For each adult learning practice, more than 20 hours of extended supports was associated with larger sizes of effect compared to less than 20 hours of extended supports. The pattern of results indicated that coaching, which included all four adult learning practices characteristics, was associated with a larger average effect compared to the other three adult practices, and that coaching, which included job-embedded learning, authentic learning opportunities, learner reflection, and more than 20 hours of extended supports was considerably more effective than the other three adult learning practices, and far superior to accelerated learning which included none of the four adult learning

practices characteristics hypothesized to be associated with optimal learner outcomes.
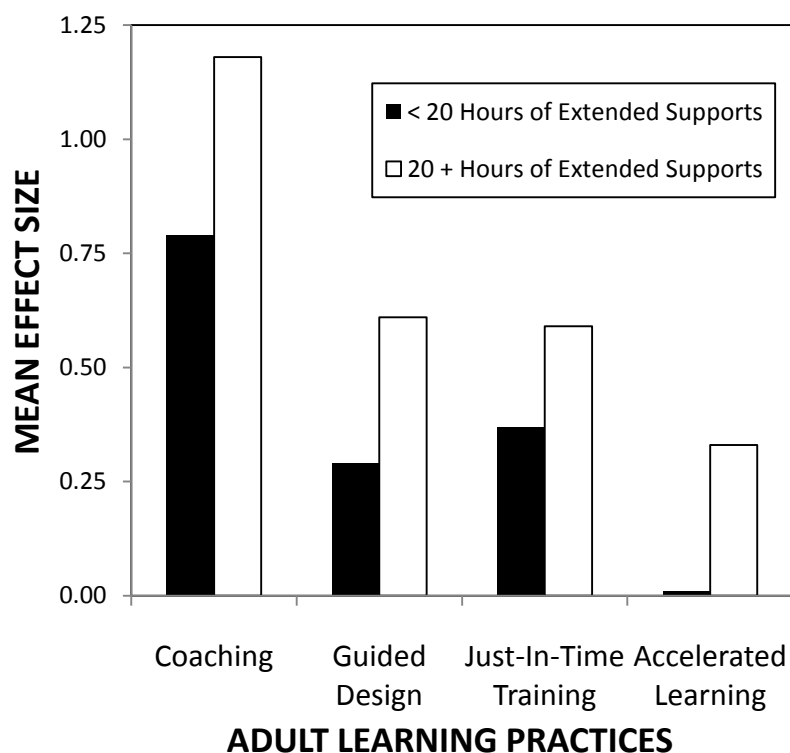

Figure 1: Average Effect Sizes for the Presence of the Four Adult Learning Practices Characteristics and the Study Outcomes

Table 2 shows the average effect sizes for the relationships between the four different adult learning practices and the two adult learning study outcomes at less than and more than 20 hours of extended professional development supports. In every instance, the sizes of effect for 20 or more hours of extended supports were larger than those for less than 20 hours of extended supports for both of the adult learning practice outcomes. In addition, at each level of extended supports, coaching, which included all four professional development characteristics (job embedded learning, authentic learning, learner reflection, 20+ hours of extended supports), had larger sizes of effects for both outcomes compared to the other three adult learning practices as was found for both outcomes combined (Figure 1), indicating that the patterns of relationships between the practices and the two different outcomes were almost identical.

4. Discussion
Results from the secondary reanalysis of the four different adult learning practices described in this paper provided evidence for both literal and theoretical replication by demonstrating (1) that the coaching studies which

included all four adult learning practices characteristics constituting the focus of investigation had the largest sizes of effects with each adult learner outcome (literal replication) and (2) that the other three adult learning practices which did not include all four adult learning practices characteristics had smaller sizes of effect (theoretical replication). Literal and theoretical replication were also

Table 2: Average Weighted Effect Sizes for the Relationships Between the Four Adult Learning Practices and the Learner Outcomes

Adult Learning Practice	Knowledge/Skills		Beliefs/Attitudes	
	Effect Size	*p*-value	Effect Size	*p*-value
Coaching				
20+ hours of extended supports	1.24	.0000	.91	.0000
< 20 hours of extended supports	.92	.0000	.64	.0000
Guided Design				
20+ hours of extended supports	.55	.0000	.76	.0000
< 20 hours of extended supports	.33	.0009	.21	.1087
Just-in-Time Training				
20+ hours of extended supports	.58	.0000	-	-
< 20 hours of extended supports	.37	.0098	-	-
Accelerated Learning				
20+ hours of extended supports	.50	.0000	.33	.1248
< 20 hours of extended supports	-.29	.0001	.01	.9375

demonstrated by the fact that the individual coaching studies each "serve as a distinct experiment that stands on its own as an analytic unit [and] like a series of related laboratory experiments, multiple cases [i.e., studies] are discrete experiments that serve as replications, contrasts, and extensions of emerging theory" (Eisenhardt & Graebner, 2007, p. 25). Accordingly, the results provide evidence that the presence of the same professional development characteristics in different studies hypothesized to be related to optimal learner outcomes were in fact associated with predicted benefits, and the absence of the professional development characteristics in other studies were related to less than optimal benefits also as predicted.

The fact that hours of extended professional development supports had value-added effects in terms of the learner outcomes deserves comment because it illustrates that a larger dose of different combinations of adult learning practices characteristics was clearly a factor contributing to learner outcomes. This is consistent with contentions by Desimone (2009) and Guskey (2002) who noted, based on both research and practice, that job-embedded learning, authentic learning opportunities, and learner reflection are more likely to have expected results if done on repeated occasions over extended periods of time measured in the present study in terms of the hours of extended professional development supports (see also Dunst, 2015).

Both deVaus (2001) and Rossman et al. (2009) describe how case study research can be combined with quantitative data to test hypothesized relationships between independent and dependent variables. A case study logic was used in the study described in this paper to categorize four adult learning practices according to the presence or absence of four different professional development practices characteristics where quantitative effect sizes were used to discern the relationships between eight different predicted patterns (Table 1) and the sizes of effects with two different adult learner outcomes (Table 2). This was neither new nor innovative (see e.g., Eisenhardt & Graebner, 2007). What was innovative was the secondary reanalysis of the studies of adult learning practices where studies that had the same characteristics were treated as multiple case examples and where the combined results from those studies were used as the metric for testing whether observed relationships provided support for hypothesized relationships. This permitted a better and more complete understanding of which adult learning practice (coaching) with which characteristics (job-embedded, authentic learning, learner reflection) under which conditions (20 or more hours of extended professional development supports) was associated with different adult learning outcomes. As a result, both goals of the study were achieved: (1) demonstrating the utility of a case study approach for secondary reanalysis of a quantitative meta-analysis and (2) identifying which adult learning practices with which characteristics had value-added explanatory yields.

5. References

Beckett, D. (2000). Just-in-time training as anticipative action and as inferential understanding. In C. Symes (Ed.), *Proceedings [of the] International Conference on Working Knowledge: Productive learning at work* (Vol. 1, pp. 15-20). Sydney, Australia: University of Technology, Research Centre for Vocational Education and Training.

Croft, A., Coggshall, J. G., Dolan, M., Powers, E., & Killion, J. (2010). *Job-embedded professional development: What it is, who is responsible, and how to get it done well: Issue brief*. Retrieved from Washington, DC:

de Vaus, D. (2001). *Research design in social research*. Thousand Oaks, CA: Sage.

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

Dunst, C. J. (2015). Improving the design and implementation of inservice professional development in early childhood intervention. *Infants & Young Children, 28*(3), 210-219. doi:10.1097/IYC.0000000000000042

Dunst, C. J., Bruder, M. B., & Hamby, D. W. (2015). Metasynthesis of in-service professional development research: Features associated with positive educator and student outcomes *Educational Research and Reviews, 10*(12), 1731-1744. doi:10.5897/ERR2015.2306

Dunst, C. J., & Trivette, C. M. (2011). Disaggregating adult learning practices to identify what works best in explaining learner outcomes. In C. Prachalias (Ed.), *Proceedings of the Seventh International Conference on Education* (pp. 55-61). Athens, Greece: National and Kapodistrian University of Athens.

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

Dunst, C. J., Trivette, C. M., & Hamby, D. W. (2010a). Meta-analysis of the effectiveness of four adult learning methods and strategies. *International Journal of Continuing Education and Lifelong Learning, 3*(1), 91-112.

Dunst, C. J., Trivette, C. M., & Hamby, D. W. (2010b). *Meta-analysis of the effectiveness of four adult learning methods and strategies: Supplemental tables and references*. Asheville, NC: Orelena Hawks Puckett Institute. Available at http://www.puckett.org/docs/ijcelldocs.pdf.

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

Essuman, S. O. (2015). Exploring the reflective learning experiences of primary school teachers during the use of Open Educational Resources. *Journal of Education and Training, 2*(2), 163-179. doi:10.5296/jet.v2i2.7793

Firestone, W. A., & Mangin, M. M. (2014). Leading professional learning in districts with a student learning culture. In L. E. Martin, S. Kragler, D. J. Quatroche, & K. L. Bauserman (Eds.), *Handbook of professional development in education: Successful models and practices, pre-k - 12* (pp. 319-338). New York: Guilford.

Fletcher, S., & Mullen, C. A. (Eds.). (2012). *The SAGE handbook of mentoring and coaching in education*. Thousand Oaks, CA: SAGE Publications.

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

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

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

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

Hancock, B. (1991). Guided design: A case study approach to enhance problem-solving. *Performance Improvement Quarterly, 4*(1), 55-62. doi:10.1111/j.1937-8327.1991.tb00491.x

Hedges, L. V. (2008). What are effect sizes and why do we need them? *Child Development Perspectives, 2*, 167-171. doi:10.1111/j.1750-8606.2008.00060.x

Leat, D., Lofthouse, R., & Wilcock, A. (2006). Teacher coaching: Connecting research and practice. *Teaching Education, 17*, 329-339. doi:10.1080/10476210601017477

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

Merriam, S. B. (2001). Andragogy and self-directed learning: Pillars of adult learning theory. *New Directions for Adult and Continuing Education, 89*, 3-13. doi:10.1002/ace.3

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

Rossman, G. B., Yore, L. D., Hand, B., & Shelley, M. C. (2009). Stitching the pieces together to reveal generalised patterns: Systematic research reviews, secondary re-analyses, case-to-case comparisons, and meta-syntheses of qualitative research studies. In M. C. Shelley, L. D. Yore, & B. Hand (Eds.), *Quality research in literacy and science education: International perspectives and gold standards* (pp. 575-602). Dordrecht, Netherlands: Springer Science + Business Media.

Selby, M. L., & Tuttle, D. M. (1988). Guided design: Evaluation of a model for teaching nursing research. *Journal of Nursing Education, 27*, 303-308.

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

Wlodkowski, R. J., & Kasworm, C. E. (2003). Accelerated learning: Future roles and influences. *New Directions for Adult and Continuing Education, 97*, 93-97. doi:10.1002/ace.92

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