Summer 2013

The Impact of Trainee Characteristics on Transfer of Training Over Time

Kristina N. Bauer
Old Dominion University

THE IMPACT OF TRAINEE CHARACTERISTICS ON TRANSFER OF TRAINING OVER TIME

by

Kristina N. Bauer
B.S., April 2006, University of Pittsburgh
M.A., May 2008, George Washington University
M.S., December 2009, Old Dominion University

A Dissertation Submitted to the Faculty of
Old Dominion University in Partial Fulfillment of the
Requirements for the Degree of

DOCTOR OF PHILOSOPHY

INDUSTRIAL/ORGANIZATIONAL PSYCHOLOGY

OLD DOMINION UNIVERSITY
August 2013

Approved by:

_____
Richard N. Landers (Director)

_____
James M. Henson (Member)

_____
Pilar Pazos-Lago (Member)

ABSTRACT

THE IMPACT OF TRAINEE CHARACTERISTICS ON TRANSFER OF TRAINING OVER TIME

Kristina N. Bauer
Old Dominion University, 2013
Director: Richard N. Landers

Given that organizations invest a considerable amount of time and money into the training and development function, it is imperative that trainees transfer the learned material back to the job and continue to use the knowledge/skills. Yet, most studies have not assessed the transfer process over time (i.e., maintenance). Based on the lack of empirical investigation of maintenance, the current study had two goals: (1) to identify *which* factors are most important for skill maintenance (2) to identify *when* factors are most important to skill maintenance. To these ends, a model was developed and tested that examines the trainee characteristics that influence maintenance. Specifically, the model posited that pre-training trainee characteristics (self-efficacy for learning and motivation to learn) would exhibit a weak and indirect effect on maintenance while post-training and delayed measures of trainee characteristics (utility reactions, self-efficacy to transfer, and motivation to transfer) and learning (declarative and procedural knowledge and skilled performance) would emerge as key determinants of maintenance. The model also distinguished between the *use* and the *effectiveness of use* of trained knowledge/skills. It was expected that trainee characteristics would be differentially related to maintenance depending on the timing of measurement and the distinction between use and effectiveness. Two hundred thirty-one accounting students or professionals completed a 2-hour Excel training program. Of those, only 100 completed a

1-month follow-up and 40 completed a 2-month follow-up. Generally, the model was unsupported due to a lack of significant relationships. Possible reasons for the lack of support include a loss of power due to attrition and the specific context of the study – a voluntary online training program marketed to undergraduates. Directions for future research including continuing to examine trainee characteristics and incorporating work environment factors are discussed.

ACKNOWLEDGEMENTS

First and foremost, I'd like to thank my family who has seen me through my academic journey with a special thanks to my parents and siblings. Although they stopped understanding what I do a long time ago, they never cease to send words of encouragement and tell me how proud they are. I would not be where I am today without their love and support. To my Mimi, we miss you; this is dedicated to you.

I'd like to thank my advisor, Dr. Richard N. Landers, my dissertation committee members, Drs. Matt Henson and Pilar Pazos-Lago, and my many mentors who helped me into and through graduate school, Drs. Karin Orvis, Debbie Major, and Traci Sitzmann. The completion of this milestone would not have been possible without their commitment to my academic success. A special, heart-felt thank you to my cohort, particularly Heather Bolen; graduate school has been an interesting road. I was privileged to travel it with some of the best people I know. I'd also like to thank my friends and colleagues who put up with me through the entire process, were excellent sounding boards, and provided an endless source of support, especially my lab mates and Circle K family. I couldn't have done it without you.

Finally, I'd like to thank the department's office staff, Mary, Peggy, and Linda, for their truly remarkable commitment to the department and to helping graduate students navigate the sea of paperwork and red tape. Your assistance, support, and kindness too often go unappreciated.

TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Organizations invest a considerable amount of resources, both time and money, in training and development each year. ASTD reported that organizations spent $171.50 billion on learning and development in 2010 (Green & McGill, 2011). In addition to this 36% increase from the year before, the average learning expenditure per employee increased from $1,081 in 2009 to $1,228 in 2010, representing a 13% increase (Green & McGill, 2011). These learning expenditures are evidence that, despite poor economic conditions, organizations still value employee learning and development and are investing a considerable amount of resources in it.

One problem that organizations face is realizing return on investment in the training and development function. To address this problem, organizations must ensure that trainees transfer the material back to the job. Positive transfer of training refers to whether trainees use what they learned in training back on the job; it requires that trainees *generalize* learning to the job content and *maintain* the use of trained knowledge or skills over time on the job (Baldwin & Ford, 1988). Numerous researchers have recognized the importance of transfer of training and the need for research examining it (e.g., Baldwin & Ford, 1988; Baldwin, Ford, & Blume, 2009; Goldstein & Ford, 2002; Kraiger, 2002).

Yet, the study of training transfer has only recently begun to flourish. In 1988, when Baldwin and Ford reviewed the literature, there were only 63 empirical studies

---

Journal of Applied Psychology was used as the journal model for this manuscript.

conducted between 1907 and 1987 that had examined transfer. Many of these studies used college students, focused on simple motor tasks, and measured either learning or short-term retention rather than the generalization or maintenance of skills. Twenty years later, Baldwin et al. (2009) found 114 new empirical studies examining transfer and noted four main advancements in the transfer literature: (1) the examination of complex training tasks; (2) the investigation of interventions to enhance transfer; (3) the increased examination of the pre- and post-training factors influencing transfer; and (4) the use of a wider variety of measures and time intervals.

The first advancement is one of the most important because it increases the generalizability of research (Baldwin et al., 2009). In contrast to the simple motor tasks previously investigated, researchers now study a wider range of skills that more closely approximate the work world. For example, Gaudine and Saks (2004) studied nurses in a 2-day training program about a specific model of nursing, whereas Parry and Sinha (2005) examined a 2-day transformational leadership training program in a sample of mid-level managers. Kirkman, Rosen, Tesluk, and Gibson (2006) researched transfer in geographically distributed teams undergoing teamwork training using Team Tools Interactive.

The second advancement concerns the increased investigation of interventions to enhance transfer. Prior to training, a positive preview of training (Karl & Ungsrithong, 1992) and framing training as an opportunity (Martocchio, 1992) enhanced learning. Post-training interventions that have been successful in enhancing transfer include goal-setting (e.g., Gist, Bavetta, & Stevens, 1990; Richman-Hirsch, 2001; Werner, O'Leary-Kelly, Baldwin, & Wexley, 1994; Wexley & Baldwin, 1986; Wexley & Nemeroff, 1975),

self-management or relapse prevention (e.g., Burke & Baldwin, 1999; Frayne & Latham, 1987; Gist et al., 1990; Latham & Frayne, 1989; Noe, Sears, & Fullenkamp, 1990; Tziner, Haccoun, & Kadish, 1991), and self-coaching (e.g., Tews & Tracey, 2008).

With respect to the third advancement and in contrast to early literature, recent work has focused more on the trainees and the environmental context than on the training program itself. The early transfer literature focused on training design characteristics as transfer can only occur after a learning experience (Baldwin et al., 2009; Goldstein & Ford, 2002). But with theory development in the late 1980s (e.g., Baldwin & Ford, 1988; Noe, 1986; Noe & Schmitt, 1986), research on individual differences and environmental factors increased. Blume, Ford, Baldwin, and Huang (2010) identified a variety of trainee characteristics and environmental factors that had been studied with enough frequency for a meta-analysis. The most commonly studied variables included motivation ($k = 29$), self-efficacy ($k = 22$), and support ($k = 12$), but environmental factors were studied with less frequency than trainee characteristics.

The final advancement in the literature is twofold: (a) the measurement of transfer has broadened and (b) time is being incorporated in measurement. Both Baldwin et al. (2009) and Ford and Weissbein (1997) noted an increased use of supervisor or other observer ratings. This is a marked improvement over reliance on self-reports that can be distorted by social desirability and memory problems (Ford & Weissbein, 1997). Additionally, more longitudinal designs are being used with time lags ranging from a week to a year (Baldwin et al., 2009). The variety of time lags is promising because this variety is necessary to model maintenance curves (Baldwin et al., 2009; Taylor, Russ-Eft, & Chan, 2005).

Despite these recent advancements, one area that continues to be understudied is the examination of the transfer process (i.e., repeated measures of transfer over time or maintenance). Most studies have not measured maintenance (Cromwell & Kolb, 2004; Gaudine & Saks, 2004). In their review and meta-analysis of the literature, Blume et al. (2010) identified only six studies that measured transfer more than once, and they noted that, "More empirical studies are sorely needed if we are to more conclusively examine transfer maintenance" (p. 1097). This is a serious gap in the literature as maintenance is a crucial component of the transfer process for organizations investing in training. To reap the full benefits, employees must continue to use the trained skills over time. It is not enough for an employee to initiate learned skills, experience failure or negative feedback, and then no longer use them. If an organization is to maximize return on investment, employees must continue to use the learned skills effectively. Thus, the purpose of this study is to outline a model of the maintenance process.

Specifically, this study has two goals that make distinct contributions to the transfer literature. The first goal is to identify *which* factors are most important for skill maintenance. Of the six studies identified in Blume et al. (2010) that measure transfer more than once, only one has examined pre-training factors that affect the transfer process. No study examined a comprehensive set of pre-training, post-training, and delayed measures of factors influencing the transfer process. The current study builds a model that examines pre-training, post-training, *and* delayed measures of predictors of the transfer process. This study limits Baldwin and Ford's (1988) original specification by examining trainee characteristics and learning in relation to maintenance. If post-training individual differences (e.g., motivation to transfer) or learning can be identified

as specifically important for maintenance, organizations will be better able to target these factors for intervention.

The second goal is to identify *when* factors are most important to skill maintenance. The extant literature demonstrates that transfer does happen, but we lack a deeper understanding of the underlying mechanisms that influence transfer (e.g., Blume et al., 2010; Grossman & Salas, 2011). Grossman and Salas specifically note that we need to understand whether such factors are most important before, during, or after training. For example, motivation to transfer may be most critical for the continued use of trained skills. If this is the case, organizations could know specifically when a targeted intervention will have the most influence. In the remainder of this section, I will give an overview of the conceptual model along with definitions and then review research relevant to the study hypotheses.

Model Overview and Definitions

The conceptual model depicted in Figure 1 is largely based on Baldwin and Ford's (1988) original model of the transfer process but is supplemented by more recent reviews of the literature (e.g., Baldwin et al., 2009; Blume et al., 2010; Grossman & Salas, 2011) and by integrating the Learning Transfer System Inventory (LTSI) framework (Chen, Holton, & Bates, 2005; Holton, Bates, & Ruona, 2000). Baldwin and Ford originally proposed that individual differences, work environment factors, and training design characteristics influence training transfer (generalization and maintenance) indirectly through learning and retention; individual differences and environment factors also directly influence transfer. Consistent with the goals of the study, I chose to focus on the influence of trainee characteristics and learning on transfer

of training. The specific variables under study were chosen based on meta-analytic estimates from Blume et al. and suggestions made by Grossman and Salas. Trainee characteristics include motivation, self-efficacy, and utility perceptions. Learning includes declarative knowledge, procedural knowledge, and skilled performance. Generally, and in line with prior theory (e.g., Baldwin & Ford, 1988; Chen et al., 2005; Colquitt, LePine, & Noe, 2000; Holton & Baldwin, 2003; Holton et al., 2000), Figure 1 illustrates that pre-training factors directly and indirectly (through post-training factors) influence the transfer process; post-training factors directly affect the transfer process. After providing definitions, a more detailed explication of the model follows.

Trainee characteristics. Generally, motivation refers to a set of internal processes including arousal, direction, and intensity of effort (Colquitt et al., 2000; Kanfer & Ackerman, 1989; Mitchell & Daniels, 2003). In the context of the current study, motivation was conceptualized using Noe's (1986; Noe & Schmitt, 1986) model of motivational influences of training effectiveness. In this model, motivation to learn and motivation to transfer are developed as key determinants of learning and transfer. Motivation to learn is defined as a trainee's desire to learn the course content and is inherently a pre-training construct (Noe & Schmitt, 1986). Motivation to transfer is a trainee's desire to use the learned material back on the job (Noe & Schmitt, 1986) and is considered a post-training variable. Because motivation to transfer could change once a trainee leaves the training environment (Gegenfurtner, Veermans, Festner, & Gruber, 2009), motivation to transfer will be measured over time.

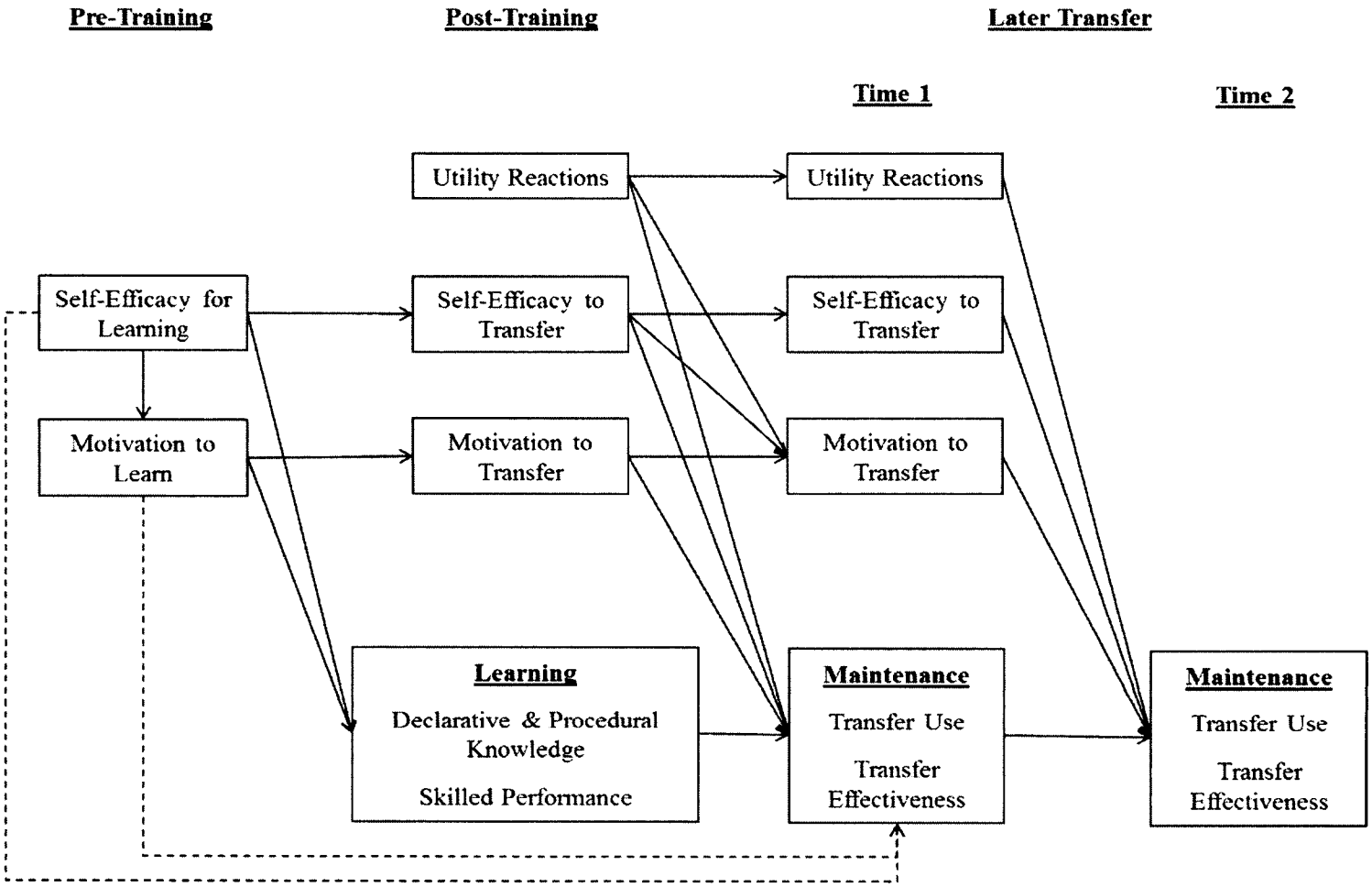


Figure 1. A longitudinal model of the effects of pre- and post-training variables on maintenance. Time 1 is 4 weeks post-training; Time 2 is 8 weeks post-training. Dashed lines represent proposed partial mediation.

For example, a trainee may be very excited about the skills learned in training and have a strong desire to transfer those skills, but have negative experiences (e.g., receive negative feedback by making many mistakes) back on the job and become less motivated to use what was learned. In their narrative review, Burke and Hutchins (2007) noted that there is limited empirical research examining these constructs in the context of transfer and additional research is needed to confirm direct relationships with transfer.

Self-efficacy refers to the degree of confidence in one's ability to perform specific tasks (Bandura, 1977; Wood & Bandura, 1989). According to Gist, Stevens, and Bavetta (1991), self-efficacy is a dynamic judgment, meaning that it will vary depending on the referent. Thus, the current study will examine two specific types of self-efficacy: self-efficacy for learning and self-efficacy to transfer. The former refers to a trainee's beliefs that he or she can learn the material in training, whereas the latter refers to a trainee's confidence in transferring learned skills back to the job. This conceptualization is consistent with Colquitt et al.'s (2000) model of training motivation where self-efficacy is a precursor to and consequence of motivation to learn. Moreover, Blume et al. (2010) found that transfer was similarly related to both pre-training self-efficacy and post-training self-efficacy when examining studies that were not biased by same measurement context. Therefore, the investigation of both types of self-efficacy is warranted.

Finally, utility perceptions refer to the usefulness or applicability of training to the job (Alliger, Tannenbaum, Bennett, Traver, & Shotland, 1997; Warr & Bunce, 1995). Although trainee reactions have been conceptualized as a multi-dimensional construct (Alliger et al., 1997; Brown, 2005; Warr & Bunce, 1995), only utility perceptions are examined here. As Warr and Bunce aptly pointed out, trainees may have found training

highly enjoyable, but not learned something useful for the job. Meta-analytic evidence confirms this assertion (e.g., Alliger et al., 1997; Sitzmann, Brown, Casper, Ely, & Zimmerman, 2008). Conversely, a trainee may have found training utterly boring but still think the learned skills are useful for the job. Furthermore, Blume et al. (2010) found that utility reactions had a true score correlation of .17 ($k = 6$ after taking into account same measurement context) with transfer, whereas affective reactions and overall reactions had a true score correlation of .08 ($k = 8$ and 7, respectively). Perceptions of usefulness require trainees to make a future-oriented judgment (Alliger et al., 1997). According to Alliger et al., trainees may be better able to judge how useful the training was, once they are back on the job. Therefore, utility reactions will also be measured over time.

Learning. Learning is the most important training criterion (Campbell, 1988) and is a fundamental precursor for other training outcomes like transfer (Baldwin & Ford, 1988; Goldstein & Ford, 2002). Cognitive and skill based learning outcomes were chosen in accordance with Kraiger, Ford, and Salas (1993). Cognitive learning encompasses verbal knowledge, knowledge organization, and cognitive strategies, whereas skill-based learning includes compilation and automaticity (Kraiger et al., 1993). Skill-based learning requires trainees to demonstrate a learned skill, as well as sequentially and hierarchically order behaviors (Weiss, 1990).

Declarative knowledge and procedural knowledge are cognitive learning outcomes. Declarative knowledge reflects trainees' acquisition of the key facts and principles taught in training (Kraiger et al., 1993), whereas procedural knowledge reflects trainees' acquisition of knowledge about how something is done (Anderson, 1982). Cognitive learning outcomes are important because they build on each other and precede

the acquisition of higher order knowledge and skill (Ackerman, 1987; Anderson, 1982; Fitts & Posner, 1967). Skilled performance is a skill-based learning outcome. This outcome refers to the demonstration of the acquired procedural knowledge and skills (Kraiger et al., 1993).

Transfer of training. As previously mentioned, positive transfer of training refers to whether trainees use what they learned in training back on the job (Baldwin & Ford, 1988). A number of taxonomies of transfer (e.g., Barnett & Ceci, 2002; Laker, 1990) or models of the transfer process (e.g., Baldwin & Ford, 1988; Broad, 2005; Broad & Newstrom, 1992; Burke & Hutchins, 2008; Grossman & Salas, 2011; Holton et al., 2000) have been proposed with Baldwin and Ford's seminal model being the most commonly cited (Brown & Sitzmann, 2010). In their model, transfer consists of two dimensions: (1) generalization, which refers to whether trained knowledge or skill is applied to settings that are different from training; and (2) maintenance, which refers to whether trained knowledge or skill is maintained over time (Blume et al., 2010). Both components of transfer are directly influenced by trainee characteristics, work environment factors, and learning and retention. Transfer is indirectly influenced (through learning and retention) by training design principles.

Building on the work of Baldwin and Ford (1988), Laker (1990) proposed a dual dimensionality model of transfer. He argued that there are two dimensions of transfer, a temporal dimension (maintenance in Baldwin & Ford's model) and a generalizability dimension (generalization in Baldwin & Ford's model). The generalizability dimension includes near and far transfer. Near transfer refers to whether trained knowledge/skills are applied to situations on the job that mirror those in training. Far transfer refers to whether

the trainee applies trained knowledge/skills to situations that are different from those in training. The temporal dimension includes transfer initiation and transfer maintenance. Transfer initiation refers to whether trainees attempt to apply the knowledge/skills taught in training. Transfer maintenance retains the original definition – continued application of trained knowledge/skills over time.

More recently in the education literature, Barnett and Ceci (2002) further broke down the generalizability dimension and proposed a taxonomy of far transfer. They suggested that there are nine dimensions of transfer that can be grouped into two broad categories: (a) Content: what transferred; and (b) Context: when and where transferred from and to. Content includes specificity of the learned skill (e.g., principle, procedure), nature of performance change (e.g., speed, accuracy), and memory demands of the transfer task (e.g., execute only; recall, recognize, and execute). Context is a near to far continuum and includes knowledge domain to which the knowledge/skill is applied (e.g., near: mouse vs. rat; far: science vs. art), physical context of learning and application (e.g., near: same room at school; far: school vs. beach), temporal context or elapsed time between learning and application (e.g., near: same session; far: years later), functional context or function of the skill (e.g., near: both clearly academic; far: academic vs. at play), social context of learning and transfer (e.g., near: both individual; far: individual vs. society), and modality (e.g., near: both written, same format; far: lecture vs. wood carving). Note that the examples are taken from Barnett and Ceci's Figure 1 (p. 621). Barnett and Ceci's taxonomy does not directly apply to this study because it focuses on generalizability and not maintenance. However, it provides insight on the importance of keeping in mind the content and context of the learning and transfer experiences.

Another distinction recently made about classifying transfer is whether the focus of measurement is on frequency of use of skills or the effectiveness of skill application. In their review and meta-analysis, Blume et al. (2010) identified the need to investigate these types of measures separately as a "pressing need for future research" (p. 1095). They contended that differences in the predictor-transfer relationships may emerge if use vs. effectiveness is considered more closely. Logically this makes sense; consider opportunity to use. Opportunity to use should be related to reported use of trained knowledge and skills consistently throughout the transfer process because the number of opportunities should be directly proportional to capitalizing on those opportunities. That is, the relationship should remain at the same magnitude over time. However, the relationship may not be stable for effectiveness. Given, a consistent amount of within person opportunity, the relationship between opportunity to use and effectiveness may increase across time. This increasing relationship could be due to skill automation where early performance is slow and riddled with errors but later performance is fast and has fewer errors (Ackerman, 1987; Anderson, 1982).

Moving away from classifying types of transfer, three main models of the transfer process have been proposed: Baldwin and Ford's (1988) model of the transfer process, Broad and Newstrom's (1992) transfer matrix, and Holton et al.'s (2000) LTSI framework. Again, the most cited is Baldwin and Ford's (1988) model, and later models largely build from this foundation. In fact, many reviews since Baldwin and Ford merely review the progress made in transfer research relative to the original model (e.g., Burke & Hutchins, 2007; Ford & Weissbein, 1997; Grossman & Salas, 2011). Together, these

reviews suggest that empirical evidence is supportive. Therefore, this model serves as the foundation for the description of the remaining models.

The second model of transfer was developed by Broad and Newstrom (1992; Broad, 2005). As a more applied model, Broad and Newstrom (1992; subsequently Broad, 2003, 2005) focused on alleviating the transfer problem – the lack of transfer of trained skills to the workplace – by identifying key people (or stakeholders) and time periods to implement transfer strategies. It should be noted that this work uses the term "transfer of learning to performance" in order to be broadly applicable to interventions other than training (e.g., performance coaching). Originally stakeholders included the manager, which lumped together all of the external environment, the trainer, and the trainee. Later work distinguished between all key stakeholders, including executives, supervisors, performers, performance consultants, evaluators, performance partners, coworkers, subject matter experts, etc (Broad, 2005). Three time periods are distinguished: before, during, and after training or other intervention. The stakeholders and time periods are crossed to form a transfer matrix, and this matrix is used to list the transfer strategies that should be undertaken by each stakeholder at each time point to ensure transfer of training occurs (Broad, 1997, 2001, 2002, 2003, 2005; Broad & Newstrom, 1992).

The contribution of this transfer matrix model is twofold. First, Broad and Newstrom (1992) take a systems approach to understanding why transfer does not always occur by recognizing the importance of key stakeholders. Second, time is explicitly incorporated into the transfer matrix. By involving all stakeholders in the process from beginning to end, the model maximizes the likelihood that transfer will occur. However,

most of the transfer strategies focus on the environment, leaving out trainee characteristics.

Recently, Burke and Hutchins (2008) integrated Baldwin and Ford's (1988) work with Broad and Newstrom (1992; Broad, 2003, 2005). The key contribution is the unification of training inputs from Baldwin and Ford (trainee characteristics, work environment factors, and training design) and the transfer matrix, particularly the time component, from Broad and Newstrom. Burke and Hutchins also supplemented their integration with a survey of ASTD training professionals to identify best practices. The integration and survey identified five major influences on learning and transfer: learner characteristics, trainer characteristics, design/delivery, work environment, and evaluation. This represents the addition of trainer characteristics and evaluation to the original three training inputs (learner characteristic, design/delivery, and work environment). In terms of important time periods, Burke and Hutchins added a "not time bound" category to Broad's (2005) before, during, and after training time periods. The not time bound category includes transfer interventions that can be utilized at any time period or should be implemented across time periods. Additionally, Burke and Hutchins identified five key stakeholders (peers, trainer, trainee, supervisor, and organization), limiting those listed in Broad (2005) to a manageable set. However, as the model is currently drawn it is untestable. It represents a way of thinking about transfer based on theory, empirical research, and practitioner input.

The third model of transfer is the LTSI framework developed by Holton and colleagues (e.g., Chen et al., 2005; Devos, Dumay, Bonami, Bates, & Holton, 2007; Holton, Bates, Bookter, & Yamkovenko, 2007; Holton et al., 2000; Holton, Bates, Seyler,

& Carvalho, 1997; Khasawneh, Bates, & Holton, 2006; Myers, 2009; Yaghi, Goodman, Holton, & Bates, 2008). The LTSI is grounded in Holton's (1996) HRD Research and Evaluation Model, which included primary (motivational, environmental, and ability elements) and secondary influences on learning, individual performance, and organizational results. It also stresses examining the *transfer system*, or all of the influences affecting transfer. The LTSI explicates the influences on individual performance, which is analogous to transfer (Holton, 2003). There are 16 factors grouped into primary and secondary influences. The first primary factor, ability, includes content validity, transfer design, personal capacity for transfer, and opportunity to use. Motivation, the second primary factor, includes motivation to transfer, transfer effort-performance expectations, and performance-outcome expectations. The final primary influence, work environment, includes feedback, peer support, supervisor support, openness to change, positive and negative personal outcomes, and supervisor sanctions. Secondary influences include performance self-efficacy and learner readiness. Secondary influences are thought to influence motivation, whereas the primary influences all directly affect individual performance.

The LTSI is meant to assess individual trainees' perceptions and be administered post-training as a diagnostic tool of the transfer environment (Holton et al., 2000). As such it has both strengths and weaknesses. The major strengths include: (a) the comprehensive set of predictors that cover the three training inputs identified by Baldwin and Ford (1988); (b) the capability to provide information to organizations about what factors to target for intervention; and (c) the fact that the measure associated with the framework has been shown to be a reliable and valid instrument – one of the only

instruments to undergo such extensive validation. However, the major weakness is the focus on post-training intervention. As Broad and Newstrom (1992) and Holton and Baldwin (2003) point out, factors influencing transfer occur before, during, and after training.

Holton and Baldwin (2003) made an initial attempt to integrate all three models of the transfer process (e.g., Baldwin & Ford, 1988; Broad & Newstrom, 1992; Holton et al., 2000). They proposed a conceptual framework for managing learning transfer systems. The notion of transfer systems was taken from Holton et al. (2000). The framework starts with Baldwin and Ford's original model but expands the concept of learner to include teams. Then, it borrows from Holton et al. and Naquin and Holton (2002) by "recognizing that the learner or team is both an input to the process...and a unit in the model that may be shaped by interventions" (Holton & Baldwin, 2003, p. 9). Broad and Newstrom's time dimension is also incorporated and expanded upon. Holton and Baldwin define five time periods. Time point 1 represents what the learner brings to the environment, including four influences identified by Holton et al. (2000): ability, motivation, individual differences, and prior experience. Time point 2 is analogous to the before stage, whereas time points 3 and 4 are analogous to the during and after stages, respectively, in the Broad and Newstrom model. Organizational interventions and learner or team interventions are thought to influence the transfer system at time points 2-4. Importantly, time point 3, or the learning event, is comprised of both the content and design. As noted in all three prior models, the training should be relevant to the job and delivered in a way that enhances transfer. Time point 5 represents transfer or performance outcomes. Holton and Baldwin distinguish between near (short term results) and far

(longer-term results and generalization to new situations) transfer. Notice that in this definition the types of transfer previously distinguished have been collapsed across. Finally, Holton and Baldwin also state that the many specific variables will fit into the elements they identified in the transfer system framework.

Taken together, the above description of transfer of training models and taxonomies suggests two conclusions. First, transfer needs to be explicitly defined and types of transfer should be clearly distinguished. In accordance with the first conclusion, this study focuses on maintenance or transfer over time from initiation to continued application of knowledge/skills (Baldwin & Ford, 1988; Laker, 1990) and distinguishes between use and effectiveness measures as suggested by Blume et al. (2010). Second, Holton and Baldwin's (2003) model for managing the transfer system is an important starting point because it integrates three models of the transfer process. It is important for new models to build on existing theory, and the model developed herein expands Holton and Baldwin's time point five. In the following sections, hypotheses are developed based on the conceptual model in Figure 1 and organized by the timing of measurement of the constructs. That is, both contributions of the study are discussed with respect to pre-training, post-training, and delayed measures in turn. In the literature review that follows, I will rely on the broader transfer literature to justify hypotheses as a limited number of studies have explicitly measured maintenance.

Pre-Training Influences on Maintenance

The influence of pre-training variables on transfer should be partially mediated by post-training variables. This assertion is consistent with Baldwin and Ford's (1988) original model of transfer and Holton and Baldwin's (2003) updated model as well as

other theoretical (e.g., Noe, 1986) and meta-analytic (e.g., Blume et al., 2010; Colquitt et al., 2000) evidence. According to social cognitive theory, trainees with higher self-efficacy are more motivated and put forth effort (Bandura, 1986; Bandura & Cervone, 1983, 1986). Thus, trainees who have higher self-efficacy for learning will be more motivated to learn, learn more, have higher self-efficacy to transfer, and subsequently transfer more. Individuals who are more motivated to learn put forth more effort, learn more, and subsequently can transfer more (Noe, 1986; Noe & Schmitt, 1986); they are also more motivated to transfer (Holton et al., 2000; Kontoghiorghes, 2004; Mathieu & Martineau, 1997; Tai, 2006).

Hypothesis 1: The relationship between self-efficacy for learning and maintenance will be partially mediated by (a) motivation to learn, (b) learning, and (c) self-efficacy to transfer.

Hypothesis 2: The relationship between motivation to learn and maintenance will be partially mediated by (a) learning and (b) motivation to transfer.

When are pre-training influences most important? The question of *when* gets at the heart of Grossman and Salas' (2011) suggestion that the field needs an understanding of whether factors are important before, during, or after training. It seems likely that *when* factors will be most important is different for each variable in the model, as well as for use vs. effectiveness of trained skills. For example, it might be that for use, the relationship between motivation to transfer and transfer will remain constant over time because trainees who are more motivated and remain more motivated are going to use and continue using trained skills. Therefore, this section, and all subsequent sections

about *when* factors are most important, discusses each variable in Figure 1 with respect to use and effectiveness in turn.

Due largely to the distal nature of motivation to learn and self-efficacy for learning, it is expected that both constructs will exhibit weak relationships with transfer (both use and effectiveness) early in the process and that this relationship will diminish over time. Consistent with the rationale for Hypotheses 1 and 2, the effects of motivation to learn and self-efficacy should be partially mediated by post-training variables. Therefore, the effect of these variables will necessarily be weak. Methodologically, measurements that are further apart are less related to each other (Cohen, Cohen, West, & Aiken, 2003), supporting a diminishing relationship.

Hypothesis 3: Self-efficacy for learning will exhibit a weak relationship with maintenance (a) use and (b) effectiveness that is stronger at Time 1 than at Time 2.

Hypothesis 4: Motivation to learn will exhibit a weak relationship with maintenance (a) use and (b) effectiveness that is stronger at Time 1 than at Time 2.

Post-Training Influences on Maintenance

Post-training variables relative to pre-training variables are key determinants of transfer. First, learning is a perquisite for transfer (Baldwin et al., 2009). In other words, trainees must have acquired knowledge/skills in training before transfer can occur, and the more trainees learn the better able they are to transfer. Utility reactions are important because trainees who view training as more relevant to their job are more likely to transfer learned knowledge/skills (Axtell, Maitlis, & Yearta, 1997; Warr & Bunce, 1995).

Trainees with higher motivation to transfer should engage in more behavior change because they have learned more in training and desire to put forth effort post-training to use these knowledge/skills (Noe, 1986; Noe & Schmitt, 1986; Poteet, 1996; Tziner et al., 1991). Additionally, trainees with higher self-efficacy persist in the face of negative feedback and are more committed to their goals (Locke & Latham, 2002). If a trainee has high self-efficacy to transfer, they should be committed to transferring learned knowledge/skills, and therefore, demonstrate higher levels of transfer.

Furthermore, all of the post-training variables should exert a stronger influence on transfer than pre-training variables. Hypotheses 1-2 posited that pre-training variables influence transfer through the post-training variables. As aforementioned, measurements that are further apart in time are less related (Cohen et al., 2003). Post-training predictors are more proximal to the transfer process, supporting the predicted stronger relationship with transfer.

Hypothesis 5: (a) Learning, (b) utility reactions, (c) motivation to transfer, and (d) self-efficacy to transfer will be uniquely positively related to maintenance.

Hypothesis 6: Post-training variables will emerge as stronger predictors of maintenance than pre-training variables.

Yet, which post-training factors will emerge as the best predictor of maintenance is less clear because the best predictor likely depends on the distinction between use and effectiveness. As noted previously, only six studies have examined multiple measures of transfer (i.e., maintenance). One study did not examine any variables in common with the current study (Heimbeck, Frese, Sonnentag, & Keith, 2003), and three were lab studies that included post-training transfer manipulations and only measured task specific self-

efficacy (Gist et al., 1991; Stevens, Bavetta, & Gist, 1993; Stevens & Gist, 1997). However, two studies have examined multiple variables in common with the current study (Axtell et al., 1997; Martineau, 1995) and provide preliminary evidence about whether post-training trainee characteristics are more important for initial use or effectiveness.

First, Martineau (1995) examined pre-training job performance, motivation to learn, motivation to transfer, utility reactions, learning, situational constraints, and climate for transfer as predictors of self-reported transfer at 3- and 6-months. The sample consisted of front-line managers in a leadership skills course and transfer focused on *use* of trained skills. Due to low response rates, the entire model was not tested and the 6-month follow up was not examined. However, in a path model of the 3-month follow-up, pre-training job performance and motivation transfer were the only individual-level significant direct effects on job performance. These findings could imply that individual characteristics (motivation, prior performance) are more important for use of trained skills.

The second study examined the effect of post-training factors (self-efficacy, motivation to transfer, relevance (utility), management support, and autonomy) on self-reported transfer at 1-month and 1-year (Axtell et al., 1997). Axtell et al.'s study utilized non-managerial, technical staff who attended interpersonal skills training. The focus of the transfer measure was on degree of transfer, another measure of use. At the 1-month follow-up, relevance and motivation to transfer were the only two predictors that influenced transfer. At the 1-year follow-up, transfer at 1-month, motivation to transfer,

and autonomy emerged as significant predictors (note relevance was not included). Thus, trainee characteristics again emerged as important predictors of use of trained skills.

Taken together, the results of Martineau (1995) and Axtell et al. (1997) preliminarily suggest that trainee characteristics may emerge as more important predictors of transfer use. However, neither study examined an effectiveness measure; thus, a logical argument is offered to further support the assertion that trainee characteristics are more important for use than effectiveness. Research demonstrates that feedback is necessary for skill development to proceed and for trainees to effectively perform skills (Anderson, 1982; Kanfer & Ackerman, 1989; Locke & Latham, 2002). Ilgen, Fisher, and Taylor (1979) distinguished between three sources of feedback: others, the task, and the self. However, self-assessments tend to be inaccurate (Mabe & West, 1982; Sitzmann, Ely, Brown, & Bauer, 2010) and are therefore likely to be a poor source of feedback. Thus, outside feedback is needed for transfer effectiveness regardless of the levels of perceived usefulness, motivation, or confidence. Additionally, Blume et al. (2010) found slightly stronger relationships for use measures than effectiveness measures for the relationships they were able to examine.

Hypothesis 7: (a) Motivation to transfer, (b) self-efficacy to transfer, and (c) utility reactions will be more strongly related to maintenance use than effectiveness.

When is learning most important for maintenance? Learning should be most strongly related to maintenance effectiveness early, or during what Laker (1990) called transfer initiation. Learning is the first stage of skill acquisition that precedes more automatic use of skills (Ackerman, 1987; Anderson, 1982; Fitts & Posner, 1967; Kanfer

& Ackerman, 1989). When a trainee leaves training and first attempts to apply learned skills, he or she should still be in the earlier stages of skill acquisition. As the trainee continues to practice the knowledge/skills, they become automated and require fewer resources (Kanfer & Ackerman, 1989). Logically, the more trainees learned in a course, the more effectively they can apply it back on the job. Furthermore, continued application of the learned knowledge/skills back on the job should make using the knowledge/skills easier and more automatic, decreasing the impact of post-training knowledge/skill level.

However, the link between learning and use of knowledge/skills should be stable and weaker than the relationship with effectiveness. As aforementioned, learning is a perquisite for transfer (Baldwin et al., 2009) and those who learn more will have more knowledge/skills to use. Unlike with effectiveness, however, use of skills cannot be automated. Given a stable amount of opportunity to use knowledge/skills within person, the relationship between learning and maintenance use should not change. Implicit in this argument is that assertion that learning influences actual use through increased opportunities for use, which has been supported by prior research (e.g., Birdi, 2000). This mediational influence is not predicted for effectiveness, supporting the suggestion the relationship between learning and use will be weaker than learning and effectiveness.

Hypothesis 8: The magnitude of the relationship between learning and maintenance effectiveness will be stronger at Time 1 than at Time 2.

Hypothesis 9: Learning will exhibit a (a) stable relationship with maintenance use that will be (b) weaker than the relationship with maintenance effectiveness.

The Influence of Repeated Measures on Maintenance

The remaining factors influencing transfer (i.e., utility reactions, motivation to transfer, and self-efficacy to transfer) cannot be fully understood without examining them together. For example, Noe (1986) proposed that trainees are motivated to transfer when they are confident in applying learned knowledge/skills and perceive the knowledge/skills to be applicable. In other words, utility reactions and self-efficacy to transfer influence motivation to transfer. For example, Seyler, Holton, Bates, Burnett, and Carvalho (1998) examined trainees undergoing training to meet Occupational Safety and Health Administration regulations. They found that confidence, was one of the strongest predictors of motivation to transfer when controlling for a host of other variables. Additionally, Kirwin and Birchall (Kirwan & Birchall, 2006) tested the LTSI in a sample of nurse managers and found that self-efficacy and utility reactions influenced motivation to transfer. Finally, Gegenfurtner et al (2009) summarized the literature examining motivation to transfer and stated that motivation to transfer is the only mediator between all other antecedents of transfer and transfer of training. This assertion is reflected in Figure 1. However, it is thought that the other trainee characteristics will exert unique influences on the maintenance process. Therefore, it is expected that motivation to transfer will act as a partial mediator between both maintenance use and effectiveness.

Utility reactions, self-efficacy to transfer, and motivation to transfer should exhibit different relationships with use versus effectiveness, regardless of the mediation hypotheses. In terms of transfer use, it is expected that motivation to transfer, self-efficacy to transfer, and utility reactions will exhibit stable relationships with transfer over time. Trainees who are initially confident, motivated, and perceive training to be useful should start out using training more; trainees who continue to remain motivated,

confident, and perceive training to be useful should continue to use training more. With regard to transfer effectiveness, it is expected that utility reactions, self-efficacy to transfer, and motivation to transfer will be more important for continued effectiveness. When trainees first attempt to apply newly learned knowledge/skills, they need support and feedback to hone them (Anderson, 1982; Kanfer & Ackerman, 1989; Locke & Latham, 2002). However, as skill increases, feedback is no longer needed as much. Instead, trainees must continue to perceive applicability of trained skills as well as feel confident and motivated to use the skills in order to continue effectively applying them. This suggests that the relationship between trainee characteristics and transfer effectiveness will get stronger over time. Based on the above evidence, the following hypotheses are made.

Hypothesis 10: The relationship between maintenance use and (a) utility reactions and (b) self-efficacy to transfer will be partially mediated by motivation to transfer.

Hypothesis 11: The relationship between maintenance effectiveness and (a) utility reactions and (b) self-efficacy to transfer will be partially mediated by motivation to transfer.

Hypothesis 12: (a) Utility reactions, (b) self-efficacy to transfer, and (c) motivation to transfer will exhibit relationships with maintenance use that are the same at Time 1 and Time 2.

Hypothesis 13: (a) Utility reactions, (b) self-efficacy to transfer, and (c) motivation to transfer will exhibit relationships with maintenance effectiveness that is stronger at Time 2 than at Time 1.

CHAPTER II

METHOD

Participants and Procedure

The final sample consisted of 231 undergraduate accounting students or accounting related professionals. Approximately 1,342 people received the link to the course. Of those, 858 signed up for the course, representing 36.1% attrition. Of the 858 students who signed up, 130 never advanced past the informed consent and an additional 218 never started training. Although the overall attrition rate (82.8% or 73.1% for links sent and sign-ups, respectively) is high, it is consistent with prior research (e.g., Sitzmann, Ely, Bell, & Bauer, 2010; 75.7% attrition) and is more reasonable if you exclude those who never started training (54.7%). With respect to the follow-up, each participant completing training was eligible to complete the 1-month and 2-month follow-ups due to the ability of estimation techniques that can account for missing data. Note that because the course closed on June 1, 2013, not all participants are currently at a point to take the first or second follow-up. Of the 189 participants currently eligible for the first follow-up, 111 participants started it, 100 participants completed it, and 2 withdrew from the study. Of the 116 participants currently eligible for the second follow-up, 40 participants started and completed it.

The demographics revealed a diverse sample and are reported for the 231 participants who completed training. The mean age of participants was 26.10 (SD = 9.37), and 65.8% (N = 152) were female while 34.2% (N = 79) were male. There were 4.8% (N = 11) freshman, 19.9% (N = 46) sophomores, 29.0% (N = 67) juniors, 34.2% (N = 79) seniors, 9.1% (N = 21) graduate students, and 3.0% (N = 7) employed participants.

With respect to ethnicity, 59.7% (N = 138) were Caucasian, 7.8% (N = 18) were African American, 10.4% (N = 24) were Asian, 10.4% (N = 24) were Hispanic or Latino, 3.0% (N = 7) were American Indian or Alaska Native, 0.4% (N = 1) were Native Hawaiian or Pacific Islander and 8.2% (N = 19) were another ethnicity. Of the current students, average GPA was 3.46 (SD = 0.49) and 63 had an internship that required Excel. Finally, in the overall sample, participants reported having a moderate amount of experience with Excel (M = 3.93, SD = 1.42 on a 7-point scale) and using it frequently in class or work (M = 3.45, SD = 1.03 on a 5-point scale).

An a priori power analysis revealed that 712 participants were needed for a fully latent SEM model, 170 participants were needed for a path model, and 247 participants were needed to test for differences between dependent correlations (i.e., Hypotheses 6 and 7). The final desired sample size was determined by comparing the power analyses and weighing the costs of experimentation. The sample size required for the fully latent model was cost and resource prohibitive. Thus, the required sample size for the difference between correlations was used because it was larger than the required sample size for the path analysis. Based on the current sample, there was sufficient power for the path analysis. The sample is only 16 participants short of the required sample testing differences between correlations.

The design was a one-group pretest/multiple-post-test design using a nonequivalent dependent variable (Shadish, Cook, & Campbell, 2002). Shadish et al. describe a nonequivalent dependent variable as one that is *not* expected to change based on treatment but should respond the same as the focal dependent variable to threats to internal validity. The nonequivalent dependent variable was incorporated in the

declarative knowledge, procedural knowledge, and skilled performance measures (described later) and consisted of items not specifically covered in training but related to Excel. There are numerous strengths to this design (Shadish et al., 2002). First, the inclusion of the pre-test allows for (a) the assessment of what could have happened without treatment (b) determination of whether the sample is similar to the population of interest, and (c) ruling out ambiguous temporal order. Second, the nonequivalent dependent variable should help rule out history, maturation, and testing as possible threats to internal validity. Third, multiple post-tests allow individuals to serve as their own controls, helping to address post-training regression and maturation.

Participants were recruited through University advertisements, visits to four accounting courses at a local community college, e-mails to 353 accounting student organizations, e-mails to 1,169 chairs/program coordinators of departments with accounting programs, and with the help of a Professor of Accounting. Of the student organizations contacted, 61 expressed interest. There were 201 department chairs or program coordinators who responded, only three of which indicated they would not participate. The message to organizations and accounting departments stressed the benefit of the training program to the students' future career in order to demonstrate the desirability of completing the study. It also indicated that interested students should contact the researcher for additional information.

After a potential participant expressed interest in the training program, he or she was sent a link to the course and instructions for creating a username and password. At first log on, students viewed an informed consent page (see Appendix A) and were required to fill out the pre-training measures before entering the actual online course.

Students then navigated through the course at their own pace. Once trainees completed training, they filled out post-training measures. Participants were then taken to a screen thanking them for their participation and instructing them to look for e-mails regarding follow-up measurements.

Two follow-up sessions were used to measure maintenance and the transfer process. Participants received an e-mail 4 and 8 weeks after training directing them to the study website. The length of the follow-up was chosen to be consistent with the broader transfer literature. A multiple contact strategy was used at each follow-up to attempt to reduce attrition. Shadish et al. (2002) suggest this type of strategy as helpful for reducing attrition. Participants were first contacted on the specific date marking 4 or 8 weeks. If the participant did not immediately respond to the follow-up, they were e-mailed every other day for up to 10 days. With this method, participants received between four and five messages encouraging them to complete the follow-up. The final e-mail stressed the "last chance" nature of participation in that follow-up.

Incentives were used to encourage participation and reduce attrition. The study was funded out of pocket so the incentives utilized were minimal. There were three raffles during the course of the study. After training, $100 was allocated to buy twenty $5 gift cards to Amazon.com. At the first follow-up, $100 was allocated to buy twenty $5 gift cards to Amazon.com. For the second follow-up, $150 was allocated to buy fifteen $10 gift cards to Amazon.com. Participants opted into raffles at the end of each part of the study.

Training Task

A 1- to 2-hour Excel 2007 online training program was adapted from prior research (Sitzmann & Ely, 2010; Sitzmann, Ely, Bell, et al., 2010) by tailoring it to be shorter and specifically relevant to accounting majors. The course is a PowerPoint based step-by-step tutorial of how to use Excel. Participants are shown slides defining key concepts and steps for completing tasks. Then slides with screen shots are used to show how each task is completed. Participants work along with a participant workbook downloaded at the beginning of training. The course was designed to take approximately 2 hours; the median training time for participants who completed the course was 1 hour and 36 minutes.

Two subject matter experts (SME) were used to determine which Excel skills would be most relevant to accounting majors. The first SME is a Professor of Accounting at one of the universities at which data was collected. The second SME is a working accountant who supervises undergraduate accounting interns. The second SME provided a list of skills that interns should possess. The first SME verified this list. The following skills were identified as important: basic functions (e.g., data entry, formatting, copying from other workbooks), simple and complex equations (e.g., sum, average, sumif, vlookup), application of filters, and viewing options (adjusting row/column size, freezing panes, splitting screens). The full list is presented in Appendix B.

Measures

Measures assessed pre-training included: cognitive ability, motivation to learn, self-efficacy for learning, prior knowledge, experience and demographics. Prior knowledge and experience are being measured as control variables. Prior knowledge and experience with Microsoft Excel affect how much trainees learn during training. Post-

training measures included: utility perceptions, motivation to transfer, self-efficacy to transfer, declarative and procedural knowledge, and performed skill. Measures assessed at each of the two post-training time points were: transfer use, transfer effectiveness, motivation to transfer, and self-efficacy to transfer. All study variables were measured on a 7-point Likert-type scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree) unless otherwise noted, and the measures are presented in Appendix C.

Control variables. Prior experience with Excel and cognitive ability were assessed as control variables because they should affect how much participants learn during training. A single item was used for prior experience, "How much prior experience do you have with Excel 2007?" It was rated on a 7-point scale ranging from 1 (No Experience) to 7 (A Lot of Experience). Cognitive ability was assessed using 12 questions from a publicly available GRE practice test (ETS, 2011), assessing both verbal and quantitative reasoning. Because some questions had multiple answers, the total score is out of 17 points. The reliability of the measure was adequate, $\alpha = .71$.

The choice of questions for the cognitive ability measure was based on (1) a 15 minute time limit; (2) the need to include both verbal reasoning and quantitative reasoning; (3) the amount of time ETS allows for the GRE practice test; and (4) maximizing test variability. Verbal reasoning was assessed with 7 items from section 3 of the GRE practice test. Quantitative reasoning was assessed with 5-items from section 5 of the GRE practice test.

Motivation. Motivation to learn and motivation to transfer were measured using Noe and Schmitt's (1986) 8- and 6-item scales, respectively. A sample motivation to learn item is, "I will try to learn as much as I can from this course." A sample motivation

to transfer item is, "The skills I learned in this training program will be helpful in solving work-related problems." Reliability of the motivation to learn scale was .81. Reliability of the motivation to transfer scale was .84 and .82 for post-training and follow-up 1, respectively.

Self-efficacy. Self-efficacy for learning was measured with 6-items adapted from Pintrich, Smith, Garcia, and McKeachie (1993). Although the original scale had 8-items, adapting the items to the specific context caused redundancy in items. For example, original items 2 and 4 are identical except for the referent at the end, the course vs. the instructor of the course. A sample item is, "I'm confident I can learn the basic concepts taught in this course." Pintrich et al. demonstrated that the original scale has excellent reliability, $\alpha = .93$. The adapted scale was also reliable in the current sample, $\alpha = .90$. Self-efficacy for transfer was measured with 6-items adapted from Spiros (2003). A sample item is, "I am confident I can apply the skills/knowledge I have learned." Reliability was .91 and .93 for post-training and follow-up 1, respectively.

Utility reactions. Utility reactions was measured with 3-items adapted from Brown (2005). Brown originally used two items ("The lecture was relevant to my education" and "The lecture provided useful examples and illustrations") but found only adequate reliability, $\alpha = .70$. Thus, the items were adapted to be specific to the Excel training course and 1-item developed by the researcher was added in an attempt to improve reliability. Reliability was .87 and .86 for post-training and follow-up 1, respectively.

Declarative and procedural knowledge. Declarative and procedural knowledge were measured with 30 multiple-choice items. The item pool was developed for previous

research (Sitzmann & Ely, 2010; Sitzmann, Ely, Bell, et al., 2010). The same items were given pre- and post-training training. Of these 30 items, 20 items assessed declarative and procedural knowledge covered in training and 10 items assessed declarative and procedural knowledge not covered in training. As mentioned in the procedure, the items assessing knowledge not covered in training constituted the nonequivalent dependent variable. An example declarative knowledge item is, "Which error code tells you that the formula contains text that Excel does not recognize? A: #####, B: #VALUE!, **C: #NAME?**, D: #REF!" The correct answer is in bold. The focal knowledge items were not adequately reliability pre-training ($\alpha = .56$), but were post-training ($\alpha = .77$). The nonequivalent dependent variable was unreliable ($\alpha = .18$ and -.02 for pre- and post-training, respectively). Although the reliability of the nonequivalent dependent variable is low, it will not affect hypothesis testing. The variable was included to assess whether learning was due to training rather than other factors, but it does not appear in the model. Scores were calculated by converting the number correct into a percentage.

Skilled performance. Skilled performance was measured with an activity asking participants to demonstrate a number of skills taught in training. The activity was developed specifically for this study based on the skills identified by SMEs as important, because activities were unavailable from prior uses of this training course (e.g., Sitzmann & Ely, 2010). The activity was modeled after a skilled performance measure used in an unpublished study (Sitzmann, 2006) that utilized a different Excel training course. Participants were given an Excel workbook with a set of instructions and asked to complete the activity within 15 minutes using only the knowledge learned in training. The time limit was determined by having several undergraduate research assistants

complete the measure. A time limit was imposed to ensure sufficient variability but prevent a ceiling effect, enhancing statistical conclusion validity (Shadish et al., 2002). The skills participants were asked to demonstrate included both those taught in training (e.g., formulas like averaging) and those not taught in training (e.g., graphing). Scores were calculated by summing the number of tasks performed correctly and converting them to a percentage. An example task is, "Calculate each day's sales in Column Q and color, in green, any day where you sold more than $1,200." This required participants to sum values in different cells and use conditional formatting. Parallel measures were created. Post-training order of administration was counterbalanced, and each subsequent assessment was the opposite measure a participant received immediately prior. That is, approximately half of the participants received Version 1 post-training, Version 2 at the first follow-up, and Version 1 at the second follow-up. Scoring was the same for both versions of the activity and is detailed in Appendix D. Scores were created by summing each participant's scores for each item on the activity. The maximum score for the focal variable was 14, and the maximum score for the nonequivalent dependent variable was 2. The focal variable (α = .87, .88, and .89) and nonequivalent dependent variable (α = .82, .87, and .83) were reliable at all three assessments.

Transfer of training. Transfer of training was measured with multiple scales in order to assess both use and effectiveness. The use measure of transfer was modeled after Wexley and Baldwin (1986). Participants rated how frequently they used 10 skills taught in training as well as Excel in general. An example skill is, "Basic cell formatting (e.g., different fonts, text size, number/text type)" The scale ranged from 1 (Never) to 7 (Every Day). Reliability was .93 and .96 for the first and second follow-ups, respectively.

Effectiveness of transfer was assessed in two ways. First, self-report effectiveness was assessed with 5-items adapted from Xiao (1996). An example item is, "Using the new Excel skills has helped me improve my work." The original scale had 6-items, but two items appeared redundant (i.e., I can accomplish my job tasks faster than before training. and I have accomplished my job tasks faster than before training.). The second item was removed to reduce redundancy. Xiao found high reliability with the original scale ($\alpha = .83$), and Chiaburu and Marinova (2005) demonstrated high reliability using an adaptation of it ($\alpha = .83$). The current study also found good reliability, $\alpha = .95$ and .92 for the first and second follow-ups, respectively.

An objective measure of effectiveness was also taken. Participants were asked to complete the measure described under skilled performance. Reliability was reported under that section.

CHAPTER III

RESULTS

Data were cleaned and inspected for outliers. Extreme outliers, values that are 3 interquartile ranges beyond the inner fence in a box and whisker plot, were winsorized to the closest value that was not an extreme outlier. Five cases were identified as extreme outliers on motivation to learn and were winsorized to 3.63. Two cases were identified as extreme outliers on self-efficacy for learning and were winsorized to 2.17. Means, standard deviations, and intercorrelations among study variables are presented in Table 1. With respect to learning, there is evidence that training was effective. The focal knowledge variable increased 21.12 percentage points from pre-training ($M = 47.90$, $SD = 14.66$) to post-training ($M = 69.11$, $SD = 18.94$), $t(230) = 18.37$, $d = 1.25$, $p < .001$. Although the nonequivalent dependent variable significantly increased 3.98 percentage points from pre-training ($M = 33.98$, $SD = 15.40$) to post-training ($M = 37.97$, $SD = 14.29$), $t(230) = 3.48$, $d = 0.27$, $p = .001$, the effect was much smaller.

Using Mplus7 with EM estimation, the path model in Figure 1 was first tested without bootstrapping in order to examine overall fit and modification indices. The following fit indices were used: model chi-square, comparative fit index (CFI), standardized root-mean-square residual (SRMR), and root-mean-square error of approximation (RMSEA). Definitions of the fit indices and suggested values are taken from Schumacker and Lomax (2004). The model chi-square tests whether the sample covariance matrix and the model-implied covariance matrix are similar and should be nonsignificant.

Table 1

Means, Standard Deviations, and Intercorrelations Among Study Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Prior Experience																			
2. Cognitive Ability	.00																		
3. Pre-Training Knowledge	.31**	.31**																	
4. Motivation to Learn	-.13	.19**	.09																
5. Self-Efficacy for Learning	.20**	.09	.09	.47**															
6. Motivation to Transfer (post)	.16*	.07	.11	.25**	.29**														
7. Self-Efficacy for Transfer (post)	.23**	-.02	.08	.16*	.38**	.79**													
8. Utility Reactions (post)	.07	.08	.07	.31**	.28**	.73**	.69**												
9. Post-Training Knowledge	.05	.43**	.48**	.26**	.08	.10	-.02	.12											
10. Post-Training Skill	.30**	.21**	.44**	-.01	.06	.20**	.23**	.12	.39**										
11. Motivation to Transfer (F1)	.12	.13	.25*	.43**	.43**	.38**	.50**	.50**	.15	.23*									
12. Self-Efficacy for Transfer (F1)	.24*	.06	.21*	.29**	.45**	.48**	.62**	.46**	-.03	.25*	.82**								
13. Utility Reactions (F1)	.25*	.12	.15	.35**	.40**	.49**	.55**	.58**	.13	.20	.70**	.70**							
14. Self-Report Transfer Use (F1)	.43**	.02	.30**	-.06	.12	.47**	.44**	.32**	-.10	.26**	.28**	.43**	.35**						
15. Self-Report Transfer Effectiveness (F1)	.11	.16	.09	.04	.11	.43**	.55**	.36**	-.09	.18	.35**	.47**	.49**	.54**					
16. Objective Transfer Effectiveness (F1)	.30**	.27**	.42**	-.01	.28**	.10	.23*	.10	.23*	.61**	.34**	.40**	.26*	.17	.17				
17. Self-Report Transfer Use (F2)	.51**	.07	.52*	-.12	.36*	.16	.28	.20	-.21	.41**	.30	.48**	.33*	.82**	.47**	.51**			
18. Self-Report Transfer Effectiveness (F2)	-.08	.10	.20	.09	.26	.25	.38*	.30	-.24	.16	.37*	.54**	.32	.42**	.62**	.46**	.40**		
19. Objective Transfer Effectiveness (F2)	.31	.41*	.39*	-.04	.26	.25	.14	.23	.32	.54**	.06	.20	.28	.34	.30	.61**	.34	.38*	
M	3.93	8.05	47.90	6.12	5.82	5.67	5.31	5.97	69.11	6.15	5.54	5.19	5.75	3.98	5.19	6.77	3.89	5.06	7.62
SD	1.42	3.41	14.66	0.68	0.93	1.00	1.14	1.04	18.94	3.72	0.92	1.13	1.00	1.36	1.16	3.91	1.47	0.84	3.98

Note. *N*s range from 27 to 231 due to missing values and attrition; post = post-training, F1 = first follow-up, F2 = second follow-up.

*$p < .05$. **$p < .01$.

However, chi-square is sensitive to sample size, particularly when samples are above 200 participants, with large samples much more likely to produce a statistically significant chi-square despite adequate model fit. SRMR assesses variance misspecification and should be less than .08. RMSEA assesses loading misspecification and should be less than .05. Several paths that are not shown in Figure 1 were allowed, including (1) controlling for cognitive ability and prior experience in all regressions, (2) controlling for pre-training knowledge in regression of post-training knowledge, (3) motivation to learn, self-efficacy for learning, post-training knowledge, and post-training skill in the Time 2 regressions of transfer to test H3, H4, H5, H8, and H9, and (4) intercorrelations among variables within time point (e.g., allowing motivation, self-efficacy, reactions and transfer to correlate at follow-up 1). The sample size for the initial model was 218 due to missing data on the cognitive ability measure, which was caused by participants closing their browsers before the measure was completed. The course was programmed to advance participants to the knowledge measure if this happened, which was an effort to prevent cheating and to ensure that participants received no more than the 15 minutes allotted for the measure. Initial model fit was lower than desired, $\chi^2(50) = 121.35, p < .001$, CFI = .94, SRMR = .12, and RMSEA = .08. There was also an error message indicating that the standard errors may not be trustworthy due to a non-positive definite first-order derivative product matrix. In Mplus, this error message is accompanied by a statement about which parameter is involved in the problem. In a series of models, I dropped the paths causing the first-order derivative product matrix to be non-positive definite until Mplus stopped printing the error. These paths were: post-training knowledge to objective transfer effectiveness Time 2 path and the post-training skilled performance to all transfer

at Time 2. Therefore, these paths were dropped in order to have trustworthy standard errors, although fit remained similar, $\chi^2(54) = 130.30$, $p < .001$, CFI = .94, SRMR = .13, and RMSEA = .08. Hypotheses 5, 8 and 9 can now only be tested with the self-report transfer measures.

In order assess the somewhat lower fit than the currently recommended standards, the model was split and tested in meaningful parts to identify the cause of misfit. First, the learning model was run, which included all pre- and post-training variables. Model fit was good, $\chi^2(10) = 27.61$, $p = .002$, CFI = .97, SRMR = .07, and RMSEA = .09. Then, self-report transfer effectiveness at follow-up 1 was added and model fit remained good, $\chi^2(11) = 27.72$, $p = .004$, CFI = .93, SRMR = .13, and RMSEA = .08. Self-report transfer use at follow-up 1 was added next and model fit remained good, $\chi^2(12) = 34.54$, $p = .001$, CFI = .97, SRMR = .07, and RMSEA = .09. Next objective transfer effectiveness was added, and model fit remained good, $\chi^2(13) = 35.83$, $p = .001$, CFI = .97, SRMR = .06, and RMSEA = .09.

The next step in assessing misfit was to model transfer at Time 2. Due to attrition, sample size drops to 109 for these analyses. A model including all three measures of transfer at follow-up 2 and all follow-up 1 variables fit very poorly, $\chi^2(18) = 58.47$, $p < .001$, CFI = .45, SRMR = .13, and RMSEA = .14. Individual models of self-report transfer effectiveness ($\chi^2(8) = 17.81$, $p = .023$, CFI = .48, SRMR = .10, and RMSEA = .11), self-report transfer use ($\chi^2(8) = 29.63$, $p < .001$, CFI = .42, SRMR = .13, and RMSEA = .16), and objective transfer effectiveness ($\chi^2(8) = 27.56$, $p = .001$, CFI = .00, SRMR = .11, and RMSEA = .16) at follow-up 2 fit equally poorly. Note that the sample

size for the objective transfer measure is 101 due to additional missing data on this variable.

A final model was run to verify that misfit of the overall model was due to inclusion of the low-sample-size Time 2 transfer variables. The Time 1 trainee characteristics were added to the model that included pre- and post-training variables and transfer at Time 1. This model fit fairly well although SRMR was slightly high, $\chi^2(32) = 70.83, p < .001$, CFI = .96, SRMR = .11, and RMSEA = .08. Finally, it should be noted that modification indices were examined for all models. Very few modifications were suggested, and they were either very small expected changes or not theoretically meaningful additions.

Hypothesis Testing

The model described above based on Figure 1 (after dropping problematic paths) was run using bias corrected bootstrapping. Results are depicted in Figure 2 and model fit was the same as before bootstrapping, $\chi^2(54) = 130.30, p < .001$, CFI = .94, SRMR = .13, and RMSEA = .08. As can be seen in Figure 2, there are many nonsignificant paths. In order to determine how much of this was due to the control variables, a bias corrected bootstrapped model was run completely removing cognitive ability and experience. Although the typical model fit estimates cannot be directly compared when different variables are in the model, model fit appears slightly worse for the model without controls, $\chi^2(52) = 150.28, p < .001$, CFI = .92, SRMR = .15, and RMSEA = .09. Additionally, the Akaike Information Criterion (AIC) can be used to compare models with different variables, for which AICs closer to zero are considered better fit (Schumacker & Lomax, 2004).

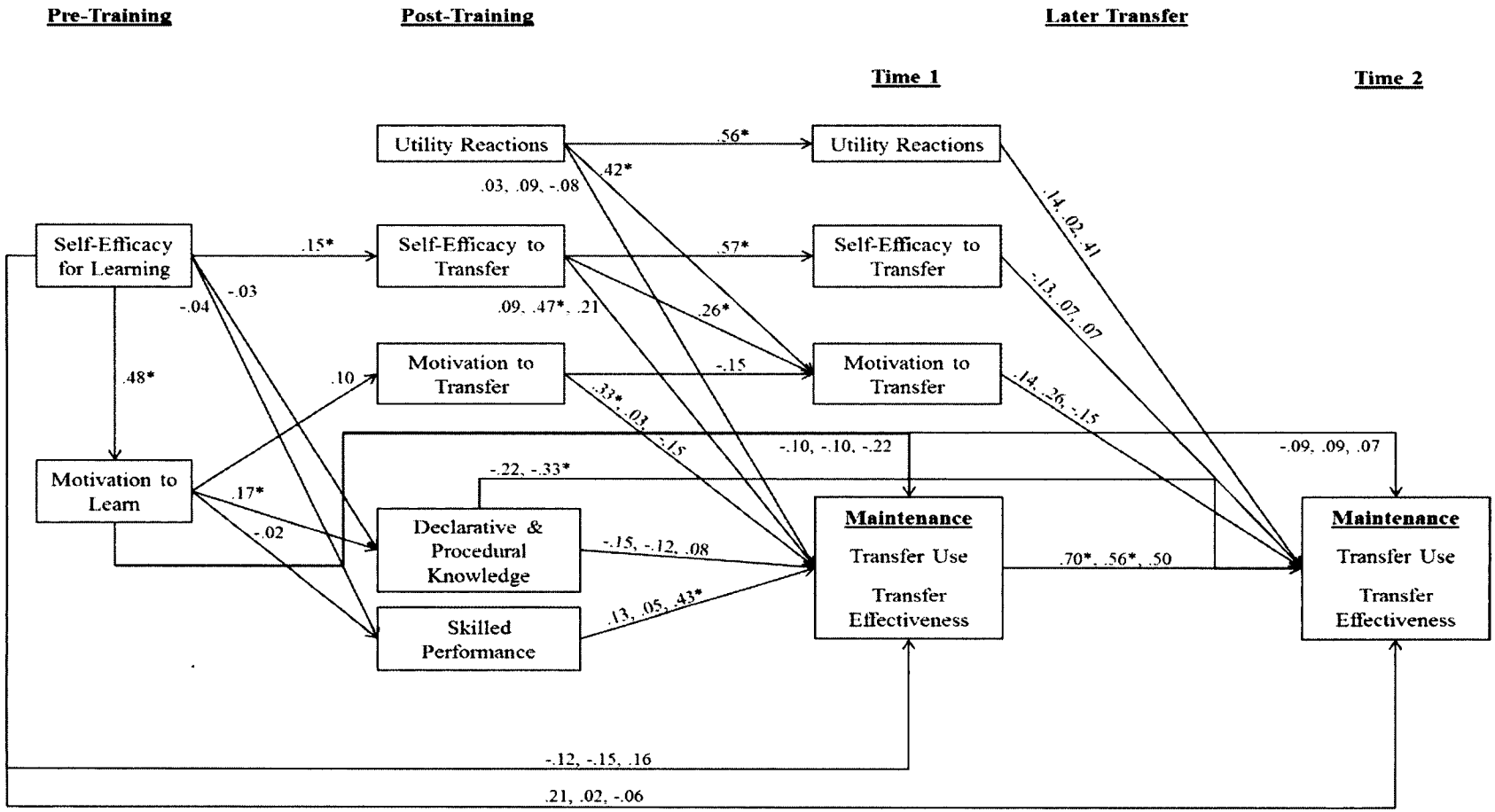


Figure 2. A longitudinal model with standardized estimates of the effects of pre- and post-training variables on maintenance. Time 1 is 4 weeks post-training; Time 2 is 8 weeks post-training. Significant paths are denoted with an asterisk. When three numbers are listed, the first is for self-report transfer use, the second is for self-report transfer effectiveness, and the third is for objective transfer effectiveness. $N = 218$.

The AIC for the model without controls was 7,325.17, whereas the AIC for the model with controls was 6,911.06. The model with controls has the lower AIC, and therefore, hypothesis testing was conducted on this model. Further, only three paths became statistically significant and no paths lost statistical significance. The paths that changed were: (1) self-report transfer use on post-training skill, (2) motivation to transfer at Time 1 on post-training self-efficacy for transfer, and (3) post-training motivation to transfer on motivation to learn.

Mediation (Hypotheses 1, 2, 10, and 11) as outlined by Shrout and Bolger (2002) was tested with bias corrected bootstrapped indirect effects as recommended by Preacher and Hayes (2008). Hypotheses 3, 4, 7, 8, 9, 12, and 13 discuss the magnitude of a relationship and were tested using the estimates from the model. In order to test whether a relationship was stronger or weaker than another as hypothesized, I constrained the appropriate paths to equality and used a chi-square difference test to see if the constraint significantly reduced fit. Thus, a statistically significant $\Delta\chi^2$ supports most of these hypotheses. However, Hypothesis 8a and 12 are unique in the fact that they posit stable relationships. In these cases, a nonsignificant result is desired, which is counter to null hypothesis significance testing. Although a decisive test of these hypotheses cannot be performed, I report the results of the tests. A summary of the results of hypothesis testing is presented in Table 2.

Table 2

Summary of Hypothesis Testing Results

Hypothesis	Supported
H1a: The relationship between self-efficacy for learning and maintenance will be partially mediated by motivation to learn.	No
H1b: The relationship between self-efficacy for learning and maintenance will be partially mediated by learning.	No
H1c: The relationship between self-efficacy for learning and maintenance will be partially mediated by self-efficacy to transfer.	No
H2a: The relationship between motivation to learn and maintenance will be partially mediated by learning.	No
H2b: The relationship between motivation to learn and maintenance will be partially mediated by motivation to transfer.	No
H3a: Self-efficacy for learning will exhibit a weak relationship with maintenance use that is stronger at Time 1 than at Time 2.	No
H3b: Self-efficacy for learning will exhibit a weak relationship with maintenance effectiveness that is stronger at Time 1 than at Time 2.	No
H4a: Motivation to learn will exhibit a weak relationship with maintenance use that is stronger at Time 1 than at Time 2.	No
H4b: Motivation to learn will exhibit a weak relationship with maintenance effectiveness that is stronger at Time 1 than at Time 2.	No
H5a: Learning will be uniquely positively related to maintenance.	Minimal; post-training skilled performance related to objective transfer effectiveness at T1
H5b: Utility reactions will be uniquely positively related to maintenance.	No
H5c: Motivation to transfer will be uniquely positively related to maintenance.	Minimal; post-training motivation to transfer related to self-report transfer use at T1
H5d: Self-efficacy to transfer will be uniquely positively related to maintenance.	Minimal; post-training self-efficacy to transfer related to self-report transfer effectiveness at T1

Table 2 Continued

Hypothesis	Supported
H6: Post-training variables will emerge as stronger predictors of maintenance than pre-training variables.	Yes
H7a: Motivation to transfer will be more strongly related to maintenance use than effectiveness.	Partial; support for self-report but not objective transfer effectiveness
H7b: Self-efficacy to transfer will be more strongly related to maintenance use than effectiveness.	No
H7c: Utility reactions will be more strongly related to maintenance use than effectiveness.	No
H8: The magnitude of the relationship between learning and maintenance effectiveness will be stronger at Time 1 than at Time 2.	No
H9a: Learning will exhibit a stable relationship with maintenance use.	No
H9b: Learning will exhibit a weaker with maintenance use than the relationship with maintenance effectiveness.	No
H10a: The relationship between maintenance use and utility reactions will be partially mediated by motivation to transfer.	No
H10b: The relationship between maintenance use and self-efficacy to transfer will be partially mediated by motivation to transfer.	No
H11a: The relationship between maintenance effectiveness and utility reactions will be partially mediated by motivation to transfer.	No
H11b: The relationship between maintenance effectiveness self-efficacy to transfer will be partially mediated by motivation to transfer.	No
H12a: Utility reactions will exhibit relationships with maintenance use that are the same at Time 1 and Time 2.	No
H12b: Self-efficacy to transfer will exhibit relationships with maintenance use that are the same at Time 1 and Time 2.	No
H12c: Motivation to transfer will exhibit relationships with maintenance use that are the same at Time 1 and Time 2.	No

Table 2 Continued

Hypothesis	Supported
H13a: Utility reactions will exhibit relationships with maintenance effectiveness that is stronger at Time 2 than at Time 1.	No
H13b: Self-efficacy to transfer will exhibit relationships with maintenance effectiveness that is stronger at Time 2 than at Time 1.	No
H13c: Motivation to transfer will exhibit relationships with maintenance effectiveness that is stronger at Time 2 than at Time 1.	No

Hypothesis 1 stated that the relationship between self-efficacy for learning and maintenance would be partially mediated by (a) motivation to learn, (b) learning, and (c) self-efficacy to transfer. Self-efficacy for learning is not directly related to any transfer variable at Time 1, suggesting that any effect is fully mediated. Additionally, self-efficacy for learning is only significantly related to motivation to learn and self-efficacy to transfer, suggesting that Hypothesis 1b cannot be examined because it does not meet a key step for mediation (i.e., the predictor is related to the mediator). Hypothesis 1a was not supported, because there was not a significant indirect effect of self-efficacy on transfer through motivation to learn ($\beta = -.048, p = .389$; $\beta = -.046, p = .373$; and $\beta = -.103, p = .074$ for self-report use, self-report effectiveness, and objective effectiveness, respectively). There was also not a significant indirect effect of self-efficacy on transfer through self-efficacy to transfer ($\beta = .013, p = .563$; $\beta = .070, p = .064$; and $\beta = .031, p = .239$ for self-report use, self-report effectiveness, and objective effectiveness, respectively), failing to support Hypothesis 1c. Overall, there is no support for Hypothesis 1.

Hypothesis 2 stated that the relationship between motivation to learn and maintenance would be partially mediated by (a) learning and (b) motivation to transfer. Motivation to learn is not directly related to any transfer variable at Time 1, suggesting that any effect is fully mediated. With respect to Hypothesis 2a, motivation to learn is not indirectly related to transfer through learning (β = -.027, p = .267; β = -.021, p = .351; and β = .015, p = .495 for self-report use, self-report effectiveness, and objective effectiveness, respectively). Motivation to learn is also not significantly related to post-training motivation to transfer, failing to meet the criteria for mediation. There is an overall lack of support Hypothesis 2.

Hypothesis 3 posited that self-efficacy for learning would exhibit a weak relationship with maintenance (a) use and (b) effectiveness that is stronger at Time 1 than at Time 2. Three models were run to test this hypothesis, one constraining the self-efficacy for learning to self-report transfer use paths to equality, one constraining the self-efficacy for learning to self-report transfer effectiveness paths to equality, and one constraining the self-efficacy for learning to objective transfer effectiveness paths to equality. Table 3 presents the results of the chi-square difference tests. The parameters shown in Figure 2 are weak by conventional standards (Cohen, 1992) and also were not statistically significant, suggesting no relationship. None of the chi-square difference tests were significant, failing to support Hypothesis 3.

Hypothesis 4 posited that motivation to learn would exhibit a weak relationship with maintenance (a) use and (b) effectiveness that is stronger at Time 1 than at Time 2. The three models run to test this hypothesis were identical to those for self-efficacy for learning except with motivation to learn. The results of the chi-square difference tests are

Table 3

Results of the Chi-Square Difference Tests for Hypotheses 3, 4, 7-9, 12 and 13

Model	χ^2	*df*	χ^2 difference	*df* for test	*p*
Base Model	130.30	54			
H3a	133.39	55	3.09	1	.079
H3b1 - Self-Report Transfer Effectiveness	131.23	55	0.93	1	.335
H3b2 - Objective Transfer Effectiveness	130.78	55	0.49	1	.485
H4a	130.30	55	0.00	1	1.000
H4b1 - Self-Report Transfer Effectiveness	131.76	55	1.46	1	.227
H4b2 - Objective Transfer Effectiveness	131.96	55	1.67	1	.197
H7a1 - Self-Report Transfer Effectiveness	134.46	55	4.16	1	.041
H7a2 - Objective Transfer Effectiveness	133.15	55	2.85	1	.091
H7b1 - Self-Report Transfer Effectiveness	135.51	55	5.21	1	.022
H7b2 - Objective Transfer Effectiveness	131.28	55	0.98	1	.321
H7c1 - Self-Report Transfer Effectiveness	130.42	55	0.13	1	.723
H7c2 - Objective Transfer Effectiveness	130.57	55	0.28	1	.599
H8	132.06	55	1.76	1	.185
H9a	130.57	55	0.27	1	.603
H9b	135.87	59	5.57	5	.350
H12a	130.68	55	0.38	1	.538
H12b	131.16	55	0.87	1	.352
H12c	130.62	55	0.33	1	.567
H13a1 - Self-Report Transfer Effectiveness	130.44	55	0.14	1	.710
H13a2 - Objective Transfer Effectiveness	133.34	55	3.04	1	.081
H13b1 - Self-Report Transfer Effectiveness	133.78	55	3.48	1	.062
H13b2 - Objective Transfer Effectiveness	130.40	55	0.10	1	.748
H13c1 - Self-Report Transfer Effectiveness	131.10	55	0.80	1	.371
H13c2 - Objective Transfer Effectiveness	130.30	55	0.00	1	.950

presented in Table 3. As shown in Figure 2, the parameters are weak by conventional standards (Cohen, 1992) and nonsignificant. None of the chi-square difference tests were significant, failing to support Hypothesis 4.

Hypothesis 5 predicted that (a) learning, (b) utility reactions, (c) motivation to transfer, and (d) self-efficacy to transfer would be uniquely positively related to maintenance. With respect to learning, the post-training skilled performance measure was significantly related to objective transfer effectiveness at Time 1. The post-training

knowledge measure was only significantly related to self-report transfer effectiveness at Time 2, but in the wrong direction. Utility reactions were unrelated to any transfer variable at Time 1 or Time 2. Self-efficacy to transfer was positively related to self-report transfer effectiveness at Time 1, and motivation to transfer was positively related to self-report transfer use at Time 1. Given the general lack of significance, Hypothesis 5 was not supported.

Hypothesis 6 stated that post-training variables would emerge as stronger predictors of maintenance than pre-training variables. The formula for testing a contrast among correlated correlation coefficients provided by Meng, Rosenthal, and Rubin (1992) was used to test this hypothesis. Three contrasts were created (one per maintenance variable) using the correlations from Mplus to enhance power. These correlations are provided in Table 4. The contrasts compared the average of the post-training correlations to the average of the pre-training correlations with each of the maintenance variables. In each comparison, the post-training variables were more strongly related to maintenance than the pre-training variables ($z = 5.67, p < .001, z = 5.77, p < .001, z = 2.51, p = .012$ for self-report transfer use, self-report transfer effectiveness, and objective transfer effectiveness, respectively). These results support Hypothesis 6.

Hypothesis 7 predicted that (a) motivation to transfer, (b) self-efficacy to transfer, and (c) utility reactions would be more strongly related to maintenance use than effectiveness. Two chi-square difference tests per predictor were run, one for self-report and one for objective transfer effectiveness, and results are reported in Table 3.

Table 4

Intercorrelations Used to Test Hypothesis 6

	1	2	3	4	5	6	7	8	9
1. Motivation to Learn									
2. Self-Efficacy for Learning	.44								
3. Motivation to Transfer (post)	.20	.25							
4. Self-Efficacy for Transfer (post)	.10	.33	.78						
5. Utility Reactions (post)	.25	.22	.70	.66					
6. Post-Training Knowledge	.29	.12	.12	-.01	.15				
7. Post-Training Skill	.01	.07	.22	.25	.14	.39			
8. Self-Report Transfer Use (F1)	-.07	.09	.47	.45	.31	-.07	.24		
9. Self-Report Transfer Effectiveness (F1)	-.04	.08	.44	.56	.39	-.09	.17	.56	
10. Objective Transfer Effectiveness (F1)	-.05	.26	.10	.24	.04	.22	.53	.13	.19

With respect to Hypothesis 7a, support was found for the self-report effectiveness measure but not the objective measure. Motivation to transfer exhibited a stronger relationship with self-report transfer use ($\beta = .33$) than with self-report transfer effectiveness ($\beta = .03$). For Hypothesis 7b, the chi-square difference test is significant for transfer use but not effectiveness, similar to motivation to transfer. However, self-efficacy to transfer exhibits a stronger relationship with self-report transfer effectiveness ($\beta = .47$) than with self-report transfer use ($\beta = .09$), failing to provide support for the hypothesis. Hypothesis 7c was not support; neither chi-square difference test was significant. Overall, there is little support for Hypothesis 7.

Hypothesis 8 stated that the magnitude of the relationship between learning and maintenance effectiveness would be stronger at Time 1 than at Time 2. Recall that this hypothesis could only be tested with self-report transfer effectiveness and post-training knowledge. Post-training knowledge is unrelated to self-report transfer effectiveness at Time 1 and significantly negatively related to it at Time 2, contrary to Hypothesis 8. Additionally, the chi-square difference test after constraining the two paths to equality was not significant (see Table 3). Hypothesis 8 was not supported.

Hypothesis 9 posited that learning would exhibit a (a) stable relationship with maintenance use that would be (b) weaker than the relationship with maintenance effectiveness. Note that this hypothesis can only be tested with post-training knowledge due to the problematic paths described above and part (a) posits a null hypothesis. With respect to Hypothesis 9a, the chi-square difference test after constraining the post-training knowledge to transfer use at T1 and T2 paths to equality was nonsignificant (see Table 3). However, post-training knowledge is unrelated to these variables, failing to support the Hypothesis. For an appropriate test of Hypothesis 9b, I constrained all paths to be equal to the beta of the smallest relationship between learning and transfer effectiveness ($\beta = .08$). The chi-square difference test was nonsignificant (see Table 3), not supporting Hypothesis 9b. Yet, preliminary evidence in support of Hypothesis 9b can be found in the relationships between post-training skilled performance and Time 1 maintenance. Post-training skilled performance is significantly related to objective transfer effectiveness but unrelated to self-report transfer use. Overall, there is a lack of support for Hypothesis 9.

Hypothesis 10 predicted that the relationship between maintenance use and (a) utility reactions and (b) self-efficacy to transfer will be partially mediated by motivation

to transfer, whereas Hypothesis 11 predicted the same mediation relationships for transfer effectiveness. Utility reactions and self-efficacy to transfer at Time 1 were significantly related to motivation to transfer at Time 2. However, motivation to transfer at Time 1 is unrelated to all three measures of maintenance at Time 2. Additionally, the indirect effects through motivation to transfer on self-report transfer use ($\beta = .060, p = .593$; $\beta = .038, p = .637$ for utility reactions and self-efficacy to transfer, respectively) self-report transfer effectiveness ($\beta = .110, p = .291$; $\beta = .068, p = .392$ for utility reactions and self-efficacy to transfer, respectively) and objective transfer effectiveness ($\beta = -.064, p = .697$; $\beta = -.040, p = .748$ for utility reactions and self-efficacy to transfer, respectively) are nonsignificant. These results do not support Hypotheses 10 or 11.

Hypothesis 12 stated that (a) Utility reactions, (b) self-efficacy to transfer, and (c) motivation to transfer will exhibit relationships with maintenance use that are the same at Time 1 and Time 2, whereas Hypothesis 13 predicted that the relationships would be stronger at Time 2 than at Time 1 for maintenance effectiveness. To test these hypotheses, nine models were run; separate models are run for each of the three predictors by the three maintenance variables. The chi-square difference tests are reported in Table 3, and none were significant. Because Hypothesis 12 posits the null, a nonsigificant result is supportive. However, there is only one significant predictor of self-report transfer use (post-training motivation to transfer predicts use at Time). The lack of significant results suggests that although the relationships may not be different, the predictors are not related to the outcomes, which is contrary to Hypothesis 12. Overall, there is a lack of support for Hypotheses 12 and 13.

CHAPTER IV

DISCUSSION

This study examined the impact of trainee characteristics on both maintenance use and effectiveness with two specific goals. The first goal was to identify *which* factors are specifically the most important for maintenance. The second goal was to identify *when* factors are most important for maintenance. Overall, the results failed to support the theoretical model. In the following sections, I discuss the findings with respect to specific hypotheses, note study limitations, and suggest future directions for research.

Two small caveats must be kept in mind when interpreting the results of the present study. First the entire model controlled for cognitive ability and prior experience with Excel. As noted above, the model with control variables fit the data better than a model without controls, but they were a contributing factor to the nonsignificant path between motivation to learn and motivation to transfer (discussed below). Including these control variables does reduce the amount of variability in the outcomes that can be explained by the predictors of interest. Second, there was multicollinearity among the individual difference predictors post-training and at Time 1. The multicollinearity among predictors reduces the ability to find significant unique effects like the ones predicted in this study, particularly Hypothesis 5. Thus, the results discussed below represent a conservative test of the hypotheses.

Hypotheses 1 and 2 posited partially mediated relationships between pre-training trainee characteristics and maintenance. The current results provided no support for these hypotheses. Although self-efficacy for learning positively predicted self-efficacy to transfer and motivation to learn (consistent with Hypothesis 1), these variables were

unrelated to maintenance. Surprisingly, self-efficacy for learning was unrelated to learning. It seems likely that this is due to a spurious suppression effect. Shrout and Bolger (2002), stated that suppression is present when the total effect of a variable is smaller than the total indirect effect of the variable. They also note that in the case of full mediation in the population, a spurious suppression effect is expected about 50% of the time and this effect is unlikely to be significant. In the case of self-efficacy for learning on post-training knowledge, the total effect ($\beta = .050$, $p = .453$) is indeed smaller than the indirect effect ($\beta = .082$, $p = .051$) because the direct effect is negative ($\beta = -.032$, $p = .675$). This is consistent with Tai's (2006) finding that training motivation mediated the relationship between self-efficacy and learning, and future research should continue to model this mediated effect.

With respect to motivation to learn, it was related to post-training knowledge (consistent with Hypothesis 2) but not with motivation to transfer. This latter relationship is inconsistent with prior literature (Holton et al., 2000; Kontoghiorghes, 2004; Tai, 2006). However, none of these studies controlled for cognitive ability and prior experience with training. The path from motivation to learn to motivation to transfer is significant in the model without control variables. This suggests that even though there is an effect of motivation to learn on motivation to transfer, it may not be above and beyond the effects of cognitive ability and prior experience. This does not negate the importance of motivation to learn, as it is a key variable predicting learning in training, even after controlling for cognitive ability and prior experience. Future research should work to disentangle the unique effects of motivation to learn, cognitive ability, and prior experience on motivation to transfer in the context of an online skills training program.

Hypotheses 3 and 4 predicted a weak relationship between the pre-training trainee characteristics and maintenance that would decrease from Time 1 to Time 2. The path coefficients and correlations are weak in magnitude, but they are also nonsignificant. Thus, the results failed to support both hypotheses. A possible explanation for the lack of a relationship between pre-training trainee characteristics and maintenance is that the post-training variables completely mediate these relationships. However, in the current study, there were few significant paths between post-training variables and maintenance at Time 1, precluding a definitive test of the assertion. As preliminary evidence, the indirect effect of self-efficacy for learning on self-report transfer effectiveness at Time 1 through self-efficacy to transfer approached significance, $\beta = .070$, $p = .064$.

An alternative possibility is that there is a lack of power to detect the small effects. This is particularly true for the Time 2 maintenance variables where only 40 people completed the time point and only 30 of those completed the skilled performance measure. This is substantially lower than the power required by the a priori power analysis. Although Mplus is able to deal with missing data using EM estimation, having only 40 people at Time 2 would generate larger standard errors making it less likely to find an effect. This possibility is not unique to Hypotheses 3 and 4, but is a general possibility for any hypothesis involving Time 2 maintenance.

Hypothesis 5, which predicted that learning and the post-training trainee characteristics would uniquely positively predict maintenance, was generally not supported due to a lack of significant results at Time 1. Yet, there are promising results in that post-training self-efficacy to transfer positively predicted self-report transfer effectiveness, post-training motivation to transfer positively predicted self-report transfer

use, and post-training skilled performance positively predicted objective transfer effectiveness. Bivariate correlations show that post-training reactions, self-efficacy to transfer, and motivation to transfer are moderately to strongly related to self-report transfer use and effectiveness at Time 1, and post-training self-efficacy to transfer is weak to moderately related to objective transfer effectiveness at Time 1. This preliminary evidence suggests the importance of continuing to examine the relationships among these variables.

Consistent with Hypothesis 6, post-training variables emerged as more important for maintenance at Time 1 than pre-training variables. Methodologically and theoretically this finding is intuitive as variables measured more proximally to an outcome are more strongly related to it (Cohen et al., 2003) and post-training variables were proposed as mediators of the relationship between pre-training variables and maintenance. Practically speaking, this finding suggests that organizations who want employees to initiate transfer should ensure that trainees leave training with appropriate knowledge/skill levels, high motivation, confidence in their ability to transfer the knowledge/skills, and perceptions of usefulness of the knowledge/skills.

Hypothesis 7 was not supported. The post-training trainee characteristics were only significantly differently related to use and effectiveness in two cases. Motivation to transfer was more strongly related to self-report transfer use than to self-report transfer effectiveness. However, motivation to transfer was not more strongly related to self-report transfer use than objective transfer effectiveness. Contrary to the hypothesis, self-efficacy to transfer exhibited a weaker relationship with self-report transfer use than with self-report transfer effectiveness but was not different from objective transfer

effectiveness. Additionally, post-training trainee characteristics were generally more strongly correlated to self-report measures than to objective measures of maintenance at Time 1, despite the fact that these measures are taken a month apart. This pattern holds for the Time 1 trainee characteristics and Time 2 maintenance variables. It could be argued that this result is due to common method bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). However, the correlations between trainee characteristics at Time 1 and maintenance at Time 1 are mostly smaller than the corresponding correlations between post-training trainee characteristics and maintenance.

A more likely explanation is that an additional distinction is necessary between perceptual and objective measures of transfer. It appears that trainees' perceptions of transfer are more strongly influenced by their post-training motivation, self-efficacy, and reactions, whereas learning more strongly predicts actual skill demonstration. Presumably, an organization would desire that employees perceive that they are transferring and also effectively transfer. Thus, maximizing both learning and trainees' motivation, confidence and perceived usefulness is important for organizations and trainers.

Hypothesis 8 was not supported, although it could not be officially tested with post-training skilled performance or objective transfer effectiveness due to difficulty modeling standard errors. Contrary to expectation, post-training knowledge significantly negatively predicted self-report transfer effectiveness at Time 2 but was nonsignificantly negatively related to self-report transfer effectiveness at Time 1. This may have occurred if trainees with greater learning are better able to identify areas where they lack knowledge and will later have difficulty implementing that knowledge. Prior research

suggests that individuals with higher cognitive ability are better able to make self-assessments (Truxillo, Seitz, & Bauer, 2008) and that cognitive ability is related to how much people learn (Colquitt et al., 2000; Ree & Earles, 1991; Schmidt & Hunter, 1998), suggesting that it is possible for trainees who learned more to have more accurate self-assessments. However, this explanation is tentative given that only 40 people have completed Time 2.

On the other hand, the correlations between post-training knowledge and objective transfer effectiveness at Time 1 and Time 2 are positive and similar. Moreover, the respective correlations between post-training skilled performance and both self-report and objective transfer effectiveness at Times 1 and 2 are also positive and change in the expected direction, albeit minimally. Because the post-training skilled performance measure and objective transfer effectiveness measures are parallel forms of the same test, this finding is insufficient to make a firm conclusion. Thus, future research should continue to investigate the impact of learning on maintenance effectiveness with a larger sample size and a skill measure that is different from the objective measure of maintenance.

Hypothesis 9 was not supported as post-training knowledge did not predict self-report transfer use at Time 1 or Time 2, and the chi-square difference test assessing the difference in magnitude between use and effectiveness was not significant. Although Hypothesis 9 could not be officially tested with respect to post-training skilled performance, a review of the correlations suggests a surprising result. Post-training skilled performance was positively correlated with self-report transfer use at Time 1 and Time 2 with a stronger correlation at Time 2. Post-hoc analyses revealed that the

correlations (r = .26, r = . 41 for post-training skilled performance with self-report maintenance use at Time 1 and Time 2, respectively) were significantly different using the Time 1 sample size (z = -2.40, p = .016, N = 109), but not the Time 2 sample size (z = -1.42, p = .156, N = 40). This strengthening relationship is contrary to Hypothesis 9a and suggests that people who have more skill post-training use the skill more over time. Because post-training skilled performance and objective transfer effectiveness are parallel measures it seems premature to make conclusions about the differences between the use and effectiveness correlations. Future work should continue to examine the relationships between learning and maintenance use and effectiveness.

Hypotheses 10 and 11 were not supported. Although the predictors (i.e., post-training utility reactions and self-efficacy to transfer) were related to motivation to transfer at Time 1, it was not related to maintenance at Time 2, failing to satisfy a key requirement for mediation. Yet, there are moderate correlations between motivation to transfer at Time 1 and self-report use and effectiveness at Time 2, and these correlations are based on only 36 people. With additional data, the partial mediation analyses might be supported. Interestingly, self-efficacy for transfer at Time 1 exhibited strong correlations with self-report maintenance use and effectiveness at Time 2. Given that Gegenfurtner et al. (2009) hypothesized motivation to transfer as the crucial mediating mechanism, it would be interesting for future research to examine whether motivation to transfer or self-efficacy to transfer is the primary mediating mechanism and whether the primary mediator changes from post-training to delayed measurement.

Hypotheses 12 and 13 were not supported. Again, there were generally no significant paths between trainee characteristics and the maintenance variables and the

only significant paths appeared for Time 1. A review of the zero-order correlation matrix provides support for Hypothesis 12, but the small sample size, particularly at Time 2, and a requirement to support the null precludes any recommendations based on the results. With respect to maintenance effectiveness, post-training trainee characteristics correlated with self-report transfer effectiveness similarly to the way Time 1 trainee characteristics related to self-report effectiveness at Time 2, which is contrary to Hypothesis 13. Interestingly, the corresponding correlations between Time 1 trainee characteristics and Time 1 and Time 2 self-report effectiveness are similar in magnitude, despite common method bias at Time 1 and attrition at Time 2. This preliminary finding is noteworthy because it suggests that an intervention 1 month after training could be useful for enhancing both current and future maintenance levels.

Strengths, Limitations, & Directions for Future Research

The measurement of maintenance is both a strength and a limitation of the current study. Maintenance was assessed three different ways and used both self-report and objective measures. This is a strength of the study over prior research, which has relied heavily on self-report measures and assessed transfer in only one way (e.g., Chiaburu & Lindsay, 2008; Chiaburu & Marinova, 2005; Simosi, 2012; Van den Bossche, Segers, & Jansen, 2010). Yet, the measurement of objective transfer effectiveness proved problematic for two reasons. First, initial programming issues resulted in a loss of 9 objective transfer measures before these issues could be remedied because 9 participants could not upload files. Second, participants sometimes uploaded the wrong file (i.e., the participant activity workbook or a class assignment), resulting in further loss of data as an incorrect file cannot be graded and compared to others. Future studies using online

submission of tasks should consider implementing verification of the file before it is accepted.

Another strength and limitation is the specific context of the study, that is, an online, job-relevant training program utilizing a primarily undergraduate sample. Technology-enabled instruction is an essential component of organizational training delivery (Paradise & Patel, 2009). Even though the sample is composed of a majority of undergraduate students, the training was developed to teach skills that were relevant to accounting interns and professionals. Thus, this study teaches job-relevant KSAOs in a manner similar to that utilized by organizations, suggesting a high degree of both psychological and physical fidelity. Psychological fidelity occurs when the essential underlying psychological processes are prompted, whereas physical fidelity is the exact replication of the physical environment (Kozlowski & DeShon, 2004). Research with higher psychological fidelity is better able to generalize to the real world (Bordens & Abbott, 2011). Additionally, Kozlowski and DeShon (2004) note that together psychological and physical fidelity improve the effectiveness of training.

On the other hand, the context does bring about specific problems related to both the online nature of the study and the sample. With respect to the online nature of the study, it is impossible to know what participants are doing while they complete training. For example, one participant e-mailed that her child needed attention as she was completing the post-training skilled performance measure, which resulted in the measure not being usable. This is only one of the 231 participants, and it is difficult to gauge whether similar events happened to other participants who did not report them to the experimenter. This issue, however, is not unique to the current study. It is a problem

inherent in voluntary self-paced training or organizational training that is not required to be completed in a specific location without distractions. This participant example in combination with research suggesting that interruptions in training have a negative impact on training outcomes (Cavanaugh, Milkovich, & Tang, 2000; North, Strain, & Abbott, 2000; Sitzmann, Ely, Bell, et al., 2010; Webster & Hackley, 1997; Wentling, Park, & Peiper, 2007) is evidence that organizations should be mindful about when and where employees complete training. Specific time during the day should be allotted for employees to complete training, and a quiet facility without distractions should also be provided.

The second potential contextual limitation is the sample. Participants were undergraduate and graduate students as well as professionals from across the country that volunteered to take part in a training study. Originally, the sample was to be comprised mainly of students from two local universities. However, one of the contacts stopped responding to e-mails, and subsequently, very few students from the university signed up for training, and even fewer completed it. One could argue that the current study is not generalizable due to the fact that students do not adequately represent working adults. However, meta-analytic research has found that sample source (student versus employee) does not moderate the relationship between motivation and learning/transfer (Bauer, Orvis, Ely, & Surface, 2012). Furthermore, 75% of the sample consisted of upperclassmen or above, suggesting that the sample may be more representative of working adults than other studies utilizing college students.

One of the major limitations of the study is attrition, which is related to the online nature of the study and the sample. Attrition can be higher in online instruction than in

traditional classroom instruction (Welsh, Wanberg, Brown, & Simmering, 2003). Moreover, as noted above, the attrition rate in this study is similar to that found in prior research on online instruction (e.g., Sitzmann & Ely, 2010; Sitzmann, Ely, Bell, et al., 2010), suggesting that the attrition problem is one that organizations attempting to foster professional development through technologically mediated mechanisms might face. This makes the study of attrition interesting in its own right.

Additionally, participants had very few incentives for remaining in the study as the potential monetary rewards were quite small. The only real benefit to the participants was increased knowledge that would help them in school or work. In the present study, this did not appear to be a sufficient incentive. People are busy, and dropping out of online instruction is as simple as closing the browser. Thus, the lack of statistically significant findings in the study should not be an indication that the variables studied herein are meaningless. Rather, it is more likely an indication of a lack of power to detect effects, particularly those at the distal follow-up. Future research should continue to examine the trainee characteristics examined here with a larger sample.

Future research should also examine contextual factors in combination with trainee characteristics. If a trainee enters a transfer environment that does not support the use of trained skills, he or she will be less likely to use those skills and maintain them (Goldstein, 1986; Rouiller & Goldstein, 1993). It could be that certain work environment factors are more or less important than trainee characteristics in predicting maintenance. Another interesting possibility is the interaction between work vs. training characteristics and use vs. effectiveness measures of transfer. For example, opportunity to use, a common work environment factor (Blume et al., 2010; Grossman & Salas, 2011), might

be more important for transfer effectiveness than trainee characteristics, because (a) opportunity to use a skill is necessary for errors to be made and (b) errors are a source of feedback (Frese, 1995; Frese & Zapf, 1994). Based on the skill acquisition literature, feedback is necessary for skill development to proceed and for trainees to effectively perform skills (Anderson, 1982; Kanfer & Ackerman, 1989; Locke & Latham, 2002).

Another interesting avenue for future research is the collection of additional time points both closer to training and further out in order to model maintenance curves. The current study only looked at two points in time. However, future research should consider incorporating at least three time points after training, which will allow for the use of hierarchical linear modeling or latent growth models of the maintenance process. Most studies have not measured maintenance (Cromwell & Kolb, 2004; Gaudine & Saks, 2004), which is a serious gap in the literature. If an organization is to receive a full return on investment in the training function, maintenance must take place. Thus, research examining maintenance is sorely needed.

CHAPTER V

CONCLUSIONS

The current study sought to investigate which trainee characteristics are specifically important for maintenance, and when those factors are important (i.e., before, after, or delayed from training). Although the study results were generally disappointing, it represents an initial step at unraveling the mechanisms underlying the transfer process. Presumably, organizations want employees to continue using learned knowledge/skills, but more critically, to use them effectively. Thus, continued work toward the identification of which factors are most strongly related to continued use and effectiveness of use will help organizations realize return on investment in training, the ultimate goal of training in most organizations.

REFERENCES

Ackerman, P. L. (1987). Individual differences in skill learning: An integration of psychometric and information processing perspectives. *Psychological Bulletin, 102*(1), 3-27. doi: 10.1037/0033-2909.102.1.3

Alliger, G. M., Tannenbaum, S. I., Bennett, W., Jr. , Traver, H., & Shotland, A. (1997). A meta-analysis of the relations among training criteria. *Personnel Psychology, 50*(2), 341-358. doi: 10.1111/j.1744-6570.1997.tb00911.x

Anderson, J. R. (1982). Acquisition of cognitive skill. *Psychological Review, 89*(4), 369-406. doi: 10.1037/0033-295X.89.4.369

Axtell, C. M., Maitlis, S., & Yearta, S. K. (1997). Predicting immediate and longer-term transfer of training. *Personnel Review, 26*(3), 201-213. doi: 10.1108/00483489710161413

Baldwin, T. T., & Ford, J. K. (1988). Transfer of training: A review and directions for future research. *Personnel Psychology, 41*(1), 63-105. doi: 10.1111/j.1744-6570.1988.tb00632.x

Baldwin, T. T., Ford, J. K., & Blume, B. D. (2009). Transfer of training 1988-2008: An updated review and new agenda for future research. In G. P. Hodgkinson & J. K. Ford (Eds.), *International review of industrial and organizational psychology* (Vol. 24, pp. 41-70). Chichester, UK: Wiley.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191-215. doi: 10.1037/0033-295x.84.2.191

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory.* Englewood Cliffs, NJ US: Prentice-Hall, Inc.

Bandura, A., & Cervone, D. (1983). Self-evaluative and self-efficacy mechanisms governing the motivational effects of goal systems. *Journal of Personality and Social Psychology, 45*(5), 1017-1028. doi: 10.1037/0022-3514.45.5.1017

Bandura, A., & Cervone, D. (1986). Differential engagement of self-reactive influences in cognitive motivation. *Organizational Behavior and Human Decision Processes, 38*(1), 92-113. doi: 10.1016/0749-5978(86)90028-2

Barnett, S. M., & Ceci, S. J. (2002). When and where do we apply what we learn?: A taxonomy for far transfer. *Psychological Bulletin, 128*(4), 612-637. doi: 10.1037/0033-2909.128.4.612

Bauer, K. N., Orvis, K. A., Ely, K., & Surface, E. A. (2012). A new look at the construct of training motivation: A meta-analytic investigation of comparative validity. *Under Review at Personnel Psychology.*

Birdi, K. (2000). *Bigger and smaller pictures: Identifying the factors influencing training effectiveness* Unpublished doctoral dissertation, University of Sheffield, United Kingdom.

Blume, B. D., Ford, J. K., Baldwin, T. T., & Huang, J. L. (2010). Transfer of training: A meta-analytic review. *Journal of Management, 36*(4), 1065-1105. doi: 10.1177/0149206309352880

Bordens, K. S., & Abbott, B. B. (2011). *Research design and methods: A process approach* (8th ed.). Boston, MA: McGraw Hill.

Broad, M. L. (1997). Overview of transfer of training: From learning to performance. *Performance Improvement Quarterly, 10*(2), 7-21. doi: 10.1111/j.1937-8327.1997.tb00046.x

Broad, M. L. (2001). Transfer of learning to performance. In L. L. Ukens (Ed.), *What smart trainers know: The secrets of success from the world's foremost experts* (pp. 160-175). San Francisco, CA: Jossey-Bass/Pfeiffer.

Broad, M. L. (2002). The research is in: Stakeholder involvement is critical. In G. Piskurich (Ed.), *Hpi essentials: A just-the-facts, bottom-line primer on human performance improvement* (pp. 133-152). Alexandria, VA: ASTD.

Broad, M. L. (2003). Managing the organizational learning transfer system: A model and case study. In E. F. Holton, III & T. T. Baldwin (Eds.), *Improving learning transfer in organizations* (pp. 97-116). San Francisco, CA: Jossey-Bass.

Broad, M. L. (2005). *Beyond transfer of training: Engaging systems to improve performance*. San Francisco, CA: Pfeiffer.

Broad, M. L., & Newstrom, J. W. (1992). *Transfer of training: Action packed strategies to ensure high payoff from training investments*. Reading, MA: Addison-Wesley.

Brown, K. G. (2005). An examination of the structure and nomological network of trainee reactions: A closer look at 'smile sheets'. *Journal of Applied Psychology, 90*(5), 991-1001. doi: 10.1037/0021-9010.90.5.991

Brown, K. G., & Sitzmann, T. (2010). Training and employee development for improved performance. In S. Zedeck (Ed.), *Apa handbook of industrial and organizational psychology: Selecting and developing members for the organization.* (Vol. 2, pp. 469-503). Washington, DC US: American Psychological Association.

Burke, L. A., & Baldwin, T. T. (1999). Workforce training transfer: A study of the effect of relapse prevention training and transfer climate. *Human Resource*

Management, 38(3), 227-241. doi: 10.1002/(sici)1099-050x(199923)38:3<227::aid-hrm5>3.0.co;2-m

Burke, L. A., & Hutchins, H. M. (2007). Training transfer: An integrative literature review. *Human Resource Development Review, 6*(3), 263-296. doi: 10.1177/1534484307303035

Burke, L. A., & Hutchins, H. M. (2008). A study of best practices in training transfer and proposed model of transfer. *Human Resource Development Quarterly, 19*(2), 107-128. doi: 10.1002/hrdq.1230

Campbell, J. P. (1988). Training design for productivity improvement. In J. P. Campbell & R. J. Campbell (Eds.), *Productivity in organizations: New perspectives from industrial and organizational psychology* (pp. 177-215). San Francisco, CA: Jossey-Bass.

Cavanaugh, M. A., Milkovich, G. T., & Tang, J. (2000). *The effective use of multimedia distance learning technology: The role of technology self-efficacy, attitudes, reliability, use and distance in a global multimedia distance learning classroom.* (CAHRS Working Paper #00-01). Ithica, NY: Cornell University, School of Industrial and Labor Relations, Center for Advanced Human Resource Studies.

Chen, H.-C., Holton, E. F., III, & Bates, R. (2005). Development and validation of the learning transfer system inventory in taiwan. *Human Resource Development Quarterly, 16*(1), 55-84. doi: 10.1002/hrdq.1124

Chiaburu, D. S., & Lindsay, D. R. (2008). Can do or will do? The importance of self-efficacy and instrumentality for training transfer. *Human Resource Development International, 11*(2), 199-206. doi: 10.1080/13678860801933004

Chiaburu, D. S., & Marinova, S. V. (2005). What predicts skill transfer? An exploratory study of goal orientation, training self-efficacy and organizational supports. *International Journal of Training and Development, 9*(2), 110-123. doi: 10.1111/j.1468-2419.2005.00225.x

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*(1), 155-159. doi: 10.1037/0033-2909.112.1.155

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences* (3rd ed.). Mahwah, NJ: Lawrence Erlbaum Associates.

Colquitt, J. A., LePine, J. A., & Noe, R. A. (2000). Toward an integrative theory of training motivation: A meta-analytic path analysis of 20 years of research. *Journal of Applied Psychology, 85*(5), 678-707. doi: 10.1037/0021-9010.85.5.678

Cromwell, S. E., & Kolb, J. A. (2004). An examination of work-environment support factors affecting transfer of supervisory skills training to the workplace. *Human Resource Development Quarterly, 15*(4), 449-471. doi: 10.1002/hrdq.1115

Devos, C., Dumay, X., Bonami, M., Bates, R., & Holton, E. F., III. (2007). The learning transfer system inventory (ltsi) translated into french: Internal structure and predictive validity. *International Journal of Training and Development, 11*(3), 181-199. doi: 10.1111/j.1468-2419.2007.00280.x

ETS. (2011). Practice book for the paper-based gre® revised. Retrieved from http://www.ets.org/s/gre/pdf/practice_book_GRE_pb_revised_general_test.pdf website:

Fitts, P. M., & Posner, M. I. (1967). *Human performance.* Monterey, CA: Brooks/Cole.

Ford, J. K., & Weissbein, D. A. (1997). Transfer of training: An updated review and analysis. *Performance Improvement Quarterly, 10*(2), 22-41. doi: 10.1111/j.1937-8327.1997.tb00047.x

Frayne, C. A., & Latham, G. P. (1987). Application of social learning theory to employee self-management of attendance. *Journal of Applied Psychology, 72*(3), 387-392. doi: 10.1037/0021-9010.72.3.387

Frese, M. (1995). Error management in training: Conceptual and empirical results. In C. Zucchermaglio, S. Bagnara & S. U. Stucky (Eds.), *Organizational learning and technological change* (pp. 112-124). Berlin: Springer-Verlag.

Frese, M., & Zapf, D. (1994). Action as the core of work psychology: A german approach. In M. D. Dunnette, L. M. Hough & H. C. Triandis (Eds.), *Handbook of industrial and organizational psychology* (Vol. 4, pp. 271-340). Palo Alto, CA: Consulting Psychologists Press.

Gaudine, A. P., & Saks, A. M. (2004). A longitudinal quasi-experiment on the effects of posttraining transfer interventions. *Human Resource Development Quarterly, 15*(1), 57-76. doi: 10.1002/hrdq.1087

Gegenfurtner, A., Veermans, K., Festner, D., & Gruber, H. (2009). Integrative literature review: Motivation to transfer training: An integrative literature review. *Human Resource Development Review, 8*(3), 403-423. doi: 10.1177/1534484309335970

Gist, M. E., Bavetta, A. G., & Stevens, C. K. (1990). Transfer training method: Its influence on skill generalization, skill repetition, and performance level. *Personnel Psychology, 43*(3), 501-523. doi: 10.1111/j.1744-6570.1990.tb02394.x

Gist, M. E., Stevens, C. K., & Bavetta, A. G. (1991). Effects of self-efficacy and post-training intervention on the acquisition and maintenance of complex interpersonal skills. *Personnel Psychology, 44*(4), 837-861. doi: 10.1111/j.1744-6570.1991.tb00701.x

Goldstein, I. L. (1986). *Training in organizations: Program development, needs assessment, and evaluation*. Pacific Grove, CA: Brooks/Cole.

Goldstein, I. L., & Ford, J. K. (2002). *Training in organizations: Needs assessment, development, and evaluation (4th ed.)*. Belmont, CA US: Wadsworth/Thomson Learning.

Green, M., & McGill, E. (2011). State of the industry, 2011: Astd's annual review of workplace learning and development data. Alexandria, VA: American Society for Training & Development.

Grossman, R., & Salas, E. (2011). The transfer of training: What really matters. *International Journal of Training and Development, 15*(2), 103-120. doi: 10.1111/j.1468-2419.2011.00373.x

Heimbeck, D., Frese, M., Sonnentag, S., & Keith, N. (2003). Integrating errors into the training process: The function of error management instructions and the role of goal orientation. *Personnel Psychology, 56*(2), 333-361. doi: 10.1111/j.1744-6570.2003.tb00153.x

Holton, E. F., III. (1996). The flawed four-level evaluation model. *Human Resource Development Quarterly, 7*(1), 5-21. doi: 10.1002/hrdq.3920070103

Holton, E. F., III. (2003). What's *really* wrong: Diagnosis for learning transfer system change. In E. F. Holton, III & T. T. Baldwin (Eds.), *Improving learning transfer in organizations* (pp. 59-79). San Francisco, CA: Jossey-Bass.

Holton, E. F., III, & Baldwin, T. T. (2003). Making transfer happen: An action perspective on learning transfer systems. In E. F. Holton, III & T. T. Baldwin (Eds.), *Improving learning transfer in organizations* (pp. 3-15). San Francisco, CA: Jossey-Bass.

Holton, E. F., III, Bates, R. A., Bookter, A. I., & Yamkovenko, V. B. (2007). Convergent and divergent validity of the learning transfer system inventory. *Human Resource Development Quarterly, 18*(3), 385-419. doi: 10.1002/hrdq.1210

Holton, E. F., III, Bates, R. A., & Ruona, W. E. A. (2000). Development of a generalized learning transfer system inventory. *Human Resource Development Quarterly, 11*(4), 333-360. doi: 10.1002/1532-1096(200024)11:4<333::aid-hrdq2>3.0.co;2-p

Holton, E. F., III, Bates, R. A., Seyler, D. L., & Carvalho, M. B. (1997). Toward construct validation of a transfer climate instrument. *Human Resource Development Quarterly, 8*(2), 95-113. doi: 10.1002/hrdq.3920080203

Ilgen, D. R., Fisher, C. D., & Taylor, M. S. (1979). Consequences of individual feedback on behavior in organizations. *Journal of Applied Psychology, 64*(4), 349-371. doi: 10.1037/0021-9010.64.4.349

Kanfer, R., & Ackerman, P. L. (1989). Motivation and cognitive abilities: An integrative/aptitude-treatment interaction approach to skill acquisition. *Journal of Applied Psychology, 74*(4), 657-690. doi: 10.1037/0021-9010.74.4.657

Karl, K. A., & Ungsrithong, D. (1992). Effects of optimistic versus realistic previews of training programs on self-reported transfer of training. *Human Resource Development Quarterly, 3*(4), 373-384. doi: 10.1002/hrdq.3920030408

Khasawneh, S., Bates, R., & Holton, E. F., III. (2006). Construct validation of an arabic version of the learning transfer system inventory for use in jordan. *International Journal of Training and Development, 10*(3), 180-194. doi: 10.1111/j.1468-2419.2006.00253.x

Kirkman, B. L., Rosen, B., Tesluk, P. E., & Gibson, C. B. (2006). Enhancing the transfer of computer-assisted training proficiency in geographically distributed teams. *Journal of Applied Psychology, 91*(3), 706-716. doi: 10.1037/0021-9010.91.3.706

Kirwan, C., & Birchall, D. (2006). Transfer of learning from management development programmes: Testing the holton model. *International Journal of Training and Development, 10*(4), 252-268. doi: 10.1111/j.1468-2419.2006.00259.x

Kontoghiorghes, C. (2004). Reconceptualizing the learning transfer conceptual framework: Empirical validation of a new systemic model. *International Journal of Training and Development, 8*(3), 210-221. doi: 10.1111/j.1360-3736.2004.00209.x

Kozlowski, S. W. J., & DeShon, R. P. (2004). A psychological fidelity approach to simulation-based training: Theory, research, and principles. In S. G. Schiflett, L. R. Elliott, E. Salas & M. D. Coovert (Eds.), *Scaled worlds: Development, validation, and applications* (pp. 75-99). Burlington, VT: Ashgate Publishing.

Kraiger, K. (2002). *Creating, implementing and managing effective training and development: State-of-the-art lessons for practice.* San Francisco: Jossey-Bass.

Kraiger, K., Ford, J. K., & Salas, E. (1993). Application of cognitive, skill-based, and affective theories of learning outcomes to new methods of training evaluation. *Journal of Applied Psychology, 78*(2), 311-328. doi: 10.1037/0021-9010.78.2.311

Laker, D. R. (1990). Dual dimensionality of training transfer. *Human Resource Development Quarterly, 1*(3), 209-223. doi: 10.1002/hrdq.3920010303

Latham, G. P., & Frayne, C. A. (1989). Self-management training for increasing job attendance: A follow-up and a replication. *Journal of Applied Psychology, 74*(3), 411-416. doi: 10.1037/0021-9010.74.3.411

Locke, E. A., & Latham, G. P. (2002). Building a practically useful theory of goal setting and task motivation: A 35-year odyssey. *American Psychologist, 57*(9), 705-717. doi: 10.1037/0003-066x.57.9.705

Mabe, P. A., & West, S. G. (1982). Validity of self-evaluation of ability: A review and meta-analysis. *Journal of Applied Psychology, 67*(3), 280-296. doi: 10.1037/0021-9010.67.3.280

Martineau, J. W. (1995). *A contextual examination of the effectiveness of a supervisory skills training program.* Unpublished doctoral dissertation, The Pennsylvania State University, State College.

Martocchio, J. J. (1992). Microcomputer usage as an opportunity: The influence of context in employee training. *Personnel Psychology, 45*(3), 529-552.

Mathieu, J. E., & Martineau, J. W. (1997). Individual and situational influences on training motivation. In J. K. Ford, S. W. J. Kozlowski, K. Kraiger, E. Salas & M. S. Teachout (Eds.), *Improving training effectiveness in work organizations* (pp. 193-221). Mahwah, NJ: Lawrence Erlbaum Associates.

Meng, X.-l., Rosenthal, R., & Rubin, D. B. (1992). Comparing correlated correlation coefficients. *Psychological Bulletin, 111*(1), 172-175. doi: 10.1037/0033-2909.111.1.172

Mitchell, T. R., & Daniels, D. (2003). Motivation. In W. C. Borman, D. R. Ilgen & R. J. Klimoski (Eds.), *Handbook of psychology* (Vol. 12, pp. 225-254). Hoboken, NJ: John Wiley & Sons.

Myers, M. J. M. (2009). *Transfer of learning from training program to the workplace in a university healthcare organization setting.* Unpublished Doctoral Dissertation, The University of Connecticut, Storrs.

Naquin, S. S., & Holton, E. F. (2002). The effects of personality, affectivity, and work commitment on motivation to improve work through learning. *Human Resource Development Quarterly, 13*(4), 357-376. doi: 10.1002/hrdq.1038

Noe, R. A. (1986). Trainees' attributes and attitudes: Neglected influences on training effectiveness. *Academy of Management Review, 11*(4), 736-749. doi: 10.2307/258393

Noe, R. A., & Schmitt, N. (1986). The influence of trainee attitudes on training effectiveness: Test of a model. *Personnel Psychology, 39*(3), 497-523. doi: 10.1111/j.1744-6570.1986.tb00950.x

Noe, R. A., Sears, J., & Fullenkamp, A. M. (1990). Relapse training: Does it influence trainees' post training behavior and cognitive strategies? *Journal of Business and Psychology, 4*(3), 317-328. doi: 10.1007/bf01125242

North, R. F. J., Strain, D. M., & Abbott, L. (2000). Training teachers in computer-based management information systems. *Journal of Computer Assisted Learning, 16*(1), 27-40. doi: 10.1046/j.1365-2729.2000.00113.x

Paradise, A., & Patel, L. (2009) *2009 State of the industry report.* Alexandria, VA: American Society for Training & Development.

Parry, K. W., & Sinha, P. N. (2005). Researching the trainability of transformational organizational leadership. *Human Resource Development International, 8*(2), 165-183. doi: 10.1080/13678860500100186

Pintrich, P. R., Smith, D. A., Garcia, T., & McKeachie, W. J. (1993). Reliability and predictive validity of the motivated strategies for learning questionnaire (mslq). *Educational and Psychological Measurement, 53*(3), 801-813. doi: 10.1177/0013164493053003024

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*(5), 879-903. doi: 10.1037/0021-9010.88.5.879

Poteet, M. L. (1996). *The training transfer process: An examination of the role of individual, motivational, and work environmental factors.* Unpublished doctoral dissertation, University of Tennessee, Knoxville.

Preacher, K., & Hayes, A. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior research methods, 40*(3), 879-891. doi: 10.3758/brm.40.3.879

Ree, M. J., & Earles, J. A. (1991). Predicting training success: Not much more than g. *Personnel Psychology, 44*(2), 321-332.

Richman-Hirsch, W. L. (2001). Posttraining interventions to enhance transfer: The moderating effects of work environments. *Human Resource Development Quarterly, 12*(2), 105-120. doi: 10.1002/hrdq.2.abs

Rouiller, J. Z., & Goldstein, I. L. (1993). The relationship between organizational transfer climate and positive transfer of training. *Human Resource Development Quarterly, 4*(4), 377-390. doi: 10.1002/hrdq.3920040408

Schmidt, F. L., & Hunter, J. E. (1998). The validity and utility of selection methods in personnel psychology: Practical and theoretical implications of 85 years of research findings. *Psychological Bulletin, 124*(2), 262-274. doi: 10.1037/0033-2909.124.2.262

Schumacker, R., & Lomax, R. (2004). *A beginner's guide to structural equation modeling*: Lawrence Erlbaum.

Seyler, D. L., Holton, E. F., III, Bates, R. A., Burnett, M. F., & Carvalho, M. A. (1998). Factors affecting motivation to transfer training. *International Journal of Training and Development, 2*(1), 16-16. doi: 10.1111/1468-2419.00031

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

Shrout, P. E., & Bolger, N. (2002). Mediation in experimental and nonexperimental studies: New procedures and recommendations. *Psychological Methods, 7*(4), 422-445. doi: 10.1037/1082-989x.7.4.422

Simosi, M. (2012). Disentangling organizational support construct: The role of different sources of support to newcomers' training transfer and organizational commitment. *Personnel Review, 41*(3), 301-320. doi: 10.1108/00483481211212959

Sitzmann, T. (2006). *Correlations among measures*. Unpublished raw data.

Sitzmann, T., Brown, K. G., Casper, W. J., Ely, K., & Zimmerman, R. D. (2008). A review and meta-analysis of the nomological network of trainee reactions. *Journal of Applied Psychology, 93*(2), 280-295. doi: 10.1037/0021-9010.93.2.280

Sitzmann, T., & Ely, K. (2010). Sometimes you need a reminder: The effects of prompting self-regulation on regulatory processes, learning, and attrition. *Journal of Applied Psychology, 95*(1), 132-144. doi: 10.1037/a0018080

Sitzmann, T., Ely, K., Bell, B. S., & Bauer, K. N. (2010). The effects of technical difficulties on learning and attrition during online training. *Journal of Experimental Psychology: Applied, 16*, 281-292. doi: 10.1037/a0019968

Sitzmann, T., Ely, K., Brown, K. G., & Bauer, K. N. (2010). Self-assessment of knowledge: A cognitive learning or affective measure? *Academy of Management Learning & Education, 9*(2), 169-191.

Spiros, R. K. (2003). *Individual differences in motivation during distance training: The influence of goal orientation and self-efficacy on learning outcomes.* Unpublished doctoral dissertation, The George Washington University, Washington, DC.

Stevens, C. K., Bavetta, A. G., & Gist, M. E. (1993). Gender differences in the acquisition of salary negotiation skills: The role of goals, self-efficacy, and

perceived control. *Journal of Applied Psychology, 78*(5), 723-735. doi: 10.1037/0021-9010.78.5.723

Stevens, C. K., & Gist, M. E. (1997). Effects of self-efficacy and goal-orientation training on negotiation skill maintenance: What are the mechanisms? *Personnel Psychology, 50*(4), 955-978. doi: 10.1111/j.1744-6570.1997.tb01490.x

Tai, W. T. (2006). Effects of training framing, general self-efficacy and training motivation on trainees' training effectiveness. *Personnel Review, 35*(1), 51-65. doi: 10.1108/00483480610636786

Taylor, P. J., Russ-Eft, D. F., & Chan, D. W. L. (2005). A meta-analytic review of behavior modeling training. *Journal of Applied Psychology, 90*(4), 692-709. doi: 10.1037/0021-9010.90.4.692

Tews, M. J., & Tracey, J. B. (2008). An empirical examination of posttraining on-the-job supplements for enhancing the effectiveness of interpersonal skills training. *Personnel Psychology, 61*(2), 375-401. doi: 10.1111/j.1744-6570.2008.00117.x

Truxillo, D. M., Seitz, R., & Bauer, T. N. (2008). The role of cognitive ability in self-efficacy and self-assessed test performance. *Journal of Applied Social Psychology, 38*(4), 903-918. doi: 10.1111/j.1559-1816.2008.00331.x

Tziner, A., Haccoun, R. R., & Kadish, A. (1991). Personal and situational characteristics influencing the effectiveness of transfer of training improvement strategies. *Journal of Occupational Psychology, 64*(2), 167-177. doi: 10.1111/j.2044-8325.1991.tb00551.x

Van den Bossche, P., Segers, M., & Jansen, N. (2010). Transfer of training: The role of feedback in supportive social networks. *International Journal of Training and Development, 14*(2), 81-94. doi: 10.1111/j.1468-2419.2010.00343.x

Warr, P., & Bunce, D. (1995). Trainee characteristics and the outcomes of open learning. *Personnel Psychology, 48*(2), 347-375. doi: 10.1111/j.1744-6570.1995.tb01761.x

Webster, J., & Hackley, P. (1997). Teaching effectiveness in technology-mediated distance learning. *Academy of Management Journal, 40*(6), 1282-1309. doi: 10.2307/257034

Weiss, H. (1990). Learning theory and industrial and organizational psychology. In M. D. Dunnette & L. M. Hough (Eds.), *Handbook of industrial and organizational psychology* (2nd ed., Vol. 1, pp. 171-222). Palo Alto, CA: Consulting Psychologists Press.

Welsh, E. T., Wanberg, C. R., Brown, K. G., & Simmering, M. J. (2003). E-learning: Emerging uses, empirical results and future directions. *International Journal of Training and Development, 7*(4), 245-258. doi: 10.1046/j.1360-3736.2003.00184.x

Wentling, T. L., Park, J., & Peiper, C. (2007). Learning gains associated with annotation and communication software designed for large undergraduate classes. *Journal of Computer Assisted Learning, 23*(1), 36-46. doi: 10.1111/j.1365-2729.2007.00197.x

Werner, J. M., O'Leary-Kelly, A. M., Baldwin, T. T., & Wexley, K. N. (1994). Augmenting behavior-modeling training: Testing the effects of pre- and post-

training interventions. *Human Resource Development Quarterly, 5*(2), 169-183. doi: 10.1002/hrdq.3920050207

Wexley, K. N., & Baldwin, T. T. (1986). Posttraining strategies for facilitating positive transfer: An empirical exploration. *Academy of Management Journal, 29*(3), 503-520.

Wexley, K. N., & Nemeroff, W. F. (1975). Effectiveness of positive reinforcement and goal setting as methods of management development. *Journal of Applied Psychology, 60*(4), 446-450. doi: 10.1037/h0076912

Wood, R., & Bandura, A. (1989). Impact of conceptions of ability on self-regulatory mechanisms and complex decision making. *Journal of Personality and Social Psychology, 56*(3), 407-415. doi: 10.1037/0022-3514.56.3.407

Xiao, J. (1996). The relationship between organizational factors and the transfer of training in the electronics industry in shenzhen, china. *Human Resource Development Quarterly, 7*(1), 55-73. doi: 10.1002/hrdq.3920070107

Yaghi, A., Goodman, D., Holton, E. F., III, & Bates, R. A. (2008). Validation of the learning transfer system inventory: A study of supervisors in the public sector in jordan. *Human Resource Development Quarterly, 19*(3), 241-262. doi: 10.1002/hrdq.1238

APPENDIX A

INFORMED CONSENT

Old Dominion University

PROJECT TITLE: Transfer of Training

INTRODUCTION

Thank you for participating in project Transfer of Training, a completely online study. Your participation in this study is completely confidential. All of your responses will be used for research purposes only. This description is presented so that you are aware of what this study is about before you decide to participate. The two purposes of this form are to give you information that may affect your decision whether to say YES or NO to participation in this research project, and to record the consent of those who say YES. This a required form for any research conducted by Old Dominion University researchers. You may discontinue your participation at any time by closing your web browser window.

RESEARCHERS

Dr. Richard N. Landers, Assistant Professor of Psychology, Responsible Project Investigator
Kristina N. Bauer, Graduate Research Assistant

DESCRIPTION OF RESEARCH STUDY

This research study examines the transfer of training process, which is the continued use of what was learned in training back on the job or another context. When trainees transfer learned material, their performance improves and there is a return on investment in the training course. If you decide to participate, you will fill out a pre-training survey, complete an Excel training program, and fill out a post-training survey. This portion of the experiment will take no more than 2 hours. You may complete it in one sitting or in multiple attempts. You will then be contacted 4, 8, and 12 weeks after training to complete follow-up measures. Survey items focus on knowledge of Excel, skill with Excel, motivation, confidence, reactions to the training, and perceptions of your environment. Approximately 400 students will be sampled.

RISKS AND BENEFITS

RISKS: There are minimal known risks associated with this project. There is a possibility of eyestrain associated with computer monitor viewing, but the risk is minimal because of the short duration of the study. There may be unforeseen risks that have not yet been identified.

BENEFITS: There are no direct benefits to you. However, by participating in this project, you will learn skills that can be applied to your schoolwork, internship, or future job.

COSTS AND PAYMENTS

The researchers want your decision about participating in this study to be absolutely voluntary. There are no costs to you. You will be entered in a raffle after you complete each component of the study (i.e., the training, the 4-week follow-up, the 8-week follow-up, and the 12-week follow-up). You may win one of six $5 Amazon.com gift cards after training, one of six $10 Amazon.com gift cards after the 4 week follow-up, one of five $15 Amazon.com gift cards after the 8-week follow-up, and one of five $25 Amazon.com gift cards after the 12-week follow-up.

NEW INFORMATION

If the researchers find new information during this study that would reasonably change your decision about participating, then they will give it to you.

CONFIDENTIALITY

The researchers will take reasonable steps to keep private information, such as your survey responses, confidential. The researchers will keep all information in private lab space and on secured computers. The results of this project may be used in reports, presentations, and publications; but the researchers will not identify you. Of course, your records may be subpoenaed by court order or inspected by government bodies with oversight authority.

WITHDRAWAL PRIVILEGE

It is OK for you to say NO. Even if you say YES now, you are free to say NO later, and walk away or withdraw from the project -- at any time. Your decision will not affect your relationship with Old Dominion University, or otherwise cause a loss of benefits to which you might otherwise be entitled.

COMPENSATION FOR ILLNESS AND INJURY

If you say YES, then your consent in this document does not waive any of your legal rights. However, in the event of illness arising from this project, neither Old Dominion University nor the researchers are able to give you any money, insurance coverage, free medical care, or any other compensation for such injury.

In the event that you suffer injury as a result of participation in any research project, you may contact the responsible principal investigator, Dr. Richard N. Landers, at 757-683-4212, Dr. George Maihafer the current Old Dominion University IRB chair at 757-683-4520, or the Old Dominion University Office of Research at 757-683-3460, who will be glad to review the matter with you.

VOLUNTARY CONSENT

By clicking "NEXT" below, you are saying several things. You are saying that you have read this form or have had it read to you, that you are satisfied that you understand this form, the research project, and its risks and benefits. The researchers should have answered any questions you may have had about the research. If you have any questions now or later on, then the researchers should be able to answer them. Their contact information is below:

Kristina Bauer
kbauer@odu.edu
757-683-4439

Dr. Richard Landers
rnlanders@odu.edu
757-683-4212

If at any time you feel pressured to participate, or if you have any questions about your rights or this form, then you should call Dr. George Maihafer, the current IRB chair, at 757-683-4520, or the Old Dominion University Office of Research, at 757-683-3460.

And importantly, by clicking "NEXT", you are telling the researchers YES you agree to participate in this project. If you do not want to participate, please close this browser window. Please feel free to print a copy of this page for your records.

APPENDIX B

LIST OF SKILLS IDENTIFIED AS IMPORTANT BY THE SUBJECT MATTER EXPERTS

1. Simple equations (sum, average, if, etc.)
    a. Including creating check figures that "disappear" when they agree
2. More complex equations (sumif, countif, sumifs, countifs, vlookup, concatenate, etc.)
3. Application of filters, both auto-filters and advanced filters
4. Basic cell formatting (number/text types, fonts, texts, text size, text color, etc.)
5. Use of the format painter (one time use and multiple use)
6. Conditional formatting (many variations)
7. How to auto-adjust column widths and row heights
8. Freezing panes
9. Splitting screens
10. Linking equations to a set of assumptions that, when assumptions change, the spreadsheet automatically updates
    a. Including linking to assumptions that may be on other workbooks
11. Copying from other workbooks
    a. Data (text/values)
    b. Just formatting
    c. Just formulas
    d. Entire worksheets

APPENDIX C

MEASURES INCLUDED IN THE STUDY

Note: Measures are presented in the order they were discussed in text. All measures, unless otherwise noted, were rated on a 7-point agreement scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree). Items marked with an asterisk are reverse coded.

Control Variable and Demographics

Experience

1. How much prior experience do you have with Excel 2007? Rated on a 7-point scale ranging from 1 (No Experience) to 7 (A Lot of Experience)

Demographics

1. What is your current age? _____

2. What is your gender: Male Female

3. What is your ethnicity?
   a. White/Caucasian
   b. Black/African American
   c. Hispanic or Latino
   d. Asian
   e. American Indian or Alaska Native
   f. Native Hawaiian or Pacific Islander
   g. Other _____

4. What is your current class level?
   a. Freshman
   b. Sophomore
   c. Junior
   d. Senior
   e. Graduate
   f. Employed – Accountant
   g. Employed – Analyst
   h. Employed – Other

5. What is your GPA? _____

6. Do you have an internship: Yes No

7. If yes, do you need Excel skills?
   a. Yes
   b. No
   c. No current major related internship

8. To what degree is Excel required in your classes?
    a. Never
    b. Rarely
    c. Occasionally
    d. Frequently
    e. Very Frequently

Cognitive Ability (correct answers are in bold)
Directions: The questions on the next page measure your general verbal and mathematical knowledge. Each set of questions has specific instructions. Please read all instructions carefully. You only have **15 minutes** to complete this section. The page will **automatically** advance. If you don't know an answer, that's OK. Please skip the question and come back if time permits. When you are ready to begin, click Next.

Verbal Reasoning

Directions: For questions 1-5, select one entry for each blank from the corresponding column of choices. Fill all blanks in the way that best completes the text.

1. In the 1950s, the country's inhabitants were_____: most of them knew very little about foreign countries.
    a. partisan
    b. erudite
    c. insular
    d. cosmopolitan
    e. imperturbable

2. It is his dubious distinction to have proved what nobody would think of denying, that Romero at the age of sixty-four writes with all the characteristics of_____.
    a. maturity
    b. fiction
    c. inventiveness
    d. art
    e. brilliance

3. The (i) _____ nature of classical tragedy in Athens belies the modern image of tragedy: in the modern view tragedy is austere and stripped down, its representations of ideological and emotional conflicts so superbly compressed that there's nothing (ii) _____ for time to erode.

   Blank (i)
   a. unadorned
   b. harmonious
   c. multifaceted

   Blank (ii)
   d. inalienable
   e. exigent
   f. extraneous

4. To the untutored eye the tightly forested Ardennes hills around Sedan look quite (i) _____, (ii) _____ place through which to advance a modern army; even with today's more numerous and better roads and bridges, the woods and the river Meuse form a significant (iii) _____.

   Blank (i)
   a. impenetrable
   b. inconsiderable
   c. uncultivated

   Blank (ii)
   d. a makeshift
   e. an unpropitious
   f. an unremarkable

   Blank (iii)
   g. resource
   h. impediment
   i. passage

5. Room acoustics design criteria are determined according to the room's intended use. Music, for example, is best (i) _____ in spaces that are reverberant, a condition that generally makes speech less (ii) _____. Acoustics suitable for both speech and music can sometimes be created in the same space, although the result is never perfect, each having to be (iii) _____ to some extent.

   Blank (i)
   a. controlled
   b. appreciated
   c. employed

   Blank (ii)
   d. abrasive
   e. intelligible
   f. ubiquitous

   Blank (iii)
   g. compromised
   h. eliminated
   i. considered

Directions: For questions 6 and 7, select the two answer choices that when used to complete the sentence blank, fit the meaning of the sentence as a whole and produce completed sentences that are alike in meaning.

6. Early critics of Emily Dickinson's poetry mistook for simplemindedness the surface of artlessness that in fact she constructed with such _____.
   a. astonishment
   b. craft
   c. cunning
   d. innocence
   e. naïveté
   f. vexation

7. While in many ways their personalities could not have been more different—she was ebullient where he was glum, relaxed where he was awkward, garrulous where he was _____—they were surprisingly well suited.
   a. solicitous
   b. munificent
   c. irresolute
   d. laconic
   e. fastidious
   f. taciturn

Quantitative Reasoning

Directions: For Questions 8 and 9, compare Quantity A and Quantity B, using the given information. You must determine which quantity is larger, if either.

8. A certain recipe requires 3/2 cups of sugar and makes 2 dozen cookies. (1 dozen = 12) Quantity A is the amount of sugar required for the same recipe to make 30 cookies. Quantity B is 2 cups.
    a. Quantity A is greater.
    b. Quantity B is greater.
    c. The two quantities are equal.
    d. The relationship cannot be determined from the information given.

9. $6 < x < 7$ AND $y = 8$. Quantity A is x/y. Quantity B is 0.85.
    a. Quantity A is greater.
    b. Quantity B is greater.
    c. The two quantities are equal.
    d. The relationship cannot be determined from the information given.

Directions: For Questions 10 and 11, choose the one correct answer.

10. $7x + 3y = 12$ AND $3x + 7y = 6$. If x and y satisfy the system of equations above, what is the value of $x - y$?
    a. 2/3
    b. 3/2
    c. 1
    d. 4
    e. 6

11. Of the 750 participants in a professional meeting, 450 are female and 1/2 of the female and 1/4 of the male participants are less than thirty years old. If one of the participants will be randomly selected to receive a prize, what is the probability that the person selected will be less than thirty years old?
    a. 1/8
    b. 1/3
    c. 3/8
    d. 2/5
    e. 3/4

12. The total number of recording titles distributed by music distributors *L* and *M* is 9,300. The number of recording titles distributed by *L* is 7,100, and the number of recording titles distributed by *M* is 5,200. Which of the following statements must be true? **Select <u>ALL</u> such statements.**
    a. More than half of the titles distributed by *L* are also distributed by *M*.
    b. More than half of the titles distributed by *M* are also distributed by *L*.
    c. No titles are distributed by both *L* and *M*.

Motivation to Learn

1. I will try to learn as much as I can from this Excel course.
2. I am motivated to learn the skills emphasized in the training program.
3. Learning the content covered in this training course is important to me.
4. If I cannot understand something during this training course, I am likely to get frustrated and stop trying to learn.*
5. I would like to improve my Excel skills.
6. I will exert considerable effort in this training course in order to learn the material.
7. I believe I can improve my skills by participating in this training course.
8. I think I could perform the tasks covered in this course quite well without any training.*

Motivation to Transfer

1. My school or work performance will improve if I use the skills I learned in this Excel course.
2. I believe it is unrealistic to try to use the skills emphasized in this Excel course in my work.*
3. I learned skills in this Excel course that I intend to use in my everyday work.
4. I know of situations in which I plan to use what I have learned during this Excel course.
5. The skills I learned in this Excel course will be helpful in solving work- or school-related problems.
6. I feel capable of using the skills developed in this Excel course in my everyday work.

Self-Efficacy for Learning

Pintrich, Smith, Garcia, & McKeachie's Original Scale

1. I believe I will receive an excellent grade in this class.
2. I'm certain I can understand the most difficult material presented in the readings for this course.
3. I'm confident I can learn the basic concepts taught in this course.
4. I'm confident I can understand the most complex material presented by the instructor in this course.
5. I'm confident I can do an excellent job on the assignments and test in this course.

6. I expect to do well in this course.
7. I'm certain I can master the skills being taught in this class.
8. Considering the difficulty of this course, the teacher, and my skills, I think I will do well in this class.

Scale Used in this Study

1. I believe I will do really well in Excel training.
2. I'm certain I can understand the most difficult material presented in this course.
3. I'm confident I can learn the basic concepts taught in this course.
4. I'm confident I can do an excellent job on the end of course test.
5. I expect to do well in this course.
6. I'm certain I can master the skills being taught in this course.

Self-Efficacy for Transfer

1. I have learned skills that will help me to perform my schoolwork well.
2. I know the knowledge/skills that I learned during the course will help me improve my school or work performance.
3. Even though I may have some difficulty using the skills I learned, I know that I will be able to use them effectively.
4. I am confident I can apply the skills/knowledge I have learned when doing my work.
5. I won't have any problems using the skills/knowledge I have learned during the program.
6. I am comfortable applying the knowledge I have learned from this program when doing my work.

Utility Reactions

1. The Excel training was relevant to my education or job.
2. The Excel training provided useful examples and illustrations.
3. The information learned in training is relevant to my schoolwork or job.

Declarative Knowledge & Procedural Knowledge

Items for Dependent Variable

1. Which of the following is associated with columns?
    a. Numbers
    b. **Letters: correct answer**
    c. Letters and Numbers
    d. None of the above

2. What is the first step for performing many basic Excel functions?
    a. copying data
    b. saving data
    c. **highlighting data: correct answer**
    d. grouping data

3. You want the numbers 1 through 50 to appear in column A. You type *1* in cell A1 and *2* in cell A2. To AutoFill the rest of the numbers, you first highlight cells A1 and A2, what is the next thing you would do?
    a. Type *3* in cell A3, *4* in cell A4, *5* in cell A5, etc.
    b. Type Ctrl + A
    c. Click on AutoFill in the user interface Ribbon, and then highlight cells A3 through A50.
    d. **Position your cursor over the bottom right corner of cell A2 so that your cursor turns into crosshairs: correct answer**

4. You want to copy and paste new data from one row into another using keyboard shortcuts. What is the correct order of steps?
    a. **Highlight data, Ctrl+C, Click in new row, Ctrl+V: correct answer**
    b. Highlight data, Ctrl+C, Click in new row, Ctrl+P
    c. Highlight data, Ctrl+P, Click in new row, Ctrl+C
    d. Highlight data, Ctrl+V, Click in new row, Ctrl+C

5. Which of the following statements is false?
    a. A standard Excel workbook has 3 sheets
    b. **You can use the arrow keys on the keyboards to move between worksheets: correct answer**
    c. Ctrl+C can be used to copy data
    d. Pressing this button will undo the last command: 

6. How do you widen a column to fit your text?
    a. Highlight the column and click Ctrl+W
    b. Highlight the column and click Column width in the user interface Ribbon
    c. Double-clicking the line to the left of a column
    d. **Double-clicking on the line to the right of the column: correct answer**

7. What does this button do in Excel? 
    a. **Applies an existing format: correct answer**
    b. Changes the color of the text
    c. Fills a cell with color
    d. Increases the font size

8. Which of the following is a way to edit the appearance of text based on a specification you provide Excel?
    a. AutoFormat
    b. **Conditional Format: correct answer**
    c. Filter data
    d. Copy and Paste

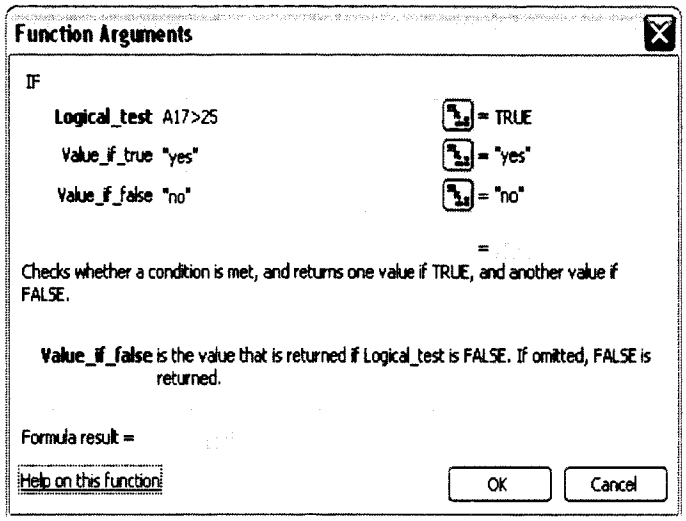
9. After highlighting a group of cells, how do you define them as a range?
    a. Formulas tab >> Apply Name >> Define Name
    b. Formulas tab >> Define Name >> Apply Name
    c. **Formulas tab >> Define Name >> Define Name: correct answer**
    d. Formulas tab >> Apply Name >> Apply Name

10. What does the If function allow you to create?
    a. Conditional Format
    b. **Conditional Formula: correct answer**
    c. Conditional Task
    d. Conditional Edit

11. Which dialogue box do you use to write an If function?
    a. **Function Arguments: correct answer**
    b. Function Cells
    c. Format Arguments
    d. Format Cells

12. Which error code tells you that the formula contains text that Excel does not recognize?
    a. #####
    b. #VALUE!
    c. **#NAME?: correct answer**
    d. #REF!

13. Cell A17 has the number $59.70 in it. If you clicked on cell C18 and then entered the following information in to the function arguments dialogue box, what would you expect to see in cell C18?
    a. 25
    b. **yes: correct answer**
    c. no
    d. >25



14. How do you perform calculations on filtered data?
    a. AutoSum
    b. AutoTotal
    c. **SUBTOTAL: correct answer**
    d. Filter:Sum

15. What does a validation rule allow you to do?
    a. **Set a minimum cell value: correct answer**
    b. Write a conditional formula
    c. Set a cell equal to zero
    d. Write an if/then formula

16. When you choose to Autofilter your data, what happens?
    a. Arrow buttons will appear at the top of each column
    b. Some of your data will no longer be displayed on your screen
    c. The data will change color
    d. **Both a and b: correct answer**

17. What is the drawback of using AutoCalculate?
    a. It does not include values in hidden rows
    b. It does not include filtered data
    c. It only calculates averages
    d. **The calculation is not available in the worksheet: correct answer**

18. How do you unfilter your data?
    a. Sort & Filter>>Off
    b. **Sort & Filter>>Filter: correct answer**
    c. Sort & Filter>>Hide
    d. Sort & Filter>>Remove

19. If you want to rearrange rows by day of the week, you should use the _____ function.
    a. Auto arrange
    b. filtering
    c. **custom list: correct answer**
    d. autofill

20. When sorting data, you rearrange the order of _____based on data in a _____.
    a. **Rows, column: correct answer**
    b. Columns, Row
    c. Rows, filter
    d. Columns, filter

Items for Nonequivalent Dependent Variable

1. When would you use the **Drop Page Field** of a PivotTable?
    a. When you are planning to conditionally format the data
    b. When the data is numerical rather than text
    c. **When you are planning to filter the data: correct answer**
    d. When you want the data to fill the fields of the table

2. What does the Chart Styles section of the Design tab allow you to do?
    a. Allows you to add a chart title and axis titles
    b. Allows you to change the type of chart you want
    c. Adds, removes, or positions labels on the chart
    d. **Changes the color and design of your chart: correct answer**
3. Which part of a graph must you click on in order to be able to add a Trendline?
    a. x-axis
    b. y-axis
    c. **data point: correct answer**
    d. chart area

4. Which of the following is the most common type of Trendline for business data?
    a. **Linear: correct answer**
    b. Power
    c. Past
    d. Predictor

5. Which of the following is true regarding creating a dynamic chart?
    a. The dialogue box for moving pieces of the chart around is called the *Dynamic Chart Field List*
    b. **The default is for Excel to create a new worksheet for the dynamic PivotChart: correct answer**
    c. Both A & B are true
    d. None of the above are true

6. Which type of workbook already has macros enabled?
    a. xlsx
    b. **xlsm: correct answer**
    c. xltx
    d. mxls

7. You have already opened the Excel options dialog box and now want to add a macro to the Quick Access toolbar. What is the first step?
    a. Select the Macro you want
    b. **Select Macros in the Choose Commands From box: correct answer**
    c. Click the Add button
    d. None of the above

8. How does Excel know to update a Web version of a workbook every time the original is saved?
    a. AutoReplenish
    b. **AutoRepublish: correct answer**
    c. AutoRefresh
    d. AutoUpdate

9. How do you insert a comment?
    a. Review tab>New Comment
    b. Right click>Insert Comment
    c. Insert tab>New Comment
    d. **Both a & b: correct answer**

10. Which of the following is true regarding sharing a workbook in Excel?
    a. Excel will save the changes that have been made for a maximum of 30 days
    b. Colleagues are not allowed to make conflicting changes to the document
    c. To share a workbook you must turn on the *Collaboration Function*
    d. **None of the above are true: correct answer**

Skilled Performance

Directions: Please open the Skilled Performance workbook and complete the following tasks to the best of your ability. Use only the skills you learned in training. There may be some things you don't know how to do, and that is ok. Please do not look up information while completing this task. You will only have 15 minutes to work through as many of the items as possible.

Version 1

1. Carla's Bakery, Inc. has asked for your help. They just started compiling customers' addresses for a newsletter. This information is on the "Customers" tab. On this tab, they would like you to:
    a. Put the city, state, and zip code into one column, Column H. The format should be city, state zip (example: Memphis, TN 38133).
    b. Sort the entries by Last Name
    c. Filter out anyone who does not live in Memphis

2. Carla is interested in sales for the month of May. These data are on the "Sales" tab. The days are listed in column A. The bakery sells five main items: vanilla cupcakes, chocolate cupcakes, red velvet cupcakes, specialty cupcakes and cakepops. Under each product Carla listed the number sold on each day (Quantity), the price of the product (Price), and the amount the bakery made that day (Profit, which equals Quantity*Price). She has asked you to do the following:
    a. Freeze the panes so that you can always see Row 6
    b. Calculate each day's sales in Column Q
        i. Color, in green, any day where you sold more than $1,200.
    c. Calculate the monthly profit for each product
        i. Color, in green, the largest monthly profit
    d. Calculate the Total Profit in cell Q38
    e. On any given day, if you did not sell more than 24 of something, you want the color of the text in the quantity column to be red.
    f. Make sure all dollar values are formatted as such
    g. Create a chart of the Total Daily Profit for May
        i. Add a trendline to the chart
    h. Determine the date with the largest profit
        i. Put the date that had the largest profit in cell B41
        ii. Put the profit associated with the date in cell C41
    i. Determine the date with the smallest profit
        i. Put the date that had the smallest profit in cell B42
        ii. Put the profit associated with the date in cell C42

Version 2

1. You work for a large firm that sells pharmaceuticals. You have been asked to help prepare a report on general demographics of the sales force. Information about the employees is on the "Employees" tab of the workbook. On this tab, you have been asked to:
    a. Put the names of each employee in a single column, column C. The format should be Last Name, First Name (example: Brown, Faith).
    b. Sort the entries by Age
    c. Filter out anyone who is male

2. The pharmaceutical company is interested in employees' sales performance for the first Quarter (January through March). These data are on the "Performance" tab. The employees are listed in column A. The company sells three primary drugs. Each drug is listed beneath each month in a single column. Under each drug is the amount in dollars that each employee sold. The company has asked you to do the following:
    a. Freeze the panes so that you can always see Row 5
    b. Calculate each employee's sales in Column K
        i. Color, in red, any employee who sold less than $5,100.
    c. Calculate the monthly sales for each product
        i. Color, in green, the largest monthly profit
    d. Calculate the Total Sales for the first quarter in cell K55
    e. For drug B in any of the three months, if an employee did not sell more than $520, you want the color of the text in the column to be red.
    f. Create a chart of the Employee Total Sales for the first quarter
        i. Add a trendline to the chart
    g. Determine the employee who had the highest first quarter sales value
        i. Put the employee that had the most sales in cell B58
        ii. Put the sales associated with the employee in cell C58
    h. Determine the employee who had the lowest first quarter sales value
        i. Put the employee that had the most sales in cell B59
        ii. Put the sales associated with the employee in cell C59

Transfer of Training

Self-Report Use – rated on a 7-point frequency scale ranging from 1 (Never) to 7 (Every Day)

How frequently do you use each of the following skills taught in training…?

1. Overall Excel use
2. Basic cell formatting (e.g., different fonts, text size, number/text type)
3. Format painter
4. Simple equations (e.g., sum or average)
5. Complex equations (e.g., sumif, countif, vlookup)
6. Conditional formatting
7. Freezing panes
8. Splitting screens
9. Copying information from other workbooks
10. Application of filters (auto or customized filters)

Self-Report Effectiveness

1. Using the new Excel skills has helped me improve my work.
2. I can accomplish my school work or job tasks faster than before training.
3. I can accomplish job tasks better by using what I learned in training.
4. The quality of my work has improved after using the Excel skills learned in training.
5. I make fewer mistakes when using the Excel skills learned in training.

Objective Effectiveness – same as the Skilled Performance measure.

APPENDIX D

SKILLED PERFORMANCE GRADING INSTRUCTIONS

I. Files are named: Skilled_Performance_V#_view_ID

II. Assign a 0 (incorrect) or 1 (correct) for each question unless otherwise noted below. Accuracy is important - inaccurate responses are marked wrong. BUT, when the answer is incorrect because of a previous mistake, the question can be marked right if the correct formulas (or steps) were applied.

III. Put the Participant ID in column A and the version of the test (1 or 2) in column B. If the file is a CSV file, leave everything blank, highlight the ID number in a bright color, and add a comment that indicates it was a CSV file.

IV. Grading Q1
   a. Start with 1c (0 or 1)
      i. V1 – Should only see Memphis in City column
      ii. V2 – Should only see Female in Gender column

   b. Then unfilter to grade 1a and 1b
      i. For 1a, **deduct half a point** if the participant didn't use a form of concatenation, if there are empty cells in the column, or if the formatting is wrong (i.e., there's no comma where it should be). If all three issues are present, give participant a 0.
      ii. 1b is 0 or 1

V. Grading Q2
   a. 2a – no special instructions
   b. 2b – minus half if participant didn't use a formula.
   c. 2bi
      i. If the participant used a conditional formatting, assign 1. To determine if conditional formatting was used go to: Home tab >> Conditional Formatting >> Manage rules…
      ii. If the participant just highlighted the cells (Q7-Q10, Q13, Q14, Q16-Q18, Q22, Q26, Q29, Q31, and Q32 for V1 & K6, K9, K15, K18-K22, K24-K26, K28, K30-K33, K36, K38, K46, K50, and K51 for V2) green for V1 and red for V2, assign .5
      iii. If there is no highlighting or it's done incorrectly (i.e., the wrong cells are highlighted), assign 0
      iv. If Q38 is highlighted, assign 0.
   d. 2c – minus half if participant didn't use a formula
   e. 2ci – 0 or 1 grading; cell G38 should be green for V1 and either cell J55 or cells J55, G55, AND D55 should be green.
   f. 2d – Should be $37,728.72 for V1 and $250,271.00 for V2. Minus half if formula is not used. Mark as 0 if the total is wrong.

g. 2e – must ensure that conditional formatting is applied. If not applied, subtract half a point.
    i. V1 – formula should be applied to columns B, E, H, K, and N
    ii. V2 – formula should be applied to columns C, F, and I
    iii. Verify that the range of the conditional formula matches the entire column
h. 2f – no special notes
i. 2fi – no special notes
j. 2gi – Should be Saturday May 12th for V1 and Jeffrey M. Bowden for V2
k. 2gii – Should be $1,446.38 for V1 and $5,230.00 for V2
    i. Minus half if participant didn't use Max or Large function
l. 2hi – Should be Thursday May 17th for V1 and Selma Whisenhunt for V2
m. 2hii – Should be $962.46 for V1 and $4969.00 for V2
    Minus half if participant didn't use Min or Small function

VITA

Kristina N. Bauer
Department of Psychology
250 Mills Godwin Building
Norfolk, VA 23529

Education

Old Dominion University, Norfolk, VA; Doctor of Philosophy, Industrial-Organizational Psychology; Expected graduation May 2012
George Washington University, Washington, DC; Master of Arts, Human Resource Management; May 2008
University of Pittsburgh, Pittsburgh, PA; Bachelor of Science, Psychology; April 2006

Work Experience

Assistant Professor, University of West Florida; Current
Grant Project Manager, Old Dominion University; May 2011 - Aug. 2013
Instructor, Old Dominion University; Jan. 2010 - Aug. 2013
Teaching Assistant, Old Dominion University; Aug. 2009 - Dec. 2009
Research Assistant, Old Dominion University; Aug. 2008 - Aug. 2013
Research Analyst, Advanced Distributed Learning Co-Laboratory; Oct. 2006 - Aug. 2008

Publications

Bauer, K. N., Brusso, R. C., & Orvis, K. A. (2012). Using adaptive difficulty to optimize videogame-based training performance: The moderating role of personality. *Military Psychology, 24,* 148-165.

Brusso, R. C., Orvis, K. A., **Bauer**, K. N., & Tekleab, A. G. (2012). Interaction among self-efficacy, goal orientation, and unrealistic goal-setting on videogame-based training performance. *Military Psychology, 24,* 1-18.

Sitzmann, T., Ely, K., Bell, B., & **Bauer**, K. N. (2010). The effects of technical difficulties on learning and attrition during online training. *Journal of Experimental Psychology: Applied, 16,* 281-292.

Sitzmann, T., Ely, K., Brown, K. G., & **Bauer**, K. N. (2010). Self-assessment of knowledge: A cognitive learning or affective measure? *Academy of Management Learning & Education, 9,* 169-191. *Awarded Best Paper in Academy of Management Learning & Education in 2010.*

Brown, K. G., Sitzmann, T., & **Bauer**, K. N. (2010). Self-assessment one more time: With gratitude and an eye toward the future. *Academy of Management Learning & Education*, 9, 348-352.

Morganson, V. J., Major, D. A., & **Bauer**, K. N. (2009). Work-life job analysis: Applying a classic tool to address a contemporary issue. *The Psychologist-Manager Journal, 12,* 252-274.