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The Science of Training and Development in Organizations: What Matters in Practice

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Summary

Organizations in the United States alone spend billions on training each year. These training and development activities allow organizations to adapt, compete, excel, innovate, produce, be safe, improve service, and reach goals. Training has successfully been used to reduce errors in such high-risk settings as emergency rooms, aviation, and the military. However, training is also important in more conventional organizations. These organizations understand that training helps them to remain competitive by continually educating their workforce. They understand that investing in their employees yields greater results. However, training is not as intuitive as it may seem. There is a science of training that shows that there is a right way and a wrong way to design, deliver, and implement a training program.

The research on training clearly shows two things: (a) training works, and (b) the way training is designed, delivered, and implemented matters. This article aims to explain why training is important and how to use training appropriately. Using the training literature as a guide, we explain what training is, why it is important, and provide recommendations for implementing a training program in an organization. In particular, we argue that training is a systematic process, and we explain what matters before, during, and after training. Steps to take at each of these three time periods are listed and described and are summarized in a checklist for ease of use.

We conclude with a discussion of implications for both leaders and policymakers and an exploration of issues that may come up when deciding to implement a training program. Furthermore, we include key questions that executives and policymakers should ask about the design, delivery, or implementation of a training program. Finally, we consider future research that is important in this area, including some still unanswered questions and room for development in this evolving field.

Introduction

We start this article with two assertions: (a) properly designed training works, and (b) the way training is designed, delivered, and implemented can greatly influence its effectiveness. That well-designed training is impactful is important as continuous learning and skill development are now a way of life in modern organizations. To remain competitive, organizations and countries must ensure that their workforce continually learns and develops. Training and development activities allow organizations to adapt, compete, excel, innovate, produce, be safe, improve service, and reach goals. In the United States alone, organizations spend about $135 billion in training individuals per year (Patel, 2010). Organizations invest in training because they believe a skilled workforce represents a competitive advantage.

Therefore, decisions about what to train, how to train, and how to implement and evaluate training should be informed by the best information science has to offer. This article briefly presents results from a series of meta-analyses that provide clear evidence of our first assertion, that properly designed training works. We build on this evidence to review and summarize what the research can tell us about designing, delivering, and implementing training effectively so that decision makers and policymakers are equipped to take informed, evidence-based actions to ensure training effectiveness. Training research and practice have greatly advanced over the last three decades. In the first chapter on training published in the *Annual Review of Psychology*, Campbell (1971) characterized the training literature as "voluminous, nonempirical, nontheoretical, poorly written, and dull" (p. 565). Campbell further noted that it was "faddish to an extreme," often testing new methods emerging in practice but unrelated to theories of learning. Kraiger, Ford, and Salas (1993) also commented on how training research and theory lagged far behind developments in learning theory in other areas of psychology.

Thirty years later, Salas and Cannon-Bowers (2001) reviewed the training literature and concluded that training theory and research had made great advancements. The

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science of training has drawn both on practical applications of general learning theory and on theories and models endemic to industrial–organizational psychology that place training in a broader organizational system. It is also the case that advancements in training research can be attributed in part to the need for evidence-based prescriptions for the design and delivery of training. The science has kept up with this demand. Meta-analyses integrating a large number of empirical studies across various training topics from manager training to team training, cross-cultural training, and all forms of employee training consistently show that when training is designed systematically and based on the science of learning and training, it yields positive results (Arthur, Bennett, Edens, & Bell, 2003; M. J. Burke & Day, 1986; Collins & Holton, 2004; Keith & Frese, 2008; Morris & Robie, 2001; Powell & Yalcin, 2010; Salas et al., 2008; Salas, Nichols, & Driskell, 2007; Taylor, Russ-Eft, & Chan, 2005). Table 1 presents the average effect size or impact of various types of training as reported in several key meta-analyses, which strongly support our contention that well-designed training works.

The indictment by Campbell (1971) on the state of training literature gave rise to theory-based research and empirically based training practices. Since Campbell's review, training research has grown, generated empirically driven principles, and made significant contributions to practice; therefore, the training research domain is now robust, exciting, dynamic, active, and relevant to organizations. The purpose of this article is to provide a comprehensive practical review of the science of training and development in organizations. We draw primarily from the training literature rather than from research in education.

This review differs from prior ones published in the *Annual Review of Psychology* by three of the current authors (Aguinis & Kraiger, 2009; Salas & Cannon-Bowers, 2001; Tannenbaum & Yukl, 1992) in that our focus is on providing clear principles as to what matters (and therefore what to do, what to consider, and what to be guided by) in the design and delivery of training. These prior reviews provided summaries on the state of the science. This article goes further and offers science-based guidance and a set of key questions for business leaders and policymakers, including those in positions that establish the guidelines for the training and development of the workforce nationally, regionally, and in specific organizations. We first address the relevance of training and development to organizational vitality.

Why Should Organizations Care About the Science of Training?

Boudreau and Ramstad (2005) argued that to maintain a competitive advantage, organizations must succeed in three domains: finance, products or markets, and human capital (or their workforce). Worldwide economic cycles tend to create conditions in which obtaining sufficient financing is either equally easy or equally difficult for most organizations of the same size. More important, in today's global economy, all organizations can sell to the same markets (e.g., through the Internet), and product development cycles are such that differences in product innovation are much smaller than in years past (as evident in similarities in smartphones across carriers). Thus, it is the third domain—building and maintaining a more capable and better trained workforce—that may offer the most sustainable advantage available to most organizations (see also Huselid & Becker, 2011).

Effective management of the acquisition and training of human capital is thus an important key to organizational success. For example, Delaney and Huselid (1996) found that effective practices by organizations related to staffing and training were positively related to perceived organizational performance, whereas in a study of nearly 1,000 companies, Huselid (1995) documented that the use of high-performance work practices (including effective recruitment and selection, compensation systems, and training) predicted employee retention and performance as well as long-term measures of corporate financial performance. Aguinis and Kraiger (2009) cited multiple studies in European countries that link training practices and policies to measures of organizational effectiveness. Studies like these show that training is a key component in building and maintaining an effective employee workforce, which in turn drives various metrics of corporate well-being. In addition, training is also a key component in leadership development (Collins & Holton, 2004), another factor integral to corporate success. Finally, at the societal level, investments in workforce development through training are often seen as a primary mechanism for national economic development. Indeed, Aguinis and Kraiger (2009) presented several case studies of the role of training in promoting economic development within nations.

We live in unprecedented economic times. Companies and government entities today face pressing challenges and opportunities, many of which have important implications for training and development. For example, a few common trends include dealing with an aging and, in many cases, cross-cultural workforce; the retraining of displaced personnel; a new generation entering the workforce with different motivations, expectations, and approaches to learning; access to rapidly emerging technologies that can accelerate or distract from employee development; and the need to develop an adaptive, flexible workforce that can adjust to changes, while simultaneously ensuring that employees have the specific skills they need to do today's work. To a large extent, problems of unemployment and stagnant economic growth can be viewed as challenges in aligning public and private training efforts with skills needed in future jobs.

Thus, national, regional, and other government entities have a vested interest in developing a well-prepared labor force in their area. A properly prepared labor pool attracts and retains employers, helps reduce unemployment, and allows for fulfillment of societal needs. It enables an area to be competitive with other locations (e.g., other states, regions, or

Table 1. Meta-Analyses of Training and Development Studies[1]

Author(s)	What was examined	Effect sizes
Arthur, Bennett, Edens, and Bell (2003)	Organizational training	Overall effectiveness = .62 Reaction criteria = .60 Learning criteria = .63 Behavioral criteria = .62 Results criteria = .62
M. J. Burke and Day (1986)	Managerial training	Subjective learning criteria = .34 Objective learning criteria = .38 Subjective behavior criteria = .49 Objective results criteria = .67
Collins and Holton (2004)	Managerial leadership development	Posttest only, with control: Knowledge-objective outcomes = .96 Expertise-objective outcomes = .54 Expertise-subjective outcomes = .41 System-objective outcomes = .39 Pretest-posttest, with control: Knowledge-objective outcomes = .35 Expertise-subjective outcomes = .4 Single group, pretest-posttest: Knowledge-objective outcomes = 1.36 Expertise-objective outcomes = 1.01 Expertise-subjective outcomes = .38
Keith and Frese (2008)	Error management training	Overall effect = .44
Powell and Yalcin (2010)	Managerial training	Posttest only, with control: Learning-objective = .48 Behavior-objective = .15 Behavior-subjective = .2 Results-objective = .17 Pretest-posttest, with control: Learning-objective = .17 Behavior-subjective = .3 Single group, pretest-posttest: Learning-objective = .55 Behavior-objective = .22 Behavior-subjective = .22
Salas, Nichols, and Driskell (2007)	Team Training: Cross-training; Team coordination and adaptation training; Guided team self-correction training	Overall performance = .29 Objective measures = .28 Supervisor ratings of performance = .34 Guided team self-correction training = .45 Team coordination and adaptation training = .61
Salas et al. (2008)	Team training	Cognitive outcomes = .42 Affective outcomes = .35 Process outcomes = .44 Performance outcomes = .39
Taylor, Russ-Eft, and Chan (2005)	Behavior modeling training	Declarative knowledge = 1.05 Procedural knowledge-skills = 1.09 Attitudes = 0.29 Job behavior = 0.25

[1]All effect sizes are *d* values, with a positive effect size indicating a significant effect for training compared to a control or no training condition.

countries). However, government resources are limited, so smart decisions must be made about where and how funds are allocated (and which policies should be supported) to help in workforce development. Knowledge about what helps and hinders training effectiveness is essential.

At the organizational level, companies need employees who are both ready to perform today's jobs and able to learn and adjust to changing demands. For employees, that involves developing both job-specific and more generalizable skills; for companies, it means taking actions to ensure that employees are motivated to learn. Organizations strive for efficiency and seek competitive advantages. As noted above, well-designed training and development can enable employees to be more productive and higher performers and hence worthy of higher pay. Understanding how best to use training helps a company establish a skilled and competitive talent pool, providing an alternative strategy to finding sources of lower priced but less skilled labor. Thus, policymakers should understand how effective workforce training and development can ensure a knowledgeable and skilled workforce. Setting useful policies and guidelines for how to enhance human capital is imperative.

Training clearly matters at multiple levels of our society. The focus of this article, however, is at the organizational level, given the current state of scientific research on training. Thus, at the organizational level, it is appropriate to ask: What do organizations receive from such investment? What features of training and development help them reap its benefits (i.e., what matters)? We hope this review shows that if organizations invest sufficiently and wisely in well-designed training, it works.

Review and Definitions

In an effort to identify relevant research, we conducted a systematic search via EBSCOhost. This search resulted in over 500 hits, which were then screened for relevance. Next, we reviewed and categorized the articles with regard to key issues, such as what theoretical drivers guided the studies, "who" was being trained, "how" training was conducted (i.e., what methods and strategies were used), and "what" factors influenced training effectiveness (i.e., motivation to learn). We also relied on other published literature to provide a more rounded perspective of the state of the science in training (see Aguinis & Kraiger, 2009; Salas & Cannon-Bowers, 2001; Salas, Priest, Wilson, & Burke, 2006; Tannenbaum & Yukl, 1992).

First, a few definitions are in order. At its most basic level, training can be thought of as the planned and systematic activities designed to promote the acquisition of knowledge (i.e., need to know), skills (i.e., need to do), and attitudes (i.e., need to feel). Effective training takes place when trainees are intentionally provided with pedagogically sound opportunities to learn targeted knowledge, skills, and attitudes (KSAs) through instruction, demonstration, practice, and timely diagnostic feedback about their performance (Salas & Cannon-Bowers, 2001). The goal of training is to create sustainable changes in behavior and cognition so that individuals possess the competencies they need to perform a job.

Although learning and training are related, they are not the same. Some training fails to produce any learning, and a great deal of learning occurs outside of training. Learning is a desired outcome of training—a process of acquiring new knowledge and behaviors as a result of practice, study, or experience. It involves relatively permanent changes in cognition, behavior, and affect (Kraiger et al., 1993). Cognitive outcomes include enhanced knowledge and better mental models. Examples of behavioral outcomes are acquiring a new skill or honing an existing one. Affective learning outcomes include improved motivation and self-efficacy. With these definitions in mind, then, we discuss what matters in designing and delivering training in organizations.

The State of the Science and Practice

We begin with a few observations about the state of the science and practice. These observations are based on what we know from the literature and from our own experiences in designing and delivering training in organizations. We first address the science.

Theoretical drivers and models

Over the last 25 years or so, we have seen better, deeper, and more integrated theoretical models prescribing when and how training works (Kozlowski & Salas, 1997; Tannenbaum & Yukl, 1992). These theoretical contributions have expanded our understanding of training to include both micro and macro perspectives as well as a multidisciplinary view. Researchers now recognize that multiple levels within an organization (i.e., at the levels of the individual, the team or unit, and the organization itself) influence and are affected by training. The science of training is rooted in a variety of disciplines; authors who conduct research and publish articles about training have a wide range of educational and experiential backgrounds and perspectives. As articulated by Salas and Cannon-Bowers (2001), the training field belongs to no one in particular but to many disciplines. Furthermore, a variety of disciplines (e.g., cognitive science, engineering, systems and industrial/organizational psychology management, education) contribute to our understanding of training effectiveness and the theories that underlie it.

One example of a theoretical advancement in the area of training concerns transfer of training. Learning transfer has a very specific meaning in the cognitive psychology domain (e.g., Gick & Holyoak, 1983), referring to the extent to which learning on one task facilitates learning on a second task. In the training realm, however, transfer refers to the extent to which learning during training is subsequently applied on the job or affects later job performance. Thus, training transfer can be estimated by a correlation between learning scores (in training) and performance metrics (on the job). Transfer is critical

because without it, an organization is less likely to receive any tangible benefits from its training investments. Historically, applied researchers were principally concerned with either estimating the extent of transfer or recommending the importance of supporting it (e.g., Newstrom, 1986). Then, Baldwin and Ford (1988) developed a model that described the transfer of training process. In their model, they depicted the interactions among training design characteristics, trainee characteristics, and the work environment in explaining learning and transfer. This model has formed a basis for numerous subsequent empirical studies that have identified when and for whom different training or transfer support methods are more or less effective (e.g., Grossman & Salas, 2011). Ford and Kraiger (1995) later drew explicit links between research on learning and transfer in the cognitive psychology domain and transfer of training in applied contexts. Contributions such as these not only expanded theory on a specific topic (transfer of training) but called attention to the link between organizational-level phenomena and both learning during training and application of learning after training to the job.

The relationship between training events and organizational characteristics is highlighted in one of the most notable advancements in the science of training—the development of training effectiveness models. Earlier training models simply described and linked the processes involved in identifying training needs, designing training, and delivering training (e.g., Goldstein, 1986). However, considerable modern research and theory considers the many factors that may impact the effectiveness of training. For example, research on vertical transfer processes (Kozlowski, Brown, Weissbein, Cannon-Bowers, & Salas, 2000), transfer of training (Baldwin & Ford, 1988; Grossman & Salas, 2011), training motivation (Colquitt, LePine, & Noe, 2000), performance measurement (Cannon-Bowers & Salas, 1997), individual differences (Noe, 1986), and learner control strategies (Ford, Smith, Weissbein, Gully, & Salas, 1998) have each contributed to a greater understanding of how to best train individuals and collectives.

Moreover, Cannon-Bowers, Tannenbaum, Salas, and Converse (1991) presented a framework that bridged the gap between training theory and practice. Their framework highlighted the linkages between training-related theory and techniques for training analysis, design, and evaluation. Specifically, their training effectiveness framework explicitly links the various areas of training theory to training practice. Moreover, the framework incorporates three practical questions that should be considered when conducting training: (a) What should be trained? (b) How should training be designed? and (c) Is training effective, and if so, why?

What can be found in training theories of today provides practitioners with a wealth of knowledge on the components critical to any training system. Clearly, as noted many years ago, "there is nothing more practical than a good theory," (Lewin, 1952, p. 169) and theories have contributed to the design and delivery of the systems in aviation, the military, and industry (Salas, Wilson, Priest, & Guthrie, 2006). We will discuss these contributions more later. Here, we observe that *theories now abound—and these provide practical paths to designing and delivering training*.

These theories have also expanded our view on training as a system. Successful training is not a one-time event but an iterative process that considers the elements leading up to training as well as important factors after training. Thus, researchers have examined how activities before, during, and after training influence training effectiveness.

Within the pretraining environment, it is important to consider both situational and individual characteristics. It has been suggested that the way in which training is framed in conjunction with the trainee's abilities or previous experience can influence the outcomes of training. For example, Smith-Jentsch, Jentsch, Payne, and Salas (1996) demonstrated that trainees who had experienced negative pretraining events that could have been helped by the training learned more from training than did those who had not had such prior experience. Other researchers have demonstrated that trainees who perceive their work climate to be supportive are more likely to attend training programs and be motivated to learn (Maurer & Tarulli, 1994; Noe & Wilk, 1993). Further, trainees hold more favorable attitudes toward training when they have input into the design of the training or when they choose to attend training, rather than being required to attend (Baldwin, Magjuka, & Loher, 1991; Hicks & Klimoski, 1987). Finally, performance in remedial training is more positive if trainees perceive that they were selected fairly (Quiñones, 1995).

Successful training not only considers the elements that will influence training beforehand, but it also examines facets within the transfer environment (Grossman & Salas, 2011; Tannenbaum, Mathieu, Salas, & Cannon-Bowers, 1991). In this regard, research clearly shows that formal and informal reinforcement is critical for ensuring that trainees will choose to transfer what they have learned outside the formal training environment (e.g., Chiaburu & Marinova, 2005; Smith-Jentsch, Salas, & Brannick, 2001; Tracey, Tannenbaum, & Kavanagh, 1995). In one study, Kontoghiorghes (2004) reported that transfer is facilitated by both a supportive climate and aspects of the work environment, specifically, environments characterized by sociotechnical system design factors (e.g., high job involvement and information sharing), job design variables such as task autonomy, and an organizational commitment to quality. There is also evidence that posttraining interventions such as goal setting (Richman-Hirsch, 2001) and guided reflection can be effective in promoting skill maintenance (Lee & Sabatino, 1998). Finally, as obvious as it may sound, trainees also need to be given opportunities to perform their newly trained behaviors on the job (Ford, Quiñones, Sego, & Sorra, 1992; Quiñones, Ford, Sego, & Smith, 1995). Trainees may be assigned to duties that differ from what they were trained to do or may return to work to find that they do not have ample time to use what they learned. If opportunities to perform are few and far between, trainees are likely to forget what they have learned and/or to view it as unimportant.

It is also known that motivation to learn can be an important predictor of actual learning in training. Motivation to learn refers to a condition when trainees believe that training is relevant and are willing to exert effort in the training environment (Noe, 1986; Noe & Schmitt, 1986). Motivation to learn can influence whether individuals decide to attend training, the level of effort they exert toward learning during training, and the perseverance they demonstrate in applying skills on the job after training (Quiñones, 1997). Motivation to learn is influenced by both individual characteristics such as self-efficacy and a mastery orientation, organizational-level influences such as support for training, and by prior successful experiences with similar training programs (for a review, see Colquitt et al., 2000; Noe & Colquitt, 2002). However, the antecedents of motivation to learning may be complex. In a recent study, Sitzmann, Brown, Ely, and Kraiger (2009) examined trainees' motivation to learn over time and found that although motivation predicted trainee reaction and learning both in earlier and later training courses, overall motivation declined over time. Sitzmann et al. concluded that trainees reacted negatively to the perceived lack of usefulness of earlier training courses, and this in turn led to a decline in their training motivation in later courses. Organizations are advised, when possible, to not only select employees who are likely to be motivated to learn when training is provided but to foster high motivation to learn by supporting training and offering valuable training programs.

Taken together, these studies illustrate the importance of viewing training "as a system" and not a one-time event. This system must take into account what happens before, during, and after training. This system must promote the application of newly acquired skills to the job. So, we suggest that *what happens in training is not the only thing that matters—a focus on what happens before and after training can be as important. Steps should be taken to ensure that trainees perceive support from the organization, are motivated to learn the material, and anticipate the opportunity to use their skills once on (or back on) the job.*

Research impact on practice

Done well, training and development can have a significant impact on organizations' bottom line. Moreover, it has also been demonstrated to reduce life-threatening errors in high-risk environments. Senders and Moray (1991) estimated that somewhere between 30% and 80% of serious accidents within human-machine settings can be attributed to human error; thus training to increase awareness, knowledge, and skills should reduce errors and improve worker and public safety. As such, researchers have focused on a wide range of challenging training needs, including electrochemical troubleshooting skills (Allen, Hays, & Buffardi, 1986; Swezey, Perez, & Allen, 1991), simulated chemical plants (Hunt & Rouse, 1981; Patrick, Haines, Munley, & Wallace, 1989), industrial inspection (Czaja & Drury, 1981), and problem-solving performance (Swezey, Perez, & Allen, 1988).

Researchers have also examined the effects of training on driver performance and safety. Studies have assessed the effects of training on risk awareness (Fisher et al., 2002; Pollatsek, Narayanaan, Pradhan, & Fisher, 2006), headway estimation (Taieb-Maimon, 2007), and general driving performance (Roenker, Cissell, Ball, Wadley, & Edwards, 2003). In addition, numerous studies over the past decades have been devoted to the development, evaluation, and implementation of Crew Resource Management (CRM) training, which is a specialized version of team training developed especially for flight crew teams (e.g., Kanki, Helmreich, & Anca, 2010; Salas, Fowlkes, Stout, Milanovich, & Prince, 1999; Salas, Wilson, Burke, & Wightman, 2006; Smith-Jentsch, et al., 2001). Components of the CRM training methodology have also been extended to other performance domains, including emergency rooms (Gaba, 1994) and air traffic control teams (Endsley & Rodgers, 1996; Jones & Endsley, 2004; O'Brien & O'Hare, 2007). More important, the evidence suggests that CRM training works. A quantitative review of 58 studies indicated that CRM training generally produces positive reactions, enhanced learning, and desired behavioral changes (Salas, Burke, Bowers, & Wilson, 2001). More effective crew coordination means safer flights, emergency rooms, and so forth.

A report from the Institute of Medicine (1999) stated that between 40,000 and 50,000 people die in hospitals a year as a result of human error and poor coordination among healthcare providers. This has led to considerable research on teamwork within the field of medicine (e.g., Carayon, 2012; Gaba, 2010; Manser, 2009). Essentially, this research has followed the path taken by the aviation community in their attempt to also mitigate human error—focusing on the deployment of team training programs (Kanki et al., 2010). Both the healthcare and aviation communities have conducted targeted research to understand the factors that lead to human error and how training can be used as an effective countermeasure. In sum, training has been shown to have life-saving consequences.

Today, training is not limited to building individual skills—training can be used to improve teams as well. Sometimes this training (e.g., assertiveness training, cross-training) is designed to provide individuals with skills they can apply when working with any group of teammates (e.g., Smith-Jentsch, Salas, & Baker, 1996; Volpe, Cannon-Bowers, Salas, & Spector, 1996), and other times (e.g., guided team self-correction) the training is designed to enable a specific group of teammates to function more effectively together (e.g., Smith-Jentsch, Cannon-Bowers, Tannenbaum, & Salas, 2008). A recent meta-analysis showed that, on average, team training explained 20% of the variance in team performance (Salas et al., 2008). Clearly, this is very encouraging and begins to demonstrate that well-designed team training also works.

There is no doubt that organizational and human factor scientists and practitioners have been at the forefront of the research and practice of team training. It is these scientists who not only have led on team training but also lead the study of team dynamics in many other complex environments.

Much is now known about training individuals, teams, groups, units, and collectives. Applied research links effective training to improving performance, reducing errors, saving lives, and enhancing safety.

Training principles can also be applied to the challenge of developing effective leaders and managers. Management development generally differs from training in that its learning objectives are often knowledge, skills, and competencies for higher level positions within the organization. Further, leadership development can be distinguished from management development in that the targeted competencies are generally "higher order" (more complex) and less connected to individual jobs. Further, trainees typically have more discretion in personalizing training content (to fit their personal style and needs) as one moves from job training to management development to leadership development. Nonetheless, management and leadership development typically incorporate a variety of both formal and informal learning activities, including traditional training, one-on-one mentoring, coaching, action learning, and feedback (M. J. Burke & Day, 1986; Cullen & Turnbull, 2005).

Research evidence suggests that management and leadership development efforts work. For example, Sirianni and Frey (2001) reported on a 9-month leadership development program at a multinational financial services company. The actual program consisted of 13 training modules delivered every 2 weeks. Regional performance indicators were collected on a monthly basis. The results showed improvements on six of seven key indicators, including teller errors, secret shopper ratings, and business retention. More generally, M. J. Burke and Day (1986) conducted a meta-analysis of 70 empirical studies to examine the effectiveness of management training across six content areas (general management, human relations/leadership, self-awareness, problem solving/decision making, rater training, and motivation/values), seven training methods (lecture, lecture/group discussion, leader match, sensitivity training, behavior modeling, lecture/group discussion with role-playing or practice, and multiple methods), and four outcome criteria (subjective learning, objective learning, subjective behavior, and objective results) and reported a positive effect for training among nearly all combinations of content, methods, and outcomes. More recently, Collins and Holton (2004) analyzed the benefits of managerial leadership development programs in 83 published studies. Although average effect sizes varied by type of outcome measure, the researchers reported strong and significant effects for management development programs on knowledge outcomes and leader behaviors. Thus, we conclude that *training improves manager and leader effectiveness; therefore, organizations should support leadership development efforts*.

As has been noted, Aguinis and Kraiger (2009) recently concluded that existing research provides strong evidence that well-designed training programs provide benefits to individuals, teams, organizations, and society. Further, they argued that training can be most beneficial where lessons learned from training effectiveness research are applied to the design and delivery of future training programs. We concur.

In the next section, we outline the process by which training programs should be developed, delivered, and monitored, and we provide evidence-based recommendations and best practices for maximizing training effectiveness. We have organized the section around what matters before, during, and after training (see Table 2).

What Matters Before Training?

Training needs analysis

The first step in any training development effort ought to be a training needs analysis (TNA)—conducting a proper diagnosis of what needs to be trained, for whom, and within what type of organizational system. The outcomes of this step are (a) expected learning outcomes, (b) guidance for training design and delivery, (c) ideas for training evaluation, and (d) information about the organizational factors that will likely facilitate or hinder training effectiveness. It is, however,

Table 2. Evidence-Based Recommendations and Best Practices for Maximizing Training Effectiveness

Before training	Conduct training needs analysis: Conduct a job–task analysis. Conduct an organizational analysis. Conduct a person analysis	Prepare learning climate: Schedule accordingly. Notify employees of training and attendance policy. Prepare supervisors and leaders.	
During training	Enable right trainee mindset: Build self-efficacy. Promote a learning orientation. Boost motivation to learn.	Follow appropriate instructional principles: Use a valid training strategy and design. Provide opportunities to practice. Promote self-regulation. Incorporate errors into training.	Use technology wisely: Use computer-based training correctly. Provide structured user control. Enhance learning through simulations.
After training	Ensure transfer of training: Remove obstacles. Provide tools/advice for supervisors. Encourage the use of debriefs and other reinforcements	Evaluate training: Clearly specify the purpose. Consider evaluating at multiple levels. Precisely link to training needs.	

important to recognize that training is not always the ideal solution to address performance deficiencies, and a well-conducted TNA can also help determine whether a nontraining solution is a better alternative. The literature outlines three components of a training needs analysis. We briefly describe these and illustrate each with some examples.

Job–task analysis. With a particular training target in mind, this component of TNA specifies the critical work functions of a job and outlines the task requirements as well as the competencies (i.e., KSAs) needed to complete these tasks. There are well-established job–task analysis procedures that can provide a solid foundation for the subsequent design and delivery of training. Unfortunately, systematic training needs analysis, including task analysis, is often skipped or replaced by rudimentary questions such as "what training do you want to take?" The research shows that employees are often not able to articulate what training they really need (Baddeley & Longman, 1978), so a more thorough TNA is needed to uncover training needs. So, clearly, *conduct a systematic job–task analysis. It is the blueprint for the training. Information from the job–task analysis should be used to decide what (and what not) to include in training, as well as setting training standards for performance.*

When uncovering job or task requirements, it is helpful to differentiate between content that job incumbents "need to know" versus content that they "need to access" (Tannenbaum, 2002). This distinction is important because humans do not have limitless cognitive capacity (e.g., Ackerman, 1987; Cowan, 2001). They can absorb only so much information at a time. Training people to memorize or retain information unnecessarily consumes cognitive capacity that should be directed toward acquiring knowledge that they will need to know from memory. Assuming that everything is "need to know" can unnecessarily lengthen the amount of training that is required before an employee can be considered fully ready. In addition, many modern work stations include context-sensitive job aids and advisory support.

This distinction is also important because it influences what should be trained and how it should be trained or supported. For example, when a TNA reveals that information needed to complete a task will be accessible from one's work station, then the training should teach people where and how to find that information rather than seeking to have them retain that information in memory. Given the ongoing advancements in knowledge repositories, communities of practice, and search technologies, we are likely to see more information becoming readily accessible, which will have clear implications for how training is designed. So, *as part of any TNA, one should be alert for the distinction between content that is need-to-know and need-to-access. Pre–job training should be focused on knowledge and skills needed on Day 1 as well as skills for accessing knowledge on the job. On-the-job training and word aids should provide rapid access for what workers need to accomplish the task at hand*.

As jobs have become more complex and knowledge based, a methodology known as cognitive task analysis (CTA) has emerged (Zsambok & Klein, 1997). CTA is a technique for uncovering the cognitive processes involved in performing a job (Cooke, 1999). CTA identifies the cognitive strategies and patterns from experts that trainees must learn in order to perform effectively through the use of various techniques, such as observation, structured interviews, and verbal protocols (Miller et al., 2006). Research has shown that CTAs can positively impact the design of training (Hoffman & Lintern, 2006; G. Klein & Militello, 2001) and aid in generating relevant training scenarios and practice opportunities (see Salas & Klein, 2001; Schraagen, Chipman, & Shalin, 2000). *Conduct a CTA when jobs are knowledge based and when there is a need to unpack the expertise and uncover the cognitive requirements*.

Finally, with jobs increasingly requiring individuals to work as part of a team, an analysis of teamwork demands is often part of a training needs analysis. Team-related tasks and competencies may be missing from job–task analyses performed for other human resource purposes as these are not typically used for selection (Smith-Jentsch, Baker, Salas, & Cannon-Bowers, 2001). Team task analysis identifies coordination patterns among jobs. This information can be used not only to determine objectives for team training but also to determine which jobholders should attend training together. An example of an environment where team task analysis is a critical part of assessing training needs is the healthcare system. As a result of the push to improve quality care and patient safety, it has become critical to develop and implement effective training strategies within the medical community. Researchers and designers have attempted to find innovative ways to train medical students in both individual task-work skills like suturing (Salvendy & Pilitsis, 1980), breast examinations (Gerling & Thomas, 2005), and drawing blood (Scerbo, Bliss, Schmidt, & Thompson, 2006) and in teamwork skills necessary to perform highly interdependent tasks, such as surgery or emergency medicine (Pronovost & Freischlag, 2010; Salas et al., in press). Focused team task analyses have been conducted in an attempt to specify the teamwork-oriented learning objectives for team training. In sum, we suggest *conducting a team task analysis when employees work in teams and determining which jobs require coordination and how they should coordinate. Note that effective team training includes training on both how to accomplish tasks (as a team) and how (in general) to work as a team*.

Organizational analysis. This step in TNA essentially answers the following questions: What are our training priorities? Is our organization ready to receive and support the training we will provide? This analysis should examine strategic priorities and the culture, norms, resources, limitations, and support for training. It helps ensure that the right training is being provided (strategic alignment) and that the environment is properly prepared for the training to succeed (environmental readiness).

The strategic alignment component involves examining key business objectives and challenges, identifying the functions and jobs that most influence organizational success, clarifying the most critical organizational competencies (i.e., what the organization must be very good at to be competitive or differentiate itself), and establishing overall strategic learning imperatives (Tannenbaum, 2002). This strategic view can be used to begin to prioritize overall training needs and allocate training resources so that the most pressing organizational needs will be addressed (e.g., Driscoll, 2003). Not all training requests are equally important.

Training researchers and designers often overlook this strategic component of TNA and instead begin with a particular training need or program in mind. It is important to periodically conduct a strategic assessment to ensure that resources are allocated properly and that there is a clear alignment between training efforts and organizational needs. Without this alignment, training can be viewed as a frivolous expense, and leadership and employee support for training may wane. Although there has not been a lot of research on the impact of conducting an organizational analysis, one study by Reed and Vakola (2006) showed that carefully linking needs analysis with existing organizational initiatives resulted in the strategic positioning of organizational change efforts and thus facilitated change.

The second part of organizational analysis examines environmental readiness. This involves diagnosing the work environment to identify and remove obstacles to training effectiveness. Research and theories cited earlier on both transfer of training and training effectiveness have helped clarify the factors that should be diagnosed as part of an organizational analysis.

For example, research has shown that a supportive organizational culture for newly acquired KSAs results in trainees applying training more effectively on the job (Rouiller & Goldstein, 1993; Tracey et al., 1995). Social support for training can take the form of covering tasks for trainees while in training, asking about training content after program completion, or providing encouragement for trainees to perform (Thayer & Teachout, 1995). The more leaders indicate that training is important to the organization, the better the outcomes of training. We also know that support for learning varies greatly across organizations (Flynn, Eddy & Tannenbaum, 2005; Holton, Chen, & Naquin, 2003; Tannenbaum, 1997). A learning organization is one in which its members are continuously learning. Research by Tannenbaum (1997) indicated that a set of nine work environment and interpersonal factors can either facilitate or hinder learning at the individual level, including providing assignments that serve as learning opportunities, tolerating mistakes (as learning events), promoting openness to change, implementing policies and practices that support training, and setting high performance expectations. Finally, reviews by Colquitt et al. (2000) and Noe and Colquitt (2002) suggest that multiple organizational-level factors can affect trainees' motivation to learn, which in turn can affect trainee learning. For example, Noe and Colquitt (2002) reported that clearly communicating the objectives, purpose, and intended outcomes of a training program can increase trainees' motivation to learn. In one empirical study, Tracey, Hinkin, Tannenbaum, and Mathieu (2001) followed hotel managers attending a two-and-a-half-day management training program. They found that managers' organizational commitment and perceptions of support and recognition predicted pretraining self-efficacy (i.e., the belief that they can perform the task), which in turn was related to their motivation to learn. Here, self-efficacy refers to trainees' belief that they can master the training material. In another study, H. J. Klein, Noe, and Wang (2006) reported that online learners had a higher motivation to learn when they perceived environmental conditions such as time and Internet access as learning enablers (rather than as barriers). In both Tracey et al. (2001) and H. J. Klein et al. (2006), motivation to learn was positively related to measures of trainee satisfaction and learning. Our recommendation, then, is to *uncover strategic requirements and the environmental factors that support or inhibit training and conduct an organizational analysis. The results of the organizational analysis can provide insight into how to best position training within the organization to maximize trainee motivation and training success*.

Person analysis. A final procedure is determining who needs the training and what they need to be trained on (Tannenbaum & Yukl, 1992). A person analysis identifies who has (and who lacks) the requisite competencies determined by the job–task analysis. With unlimited resources, it may be appropriate to train everyone, but with limited resources, training can be targeted to those with the largest gaps between actual and needed competencies.

A person analysis can also be used to examine individual characteristics (e.g., goal orientation, personality) that may influence the relative effectiveness of various training strategies. We discuss relationships between individual characteristics and training outcomes below. Here, we note that individual difference variables can predict whether individuals are likely to benefit from training. These variables can be measured during a person analysis.

A person analysis can also uncover characteristics of prospective trainees. This information can lead to better decisions regarding the content and delivery of training. One obvious example is the delivery of training to older workers. With evidence that the world's working population is graying (Hedge, Borman, & Lammlein, 2006), the topic of training older workers has gained increased attention in recent years (e.g., Beier, 2008; Beier, Teachout, & Cox, in press; Wolfson & Cavanagh, 2011). It is important to consider the relationship between age and training: A well-cited meta-analysis suggests that age is positively correlated with training time and negatively correlated with training performance (Kubeck, Delp, Haslett, & McDaniel, 1996). According to Beier (2008), this suggests two tactical approaches to training older workers: treating age as an "aptitude" in the classic aptitude-treatment interaction

approach paradigm (Snow, 1989), or accommodating older workers by providing more training time and/or allowing self-pacing. In support of the latter approach, one study found that pretraining older workers can increase employability by removing the perceived barrier of their trainability (Czaja & Drury, 1981). Research on elderly populations and automated teller machine (ATM) training has provided support for age-specific training materials (Mead & Fisk, 1998). Another study by Rogers, Fisk, Mead, Walker, and Cabrera (1996) found that an online tutorial was the most effective type of ATM training for the sample of older adults.

The adaptation of training materials for older workers may also take into account known cognitive changes in older adults. For example, one of the best-known age-related effects is the slowing of cognitive processes. Meta-analytic evidence reveals a strong negative correlation between age and speed of processing (Verhaeghen & Salthouse, 1997). An important implication of this finding is that sufficient time must be allocated for older trainees to study, review, practice, and master training content. In addition, older learners may struggle to coordinate and integrate different sources of information (Mayr & Kliegl, 1993); thus, the performance gap between older and younger learners increases with more complex tasks (Oberauer & Kliegl, 2001). Again, there are several direct implications of this for training older workers; one is to rely more on whole (rather than part) training. Another is to help structure or organize training content, perhaps through the use of advanced organizers. An advanced organizer is an outline or framework of training content (Mayer, 1979). Indeed, in a recent study, Wolfson (2010) found that advanced organizers were more useful for older learners than younger learners and that these reduced performance differences in training between younger and older individuals.

Thus, we recommend *conducting a person analysis: Determine who will most likely benefit from training and whether training content or methods must be adapted for particular learners. In particular, older learners will likely require self-paced or well-structured training to maximize learning gains*.

In sum, TNA is a must. It is the first and probably the most important step toward the design and delivery of any training. So, *conduct a systematic and thorough training needs analysis*.

The learning climate

There are other critical issues that must be considered and actions taken before training is held. For example, expectations about the training can affect learning. We know that trainees with unmet expectations demonstrate lower post-training commitment, self-efficacy, and motivation (Sitzmann, Bell, Kraiger, & Kanar, 2009; Tannenbaum et al., 1991) as well as reduced performance (Hoiberg & Berry, 1978). Therefore, *one should be careful not to oversell or create false expectations when communicating about forthcoming training programs. Trainees should understand how the training is relevant to successful job performance but should receive realistic previews of what and how content will be covered*.

Other more subtle issues may affect learning. For example, how the trainees are notified about the training matters. Baldwin and Magjuka (1991) showed that advance notification that highlights "follow-up" increases trainees' intention to use what they learned. Others have shown that training that is described as an "opportunity" (e.g., to help one's career) rather than as a "test" encourages mastery orientation that enhances learning (Ford et al., 1998) and reduces trainee anxiety (Martocchio, 1992). Further, although research on stereotype threat (e.g., Steele & Aronson, 1995) has not been extended to training assignments, we could envision training assignments being made in such a way as to create anxiety and decrease trainee performance within organizational subgroups. One example that comes to mind is a course in Microsoft Office software designed for workers over 50. We suggest *providing proper, effective communication prior to training. Communication should focus on the benefits of training and not on (alleged) deficits of learners.*

The literature has also shown that the way attendance requirements are framed matters. For example, Tannenbaum and Yukl (1992) concluded that mandatory training may be viewed more positively than optional training if the overall attitudes toward training in the organization are generally positive. In those circumstances, mandatory attendance may signal that a training program is important. Baldwin et al. (1991) also found that ignoring trainees' input after they have been asked about the training they would like to attend is worse than not asking for their preferences. Clearly, when the training is needed (e.g., when there are safety requirements involved), organizations should make attendance mandatory. But they should be selective, particularly if training is not viewed positively in the organization. If training has a good reputation in the organization, use the mandatory label to signal its importance. We recommend *establishing appropriate attendance policies, while recognizing that the balance between mandatory and optional training requirements can be tricky*.

As we will note later, what supervisors do and say about training affects the trainee. Smith-Jentsch et al. (2001) found that one misdirected comment by a team leader can wipe out the full effects of a training program. What organizations ought to do is provide leaders with information they need to (a) guide trainees to the right training, (b) clarify trainees' expectations, (c) prepare trainees, and (d) reinforce learning objectives. Thus, organizations should *prepare and encourage supervisors, mentors, and team leaders to have effective conversations with trainees prior to training. These individuals should be involved early in the needs assessment so that they understand the need for training and can provide accurate, motivating information about the training.*

Finally, skill decay is a major problem in training. Arthur, Bennett, Stanush, and McNelly (1998) conducted a meta-analysis of skill decay studies and reported that the day after training, trainees exhibit little to no skill decay, but 1 year after

training, trainees have lost over 90% of what they learned. Among factors found by Arthur et al. to affect retention levels was the nature of the task (greater retention for closed-loop vs. open-loop tasks; greater decay for cognitive vs. physical tasks). Most important, Arthur et al. also reported that overall retention decreases dramatically with longer periods of nonuse or practice.

Skill decay is a serious problem, and it is important to take actions to try to minimize it. Thus, it helps to schedule training close in time to when trainees will be able to apply what they have learned so that continued use of the trained skill will help avert skill atrophy. In other words, trainees need the chance to "use it before they lose it." Similarly, when skill decay is inevitable (e.g., for infrequently utilized skills or knowledge) it can help to schedule refresher training. In general, it has been our experience that organizations do not offer sufficient refresher training except when mandated by regulations. Although refresher training may not be as exciting as new training, the research on skill decay shows why refresher training can be critical in many instances. So, we recommend that organizations *reduce skill decay by having people attend training shortly before they will have the chance to use what they learn and provide refresher training when decay cannot be avoided.*

Table 3 provides a summary and checklist of steps to take before training. Now we turn to what matters during the design and delivery of training.

What Matters During Training?

The design of training should be driven by the results of the TNA and what we know from the science of learning (Salas & Stagl, 2009). During this phase, the developer focuses on selecting the appropriate instructional strategies, delineating content, and designing training to meet the specified learning objectives given what is known about the nature of the trainees and their work.

Individual characteristics

The trainee brings to the learning environment individual characteristics that influence training outcomes. These include self-efficacy, goal orientation, and a motivation to learn.

Self-efficacy. What a trainee believes about his or her own ability influences training outcomes. Research over the last two decades clearly indicates that self-efficacy, acquired before or during training, leads to more motivation to learn and better learning outcomes (Chen, Gully, Whiteman, & Kilcullen, 2000; Ford et al., 1997; Mathieu, Tannenbaum, & Salas, 1992; Quiñones, 1995). Specifically, individuals high in self-efficacy are more likely to participate in learning, work harder and persist longer during learning activities, and respond less negatively to challenges and difficulties (Bandura, 1997; Phan, 2011). So, clearly *self-efficacy leads to better learning. Training should be designed to promote self-efficacy and then to reinforce it afterward. Self-efficacy can be enhanced by reminding trainees of past successes in training or on the job and by ensuring early successful learning experiences during training*.

Goal orientation. Over the last decade, goal orientation has received a fair amount of attention as a trainee characteristic influencing learning. Goal orientation is the mental framework that one uses to interpret and then shape how to behave in learning-oriented environments. There are two forms: mastery orientation (or learning orientation) and performance orientation (Dweck, 1986). Trainees with a strong learning orientation seek to acquire new skills and master any novel situations. Individuals with a learning orientation exert more effort in learning (Fisher & Ford, 1998), engage in more adaptive metacognitive strategies (Ford et al., 1998), stay on task after receiving feedback (VandeWalle, Cron, & Slocum, 2001), and demonstrate stronger learning outcomes (Ford et al, 1997; Phillips & Gully 1997). In contrast, trainees with a strong performance orientation seek to achieve better scores, avoid engagement in situations in which they may fail, and want to be perceived as capable and thus may learn less during training. Although trait goal orientation is considered to be somewhat stable over time and across situations, research has also shown that various training design elements (e.g., framing, goals) can produce training-related behavior and goal states that are more consistent with either learning or performance goal orientation and their respective learning outcomes (e.g., Leonardelli, Herman, Lynch, & Arkin, 2003).

There is also some evidence that individuals' trait goal orientation determines the manner in which they will respond to different types of training. Those with a stronger learning goal orientation may demonstrate poorer performance during training as they are more prone to take risks and learn from their mistakes. However, they outperform others on retention and transfer tasks because they learn trained principles at a deeper level. In addition, trainees with a stronger learning goal orientation tend to learn best from training that allows them more control over the manner in which they explore and organize training material. For instance, they respond positively to difficult goals and opportunities to self-regulate during training. By contrast, trainees with a strong performance orientation may actually respond negatively to these same training features. Such individuals seem to learn best in a highly structured environment in which they complete successively more difficult tasks. Thus, we recommend *framing training objectives and goals in a way that fosters learning-oriented behavior. Learning-oriented trainees should be allowed the freedom to take greater responsibility for their own learning processes, but one should also provide greater structure for those who are more performance oriented.*

Motivation to learn. As noted earlier, motivation to learn matters—it makes a difference in whether trainees learn during training. Trainee motivation can be defined as the direction, effort, interest, and persistence that trainees put forth in learning before, during, and after training (Tannenbaum & Yukl, 1992). Motivation to learn is a function of individual characteristics, the work environment, and the training itself.

Table 3. Checklist of Steps to Take Before Training

Step	Actions	Outcomes
☐ Conduct training needs analysis	Determine what needs to be trained, who needs to be trained, and what type of organizational system you are dealing with.	Clarifies expected learning outcomes and provides guidance for training design and evaluation. Enhances training effectiveness.
☐ Job–task analysis	Specify work and competency requirements. Examine teamwork demands, if needed. Identify what trainees need to know vs. what trainees need to access. Consider conducting a cognitive task analysis for knowledge-based jobs.	Ensures that the training provided will address real job requirements and demands.
☐ Organizational analysis	Examine strategic priorities and the culture, norms, resources, limitations, and support for training. Determine whether policies and procedures in place support training.	Enables strategic resource-allocation decisions. identifies how the work environment can support or hinder the training objectives.
☐ Person analysis	Uncover who needs training and determine what kind of training they need. Determine whether training must be adapted for some learners.	Clarifies training demand and trainees' needs. Maximizes benefits of the training by ensuring fit with trainees' needs.
☐ Prepare learning climate		
☐ Schedule training	Schedule training close to when trainees will be able to use on the job what they have learned. Plan to offer refresher training when skill decay cannot be avoided.	Reduces skill decay and atrophy.
☐ Notify employees	Communicate clear expectations about the training. Describe training as an "opportunity" without overselling. Inform employees about any posttraining follow-up. Communicate the importance of training.	Encourages the right attendees. Ensures trainees enter with appropriate expectations, which enhances readiness and learning.
☐ Establish attendance policies	Determine whether attendance should be mandatory. Use the mandatory label selectively.	Helps ensure learner motivation and attendance.
☐ Prepare supervisors and leaders	Prepare supervisors to support their employees and send the right signals about training.	Enhances employees' motivation to learn.

Research has shown that trainees' motivation to learn is influenced by personality traits such as conscientiousness and openness to experience (Major, Turner, & Fletcher, 2006), as well as self-efficacy, age, cognitive ability, and anxiety (Colquitt et al., 2000). Motivation to learn can also be enhanced by organizational and supervisory support before training (Salas & Cannon-Bowers, 2001) as well as by specific experiences during training. For example, Knowles, Holton, and Swanson (2005) suggested that adults have higher motivation to learn when they see the training content as related to their job demands. Most important, we also know that the greater the motivation to learn by the trainee before training, the greater their learning and the more positive their reactions (Baldwin et al, 1991; Tannenbaum et al., 1991).

To summarize, *motivation to learn matters, before, during and after training and it should be promoted throughout the learning process. Motivation to learn can be enhanced by clarifying the link between training content and learning needs and by providing organizational and supervisory support for training.*

Instructional strategies and principles

Instructional strategies are tools, methods, and context that are combined and integrated to create a delivery approach. How the training experience is planned, organized, and structured matters. On the basis of a review of the literature, Noe and Colquitt (2002) identified a number of characteristics of well-designed training that enhances learning and transfer: (a) Trainees understand the objectives, purpose, and intended outcomes; (b) the content is meaningful and examples, exercises, and assignments are relevant to the job; (c) trainees are

provided with learning aids to help them learn, organize, and recall training content; (d) trainees can practice in a relatively safe environment; (e) trainees receive feedback on learning from trainers, observers, peers, or the task itself; (f) trainees can observe and interact with other trainees; and (g) the training program is coordinated effectively.

A thorough training strategy does four things (Salas & Cannon-Bowers, 2001). First, it conveys information to the trainees (i.e., the concepts, facts, and information they need to learn). Second, it demonstrates the desired behavior, cognition, and attitudes. Third, it creates opportunity to practice the KSAs to be learned. Fourth, it gives feedback to the trainee on how he or she is doing with respect to the learning, and as a result, it allows for remediation. Most training programs that attempt to build skills should have all these components present. However, recent reports suggest that information and demonstrations (i.e., workbooks, lectures, and videos) remain the strategies of choice in industry (Patel, 2010). And this is a problem. We know from the body of research that learning occurs through the practice and feedback components. For instance, Smith-Jentsch et al. (1996) found that assertiveness training that incorporated information and demonstration without practice and feedback did not produce any behavioral effects in a team transfer task. However, when trainees actively practiced assertive communication in a series of role-play exercises and received feedback on their skills in addition to viewing a lecture and behavioral models, they demonstrated significantly greater team performance-related assertiveness.

Practice provides opportunities to learn. However, not all practice is created equal—unstructured practice without objectives, appropriate stimulation, and useful feedback can teach wrong lessons (Cannon-Bowers, Rhodenizer, Salas, & Bowers, 1998). Moreover, not all feedback is equally effective. Practice is most powerful when combined with timely, constructive, and diagnostic feedback, particularly when the feedback is actionable and task focused (Cannon & Witherspoon, 2005; Kluger & DeNisi, 1996). Thus, we suggest *incorporating four concepts into training: information, demonstration, practice, and feedback*.

Designing or selecting the appropriate strategy is a key to maximize transfer of training. Training research has identified a number of instructional elements that enhance the learning value of training strategies. In the following sections, we highlight a sample of those that have been consistently shown to be effective.

Transfer appropriate processing. A notable review by Schmidt and Bjork (1992) summarized a number of studies of verbal and motor learning in which conditions that maximized training performance were different than those that maximized transfer or ensured long-term retention. These authors concluded that when strategies require "transfer appropriate processing," or cognitions the trainees must engage in to apply their training in the transfer environment, generalization and maintenance of skills is enhanced. Such strategies make performance in training more challenging and variable; however, trainees learn underlying rules and principles more deeply as a result. For instance, it is well known that "drilling" (or the constant repetition of stimulus-response pairs) facilitates rapid learning in training. However, considerable research shows that although this form of training facilitates rapid skill acquisition, it is less likely to transfer to posttraining environments than other forms of training. Other factors that have been found to promote the type of deep learning that leads to transfer are contextual interference during practice (e.g., embedding performance cues within "noise"), variability in practice conditions, withholding knowledge of results until trainees have completed multiple trials (i.e., not providing continuous feedback), and gradual removal of knowledge of results. Though we are providing only a high-level view of a rich research domain, the idea is simple: as trainees begin to master a skill, the training and practice conditions should be increasingly difficult, there should be less trainer support, and practice conditions should increasingly resemble transfer conditions. Thus, *practice opportunities should require trainees to engage in the same cognitive processes they will need to engage in when they return to work. Often, that will mean designing sufficient challenge into the training.*

Error training. It has long been recognized that traditional, stand-up lectures are an inefficient and unengaging strategy for imparting new knowledge and skills. In recent years, multiple new strategies have been advanced for classroom-style training, each with the promise of encouraging deeper initial learning and greater transfer of training. These include discovery learning, error training, and training in metacognitive skills (Ford & Weissbein, 1997). Two important articles raised awareness of the value of incorporating errors into formal training programs. Frese et al. (1991) noted that trainee errors are typically avoided in training, but because errors often occur on the job, there is value in training people to cope with errors both strategically and on an emotional level. In this study, the authors compared a group instructed to avoid errors in learning with another given more difficult problems along with guidance on managing errors. The latter scored better on a nonspeed performance test. This initial finding has been replicated and extended many times. Gully, Payne, Koles, and Whiteman (2002) conducted a larger-scale replication contrasting learners tasked to perform a decision-making simulation and assigned to a control, error encouragement, or error avoidance condition. Participants in the error encouragement condition learned the most (as evident on tests of declarative knowledge and task performance), although the effects were greatest for trainees who were high in cognitive ability or open to new experiences. Similarly, Lorenzet, Salas, and Tannenbaum (2005) found that guiding trainees to make errors and providing them with support to build correction management strategies was a useful approach. Finally, a recent meta-analysis reported that error management was superior to error avoidance or exploratory training (Keith & Frese, 2008). Error training seems to work by encouraging greater effort to learn, promoting a deeper understanding of tasks, and by providing

both strategies and emotional management tactics for handling on-the-job errors. Keith and Frese found that the positive effects of error training are more evident for posttraining performance, as opposed to performance during the training itself. So, we recommend *the incorporation of errors, particularly when training complex cognitive tasks. Training tasks can be designed so that trainees are more likely to commit errors, and trainees can be encouraged to try new responses even if it leads to errors*.

Behavioral role modeling. Behavioral role modeling has been used to train a variety of psychomotor and interpersonal skills (Taylor et al., 2005). This training strategy is based on Bandura's (1977) social learning theory. Specifically, trainees learn new skills by watching others perform those skills. First, trainees are provided with a set of behaviors (skills) to be learned. These learning objectives are most effective when presented as rule codes (Taylor et al., 2005). Second, targeted behaviors are demonstrated by behavioral models, usually through audio and/or video media. The demonstration component is most effective when both positive and negative models are shown rather than positive models only (Baldwin, 1992). Third, trainees practice using the targeted behaviors. Practice opportunities are most effective when they include some scenarios that are generated by the trainees themselves during training (Taylor et al., 2005). Finally, trainees are provided with feedback on their performance and reinforcement for transferring their newly learned skills. In this regard, instructing trainees to set their own goals for transfer facilitates behavior change (Taylor et al., 2005). Thus, we recommend *demonstrating effective workplace behaviors based on demonstrated behavioral modeling practices*.

Self-regulation. One way that organizations can structure training to enhance learning is to prompt self-regulatory activity by trainees. In the training context, self-regulation refers to learner cognitions that help them sustain focused attention on learning through self-monitoring of performance, comparison of progress to an end goal, and adjustment of learning effort and strategy as appropriate. Although self-regulation is generally thought of as a characteristic or behavior of learners, several recent studies have shown that prompting self-regulatory activity during training programs can increase trainees' focus (Sitzmann & Ely, 2010) and improve their learning (Berthold, Nückles, & Renkl, 2007; Sitzmann, Bell, et al., 2009). For example, in two studies, one in an online environment, Sitzmann, Bell, et al. (2009) found that encouraging trainees to self-regulate resulted in immediate improvements in their declarative and procedural knowledge that were maintained over time.

So, it is clear that there is a need to *engage learners in self-regulatory processes during training and to encourage them to reflect and adjust. Simple questions such as "Are you learning what you need to learn?" or "Would you be ready to take an exam on this material?" may be sufficient to affect trainee learning*.

Technology-based training

Technology has been incorporated into almost every aspect of human life, including training. Surveys of industry practice show that an increasing number of organizations are implementing technology-based training in support of, or instead of, traditional forms of training (Patel, 2010). Both traditional forms of training and technology-based training can work (Sitzmann, Kraiger, Stewart, & Wisher, 2006), but both can fail as well. Trainees can sit and listen without learning, and they can interact with the computer and make poor decisions leading to suboptimal learning.

A recent meta-analysis by Sitzmann et al. (2006) found that on average, Web-based training resulted in slightly greater learning than classroom training. However, mean effect sizes were essentially equal for the two training media when instructional principles and content were held constant. This recalls Clark's (1994) argument that the medium doesn't matter—well-designed instruction works irrespective of the delivery mode. In order to be effective, technology-based training must have a clear purpose and incorporate the right learning principles (as we offer here) into the design of the program (Bedwell & Salas, 2010).

Further, it is sometimes argued that technology-based training is preferred (to classroom or one-on-one training) even if there are no instructional benefits, because it is cheaper and easier to deliver. However, Kraiger (2003) contended that there is little research to support such assumptions about the cost-effectiveness of technology-based training. In fact, survey data suggest that training costs across organizations remain relatively constant as training shifts from face-to-face to technology-based methods (Patel, 2010). Perhaps reductions in staffing of trainers and travel savings are offset by greater information technology support costs and investment in technology. Thus, *plans to implement technology-based training should be based on whether content can be learned effectively using technology, and reduced training costs should be modeled and then tracked, not simply assumed.*

Regardless of the media used, it is important to plan all training efforts carefully and to incorporate research findings about training effectiveness in order to build engaging, challenging learning environments (and not simply "entertaining" experiences) that optimize individual learning. Well-designed technology-based training can be quite effective, but not all training needs are best addressed with that approach. Thus, we advise that organizations *use technology-based training wisely—choose the right media and incorporate effective instructional design principles.*

Computer-based training (CBT). Even as researchers find new ways of transforming classroom training, CBT has become a common delivery system in many work organizations (see Patel, 2010). CBT can take many forms, from Web-based training programs to single work station training programs to training offered on tablets and smartphones. Organizations

investing in CBT frequently make use of self-directed learning tools that transfer responsibility about what to learn and how learning should progress from the trainer to the trainee. Unfortunately, we know from multiple studies that when trainees are provided with greater learner control, they frequently learn little more than if the program maintains control over learning conditions (Kraiger & Jerden, 2007). Here, learner control refers to decisions on the part of the trainee about what and how the training should be delivered (e.g., sequencing of training modules). Learner control differs from active learning, in which trainees are engaged in acting and reflecting upon training content. The failure of high learner control to positively affect trainee learning results largely because trainees may not be knowledgeable enough about training content or motivated or skilled enough to successfully navigate high learner-control environments (DeRouin, Fritzsche, & Salas, 2004). Thus, while high learner-control programs are perceived as preferable to high program-control ones, there is little evidence that they work better in practice. Thus, just as traditional training can benefit from the careful planning of learning events (as in error training), so can CBT benefit from sufficient structure that enables self-directed learning, but with some computer-generated guidance as to what or how to learn. A good example of this was provided by Bell and Kozlowski (2002), who suggested a new type of training program in which the learner exhibits a high amount of control in navigating the learning environment, but the instructional program provides "adaptive guidance" to the learner. Trainees capable of navigating high control environments with specific learning needs could move efficiently through the training program, but less capable trainees or those without specific instructional needs would benefit from an instructional program that provides context-dependent feedback and advice. We suggest that organizations *examine whether CBT provides sufficient structure and guidance as to what and how trainees should learn*.

Simulation. Simulations refer to systems that attempt to provide realistic training by using a "working representation of reality . . . [that is] an abstracted, simplified, or accelerated model of process" (Galvao, Martins, & Gomes, 2000, p. 1692). A working representation does not mean an exact replication of the task environment. What seems to matter is not the physical fidelity level of the simulator. Instead, what matters is the relevance of the content for job performance (i.e., "psychological fidelity") and the design of the simulation. What matters is that instructional features (e.g., measurement scenario control) are embedded in the simulation; that the simulation contains several opportunities for measuring and diagnosing multilevel performance (i.e., individual and team); and finally, as noted before, that the learning experience is appropriately guided (through carefully crafted scenarios and events as well as timely diagnostic feedback; see Salas & Burke, 2002; Salas, Rosen, Held, & Weismuller, 2009).

Although simulation has been around for decades, many industries have only recently begun to recognize the potential value and power of simulation in training. Indeed, technology has revolutionized training. Simulations, games, and synthetic learning environments now enable organizations to provide instruction, allow for practice, and provide detailed feedback to trainees in a realistic, engaging, immersive, and safe setting (Salas, Wildman, & Piccolo, 2009). And the more trainees are provided with structured opportunities to practice job-relevant skills and receive diagnostic feedback, the better. Several studies have shed light on how and why simulation-based training works (e.g., Baldwin, 1992; Brannick, Prince, & Salas, 2005; Gopher, Weil, & Bareket, 1994; Smith-Jentsch et al., 1996). The airline industry and the military have used simulation-based training for decades, with encouraging results, and health care is now starting to use more simulation-based training.

When properly constructed, simulations and games enable exploration and experimentation in realistic scenarios. Properly constructed simulations also incorporate a number of other research-supported learning aids, in particular practice, scaffolding or context-sensitive support, and feedback (see Colquitt et al., 2000; Noe & Colquitt, 2002). *Well-designed simulation enhances learning, improves performance, and helps minimize errors; it is also particularly valuable when training dangerous tasks*.

Table 4 provides a summary and checklist of steps to take during training. We now discuss those aspects that matter for evaluation and transfer of training.

What Matters After Training?

The organizational context after training can have as great an impact on training effectiveness as what happens during training because posttraining events influence whether trained skills transfer and are used on the job.

Transfer of training

Transfer of training has long been a fundamental concern for researchers and practitioners alike. As noted, despite the fact that billions of dollars are invested in training every year, even recent reports suggest that trained competencies often do not transfer to the workplace, indicating an enduring "transfer problem." Transfer of training is the "endgame," the extent to which knowledge and skills acquired during training are applied to the job (Baldwin & Ford, 1988). Models of transfer of training (e.g., Grossman & Salas, 2011; Thayer & Teachout, 1995) posit that factors before, during, and after training can influence the extent of transfer to the job. As we have already discussed the pretraining and concurrent training factors for transfer (e.g., ensuring high motivation to learn), here we limit our review to factors that occur after training.

Rouiller and Goldstein (1993) introduced the construct of transfer climate, showing that the extent to which trainees perceive the posttraining environment (including the supervisor) as supportive of the skills covered in training had a significant effect on whether those skills are practiced and maintained.

Table 4. Checklist of Steps to Take During Training

Step	Actions	Outcome
☐ Enable right trainee mindset		
☐ Build self-efficacy	Deliver training in a way that builds trainees' belief in their ability to learn and perform trained skills. Reinforce performance during training.	Enhances motivation and increases perseverance when on the job.
☐ Promote a learning orientation	Encourage trainees to participate in training to learn rather than to appear capable. If most trainees will not have that orientation, design more structured training experiences.	Leads to greater learning.
☐ Boost motivation to learn	Engage trainees and built their interest. Ensure that training is perceived as relevant and useful. Show why it benefits them.	Leads to learning and positive reactions to learning; may encourage transfer back on the job.
☐ Follow appropriate instructional principles		
☐ Use a valid training strategy and design	Include these elements in training: provide information, give demonstrations of good/bad behaviors, allow trainees to practice, and give meaningful and diagnostic feedback.	Helps trainees understand and practice the knowledge, skills, and abilities that they need to develop; allows for remediation.
☐ Build in opportunities for trainees to engage in transfer-appropriate processing	Incorporate features that require trainees to engage in the same cognitive processes during training that they will have to in the transfer environment (e.g., sufficient variability and difficulty). Recognize that performance during training does not necessarily reflect trainees' ability to apply what they have learned in the transfer environment.	Equips trainees to be better able to apply what they learned when performing their job.
☐ Promote self-regulation	Maintain trainees' attention and keep them on task by encouraging self-monitoring.	Allows trainees to monitor their progress toward goals; enhances learning.
☐ Incorporate errors into the training	Encourage trainees to make errors during training, but be sure to give guidance on managing and correcting the errors.	Improves transfer of training and equips trainees to deal with challenges on the job.
☐ Use technology-based training wisely	Technology can be beneficial in training, but proceed with caution. Recognize that entertaining trainees is insufficient for return on investment.	Optimizes individual learning.
☐ Use computer-based training (CBT) correctly	Ensure that any CBT is based on sound instructional design, for example, providing trainees with guidance and feedback. Recognize that not all training can be delivered via computer.	Allows for self-paced learning.
☐ Allow user control wisely	Provide sufficient structure and guidance to trainees when allowing them to make decisions about their learning experience.	Allows for individualized training experiences while ensuring trainees have appropriate learning experience.
☐ Use simulation appropriately	Best to train complex and dynamic skills, particularly those that may be dangerous. Ensure the simulation is job relevant, even if it is not identical to the job. The priority should be on psychological fidelity rather than physical fidelity. Build in opportunity for performance diagnosis and feedback. Guide the practice.	Enhances learning and performance; allows trainees to practice dangerous tasks safely.

Tracey et al. (1995) conducted an important study for clarifying the impact of the posttraining climate environment (i.e., the transfer environment)—particularly the role of supervisory support. They found that organizational climate and culture were directly related to posttraining outcomes. More recently, Martin (2010) found a positive effect on transfer for peer support, even in a negative work environment. As to why a positive climate and social support positively affect transfer, Chiaburu, Van Dam, and Hutchins (2010) reported mediating effects for trainee self-efficacy, motivation to transfer, and mastery goal orientation. In other words, a supportive posttraining environment affects employees' mindset, which in turn will determine whether they use what they have learned in training.

The posttraining environment can also have a direct effect on whether trained skills transfer. For example, it is important that the work environment be structured to allow trainees to use the skills on which they were trained. Ford, Quiñones, and colleagues (Ford et al., 1992; Quiñones et al., 1995) discovered that transfer is directly related to opportunities to practice—opportunities provided either by the direct supervisor or the organization as a whole. In short, even when trainees master new knowledge and skills in training, a number of contextual factors determine whether that learning is applied back on the job: opportunities to perform; social, peer, and supervisory support; and organizational policies. *After trainees have completed training, supervisors should be positive about training, remove obstacles, and ensure ample opportunity for trainees to apply what they have learned and receive feedback.*

Team leaders and supervisors. It has been reported that only 7%–9% of skill acquisition in organizations comes from formal training (Tannenbaum, 1997). Clearly, trainees must continue to learn on the job (Tannenbaum, Beard, McNall, & Salas, 2010). Learning on the job is more complex than just following someone or seeing what one does. The experience has to be guided. For example, Buckingham and Coffman (1999) reported that team leaders are a key to learning on the job. These leaders can greatly influence performance and retention. In fact, we know that leaders can be trained to be better coaches (Zsambok, Kaempf, Crandall, Kyne, & Klein Associates Inc., 1997). Eddy, D'Abate, Tannenbaum, Givens-Skeaton, and Robinson (2006) demonstrated the importance of effective "developmental interactions" between employees and team leaders and suggested that leaders can be taught to conduct effective conversations and, hence, to facilitate skill acquisition and retention. Organizations should therefore *provide tools, training, and support to help team leaders to coach employees and use work assignments to reinforce training and to enable trainees to continue their development.*

Debriefing and other supporting mechanisms. There is a simple, powerful, yet underused tool for stimulating and reinforcing learning: debriefs. During a debrief, a team (or individual) reflects on a recent experience and identifies what went well and where improvement is possible. Debriefs can be conducted during training (e.g., after a simulation or exercise), but they can also be a valuable tool in the posttraining work environment, in which the focus is on work experiences that require the use of competencies acquired during training. The military has been using debriefs or after-action-reviews for over 30 years (Brock, McManus, & Hale, 2009). In recent years, the use of debriefs has extended to many other venues, including health care (Berenholtz et al., 2009) and firefighting (Allen, Baran, & Cliff, 2010).

Debriefs provide an opportunity to self-correct and to reinforce what is working. When conducted after training, they can help uncover obstacles to transfer and lead to the establishment of goals or agreements about what to do going forward, which can help improve subsequent performance. For example, in research on military leaders and their teams, those teams that conducted effective debriefs outperformed other teams by up to 40% (Smith-Jentsch et al., 2008; Tannenbaum, Smith-Jentsch, & Behson, 1998). Given the simplicity and efficacy of debriefs, we recommend that *organizations encourage the use of real-world debriefing related to learning objectives.*

There are other ways of reinforcing training and supporting learners when they return to the work environment. Over time, trainees can forget what they learned, so it can be helpful to provide them with access to job aids, knowledge repositories, Web sites, or databases where they can get reminders about what they learned and can extend and supplement their learning on an ongoing basis (Gallupe, 2001; Rosenberg, 1995). These tools can also allow trainees to retrieve "need-to-access" information identified during the TNA.

It is also possible to establish "communities of practice" where individuals who share similar job demands and interests can interact virtually, answering each other's questions and discussing challenging situations (Wenger, 1998; Wenger, McDermott, & Snyder, 2002). Collectively, providing trainees with access to the right tools and people posttraining can greatly increase the likelihood that they will use what they learned in training. Further, Kraiger (2008) proposed that training itself should be designed to prepare learners to know where (and to whom) to go to for help and how to maximize knowledge elicitation back on the job. We advise that organizations *prepare trainees to use posttraining sources of job knowledge and provide trainees with access to appropriate information sources, tools, and people when they return to the job.*

Training evaluation

Evaluation is part of an effective training system. Evaluation allows organizations to continue conducting training that works and to modify or discontinue training that does not work. As discussed below, evaluation outcomes can also be used to market training to other organizations or organizational units and enhance the motivation of future trainees. Conceptual work and research over the last 20 years has led to considerable innovation in best practices in training evaluation.

Training evaluation refers to the systematic collection of data in order to answer the question(s) of whether learning objectives were achieved and/or whether accomplishment of those objectives resulted in enhanced performance on the job (Kraiger, 2002; Kraiger et al., 1993). Kraiger et al. emphasized that learning is multidimensional (including affective, behavioral, and cognitive components). Thus, the question of whether instructional objectives were achieved usually requires multiple measures of different types of outcomes, for example, measures of changes in declarative knowledge (whether trainees now know more), in skilled behavior (whether trainees are doing things better), and in self-efficacy for transfer (whether there has been a positive affective change).

Specifying evaluation criteria is straightforward. Following a TNA, the primary training needs are used to identify both

instructional objectives and training outcomes, that is, the criteria (see Goldstein & Ford, 2002). For example, a needs analysis may identify that many call center employees do not know the features of new cell phones as they are introduced. This need can be translated into both an objective (trainees will know the primary new features of phones before they are introduced on the market) and a possible training outcome (trainees will score high on a test of product features).

Broad training outcomes may be translated into evaluation measures in several ways. Historically, organizations and training researchers have relied on Kirkpatrick's (1994) hierarchy as a framework for evaluating training programs. In the late 1950s, Kirkpatrick responded to requests from practitioners for useful techniques for evaluating training programs by recommending four "levels" by which training programs may be evaluated (see Ford & Kraiger, 2007, for a discussion). Kirkpatrick recommended measuring, in sequence, trainees' reactions (how well trainees liked the training), learning (principles, facts, or skills learned), behavior (resulting changes in behavior on the job), and results (tangible outcomes of training, such as greater profit or fewer errors). Kirkpatrick's four levels were considered hierarchical such that higher levels would not be expected to change and thus should not be assessed unless satisfactory results were achieved at prior levels.

The Kirkpatrick framework has a number of theoretical and practical shortcomings that have been well articulated elsewhere (e.g., Alliger & Janak, 1989; Holton, 1996; Kraiger, 2002) and will not be discussed in detail here. However, the framework is antithetical to nearly 40 years of research on human learning, leads to a checklist approach to evaluation (e.g., "we are measuring Levels 1 and 2, so we need to measure Level 3"), and, by ignoring the actual purpose for evaluation, risks providing no information of value to stakeholders.

Nonetheless, Kirkpatrick's framework remains the basis for much of the evaluation efforts in organizations today. This is evident in the yearly surveys of organizations' training practices conducted by the American Society of Training and Development (ASTD). Since the late 1960s, ASTD has surveyed a sample of organizations regarding their training practices, giving a snapshot of what organizations actually do with respect to training investments, training delivery, and evaluation. Evaluation practices have always been and continue to be tracked in terms of the "four levels." Today, over 90% of companies surveyed measured trainee reactions, over 80% measured trainee learning, over 50% measured on-the-job behavior, and nearly 40% reported measuring results (Patel, 2010).

Although the Kirkpatrick hierarchy has clear limitations, using it for training evaluation does allow organizations to compare their efforts to those of others in the same industry. For organizations who are not conducting much evaluation at all, adding "levels" can be a first step toward more comprehensive evaluation programs. Thus, we recommend *measuring trainee reactions, learning, behavior, and results as a strategy for increasing the scope of training evaluation practices*.

There are two primary strategies for increasing the impact of training evaluation practices. The first is to begin by clarifying the purpose for evaluation and then tailoring subsequent decisions about what and how to evaluate training (see Kraiger, 2002, for more discussion). As outlined by Kraiger (2002), evaluation is generally done for one or more of the following purposes: (a) to make a decision about the training (e.g., whether a new online training program should be kept or eliminated); (b) to provide feedback to trainees, trainers, or training designers; and/or (c) to market training outcomes either to future organizations (or units within organizations) or to future trainees. By identifying the purpose of the evaluation and deciding on evaluation measures consistent with the purpose, evaluators can increase the likelihood that data are well received, eliminate time spent measuring outcomes that do not support the evaluation purpose, and increase the likelihood that training matters in the organization. Failure to consider purpose increases the risk that the evaluation fails to make a significant contribution to organizational decision making because it does not address the interests or needs of organizational stakeholders (Nickols, 2005). Thus, organizations should *begin training evaluation efforts by clearly specifying one or more purposes for the evaluation and should then link all subsequent decisions of what and how to measure to the stated purposes.*

The second strategy is to be more precise in how training outcomes are assessed. Once the instructional objectives are set, much more can be done than simply creating a multiple-choice test on the training content or asking supervisors to rate trainees' job performance. In training research, there has been a tendency to use more precise measures of learning outcomes. Recently, Ford, Kraiger, and Merritt (2010) reviewed 125 studies that cited Kraiger et al.'s (1993) multidimensional learning model. The researchers noted that researchers, authors, and practitioners are increasingly cognizant of the need to adopt a multidimensional perspective on learning. The methodology for how to measure learning outcomes in a precise, specific way is beyond the scope of this article but is discussed in more detail by Kraiger and associates (Kraiger, 2002; Kraiger et al., 1993; Kraiger & Jung, 1997). The logic, however, is straightforward. If, as an example, the training is related to product features of cell phones for call center representatives, the intended outcome and hence the actual measure should look different depending on whether the goal of the training is to have trainees list features by phone or have a "mental model" that allows them to generate recommendations for phones given customers' statements of what they need in a new phone. It is likely that a generic evaluation (e.g., a multiple-choice test) will not show change due to training, whereas a more precise evaluation measure, tailored to the training content, might. Thus, our final recommendation with respect to training evaluation is to *use precise affective, cognitive, and/or behavioral measures that reflect the intended learning outcomes*.

Table 5. Checklist of Steps to Take After Training

Step	Actions	Outcome
☐ Ensure transfer of training		
☐ Remove obstacles to transfer	Ensure trainees have ample time and opportunities to use what they have learned.	Increases transfer of training and reduces skill decay. Maintains employee motivation and self-efficacy.
☐ Provide tools and advice to supervisors	Ensure supervisors are equipped to reinforce trained skills and can promote ongoing learning using on-the-job experiences.	Enables employees to retain and extend what they learned in training.
☐ Encourage use of real-world debriefs	Reflect on and discuss trainees' on-the-job experiences that are related to the training. Reinforce lessons learned, uncover challenges, and plan how to handle situations in the future.	Promotes retention, self-efficacy, and motivation. Improves job performance; promotes adequate mental models.
☐ Provide other reinforcement and support mechanisms	Consider providing trainees with job aids or access to knowledge repositories or communities of practice to reinforce and support what they learned in training.	Improves performance.
☐ Evaluate training		
☐ Clearly specify the purpose of evaluation	Determine what you hope to accomplish by evaluating the training and link all subsequent decisions back to the purpose.	Ensures that time spent evaluating training produces desired results.
☐ Consider evaluating training at multiple levels	Consider measuring reactions, learning, behavior, and results. Use precise affective, cognitive, and/or behavioral indicators to measure the intended learning outcomes as uncovered during the needs assessment.	Allows well-grounded decisions about training, including any necessary modifications. Enables effective training to continue to be supported.

Table 5 provides a summary and checklist of steps to take after training.

Implications for Leaders and Policymakers

While we acknowledge that much of the training research has been supported by military and government agencies (e.g., Schmorrow, Cohn, & Nicholson, 2009), in this section we focus on business, the private sector, and those in positions to set policy about how, what, and why to train the workforce.

Business leaders

Human resources executives, learning officers, and business leaders can influence the effectiveness of training in their organizations and the extent to which their company's investments in training produce desired results. Collectively, the decisions these leaders make and the signals they send about training can either facilitate or hinder training effectiveness.

We encourage leaders to be informed, active investors. As noted throughout this article, there is ample evidence that training works, so leaders should ensure that their organization invests adequately in training. In other words, training is best viewed as an investment in an organization's human capital, rather than as a cost of doing business. Underinvesting can leave an organization at a competitive disadvantage. But the adjectives "informed" and "active" are the key to good investing.

When we use the word "informed," we mean being knowledgeable enough about training research and science to make educated decisions. Without such knowledge, it is easy to fall prey to what looks and sounds cool—the latest training fad or technology. Informed investments in training are based on an evidentiary foundation and help companies avoid expenditures that are unlikely to produce desired results. Being informed about the science of training effectiveness, as highlighted in this article, also enables leaders to be "active" rather than passive investors.

A useful personal analogy is investing a large sum of money in a mutual fund without conducting research on the fund's past performance or subsequently tracking returns over time. Passive investing involves approving or disapproving a training budget. In contrast, active investing involves asking

challenging questions, informed by what is known about what influences training effectiveness. Active investing could include asking questions that help ensure that the organization is addressing the right training needs, confirm that the right training methods will be used, and enable the right actions to be taken before and after training. Active investing also means staying involved and sending signals that convey that training is valued in the organization—for example, by participating in training both as presenters and attendees, encouraging employees to attend training, and asking team members about how they will use what they learned in training on the job. We also encourage leaders to follow up on training investments to ensure they are working as intended and make evidence-based adjustments over time.

This article covers a wide range of research on training effectiveness. Drawing on this research, we offer the following advice for ensuring that training works in organizational settings.

Ensure that training addresses workforce needs. Invest the time and resources needed to conduct "thorough-enough" TNA. Leaders often send the signal to training developers, either directly or inadvertently, that there is no time or need to diagnose training needs. This leads to suboptimal training. As part of the training needs analysis process, designers should uncover current job and learning requirements and, given the incessant pace of change, should also try to understand the competencies employees will need to possess to adapt to future changes. To avoid overloading trainees with unnecessary information and to promote training efficiency, the needs analysis should differentiate between what trainees will "need to know" versus what they "need to access." Finally, be sure that training developers understand the characteristics of the people who will be trained and make adjustments to the training strategy as needed.

Maximize learning that trainees can use on the job. Much is known about how to design training properly. There are solid, evidence-based training design principles. For example, training that includes the right instructional design elements (e.g., information, demonstration, practice, and feedback) has a greater probability of success. Training that promotes a mastery orientation and allows trainees to leave with strong self-efficacy will prepare trainees to learn and apply what they have learned. Training that provides sufficient challenge and has trainees work through errors (i.e., "transfer appropriate processing") will be more likely to result in learning that is actually used on the job. It is important to recognize that it is easier to simply "show and tell" than provide challenging practice and feedback; and some trainees will not like being challenged. However, leaders who are truly interested in providing training that will lead to positive changes on the job should encourage the use of scientifically based training design principles.

Increase motivation to learn. Leaders can take actions that boost motivation to learn. It starts with the messages sent before training. Clear communications about the training allow the right people to participate with the right expectations. Notifying trainees that there will be some form of follow-up increases their attention during training. Ensuring that the content and timing of the training is relevant enhances trainee interest and reduces subsequent skill decay. Finally, we know that a trainee's direct supervisor plays a key role in pre- and posttraining motivation, so taking steps to prepare team leaders, ensuring that they can answer questions about the training and are able to follow up after the training, pays large dividends. Collectively, these actions can greatly boost trainee motivation and learning and, subsequently, on-the-job application of trained skills.

Use technology wisely. Technology can be a great enabler of learning, but it can also be an expensive, seductive, and ineffective tool. Leaders should be smart consumers of learning technology, asking questions to ensure that the company invests in technology that actually works. Technology that simply entertains may get high praise from employees but does little to promote real learning. Research has shown how well-designed technology (e.g., simulations, computer-based training) can be used to stimulate learning, but behind every successful learning technology is a well-designed instructional strategy. As technology continues to proliferate, the options will expand. Explore those options, but be sure that there is more to any technology-based learning solution than that it just looks novel and is fun to use. "Wow" does not necessarily equal effective.

Promote ongoing learning. Research has shown that most learning does not occur in formal training environments. Therefore leaders should take actions that promote ongoing, continuous learning on the job. Providing trainees with tools and knowledge repositories they can use after training, establishing communities of practice where employees can use each other as learning resources, and preparing leaders to provide ongoing support and advice posttraining are examples of the ways in which continuous learning can be promoted. Leaders should also encourage individuals and teams to conduct debriefs of on-the-job experiences as a means of fostering experiential learning.

Leaders are in a unique position to drive training effectiveness by asking the right questions. In Table 6, we highlight the type of questions that informed, active leaders could ask about training both in general and for specific training programs.

Finally, when the work is riskier and the consequences at stake are greater, we encourage leaders to up the ante. That is to say, when lives, safety, health, or well-being depend on employees being well trained, leaders must be even more vigilant about using scientifically valid training design, delivery, and evaluation. Ask questions such as "how can we be sure that this training will work?" and "what is the science behind this training?"

Workforce development policymakers

Within a region, country, or industry, policymakers can also influence how likely it is that training will attain desired results. When drafting or reviewing training-related policies or determining whether to support a particular training initiative,

Table 6. Key Questions Human Resources Execs, Chief Learning Officers, and Business Leaders Should Ask About Training

For training in general throughout the organization or business unit:
Have we *invested* sufficiently and wisely in training and learning-related activities in our organization? How do we know?
How have we determined and *prioritized* our most important training needs?
How clear are we about the *competencies* we will need in order to compete successfully? How clear are we about where the gaps exist?
What have we done to diagnose our organization's *learning environment?* What are we doing to make our organization more conducive to learning?
What do you need me to do to send the *right signals* to our employees about the importance of training and learning in our organization?
How will we know that our overall efforts in training and development have an impact? What *evidence* do we expect to see?
For a specific training program:
What type of *training needs analysis* have we conducted to ensure we will be training the right things in the optimal way?
What *training strategy* will be employed? How are we incorporating effective *instructional design* elements (e.g., information, demonstration, practice, and feedback)? How clear are the learning objectives?
What are we doing to ensure we adequately *engage, motivate*, and *challenge* the trainees (and not simply ensure they are "happy")?
What are we going to do *before and after* this training to ensure trainees can and will use what they have learned? What are we doing to prepare trainees, remove obstacles on the job, and reinforce and sustain learning?
How is any training *technology* that we plan to use going to enhance learning and help trainees perform their jobs better, and not just look cool?
Should we be *evaluating* this training program? If so, for what purpose (e.g., to make adjustments or decide whether to continue it) and how?

key stakeholders should ask informed questions. Resources are not limitless, so policies should help encourage wise investments, and public funding should target training programs that are likely to be successful.

Policymakers need to ensure that the right skills will be developed, so similar to organizational decision makers, they need TNA data. If those are not available, then they should consider whether it would be wise to fund such an analysis. The focus of a needs assessment for a region or country would be different than that for a company. Policymakers typically have different goals than business leaders, and these goals should be clearly articulated. Are they trying to attract or retain employers to their region? Are they targeting any specific industries? Are they hoping to help people who need to reenter the workforce? Is retraining or reskilling an issue? Do they need to enhance employability among the unemployed? Once purpose has been established, then an assessment of competency and skill requirements can be conducted with which to guide training investments and policy decisions. Whereas organizations are interested in developing knowledge and skills that apply in their company (some of which may apply only in their company), policymakers will typically be interested in promoting the development of more "transportable" competencies. Transportable competencies are generally applicable across organizations. Recalling our discussion of "need-to-know" versus "need-to-access" content, it is important that workforce development efforts focus on knowledge and skills that are needed on Day 1 of multiple jobs, rather than on competencies developed over time on the job. In addition, workforce development training should focus on providing learners with the social skills to acquire and negotiate meaning (of knowledge) on the job (cf. Kraiger, 2008).

The scientific findings about training effectiveness can be used to make good investment and policy decisions. Government should not be promoting or investing in training efforts that fail to incorporate the principles of good training. Moreover, policymakers can apply the best practices of training evaluation to follow up on funded programs to assess whether adjustments are needed and determine whether continued funding is merited. In Table 7, we highlight the type of questions that informed, active policymakers could ask about training policies and publically funded programs.

What Does the Future Hold for the Science of Training?

The next 50 years will bring many challenges to the science of training. As the population gets older, wiser, more technology savvy, more insistent of receiving just-in-time knowledge, more supportive of collaboration, and more involved in multitasking, the science will have to be even more multidisciplinary, integrating findings from diverse areas such as neuroscience, computer science, human performance modeling, expertise, augmented cognition, change management, and skill acquisition (Ford & Kraiger, 2007; Salas & Kozlowski, 2010).

Researchers interested in training effectiveness will need to examine a number of evolving questions. For example, what specific features of new technologies really contribute to learning? There is no question that technology will (and does) affect how we learn. We have increasing access to mobile devices, intelligent agents, serious games, virtual reality, and synthetic learning environments. These are very engaging, fun, realistic, and motivational. However, as noted earlier, technology in and of itself does not create learning. The instructional features embedded into and surrounding technology are what enable learning. Although emerging and advancing technologies are promising, we need to know more about what works and why. We need more science around these technologies and the features that contribute to skill acquisition. Furthermore, it is important that research development work focuses on what promotes learning, more so than on how

Table 7. Key Questions Workforce Development Policymakers

What do we hope to accomplish through this policy or program? What are the intended *outcomes*?
What *competencies* are needed to compete regionally, nationally, or globally? What have we done to feel confident that we have identified the true needs and know where the gaps exist? How thorough was the training needs analysis? Do we need to fund one?
Are we supporting the development of *transportable competencies* that could be applied across companies or specific competencies that are likely to benefit only a single company? How does this align with our intended goals?
What *similar investments* have been made in the past? How well have they worked? How do we know? How can we leverage these prior investments to reduce our costs/risks?
What *training/learning methods* will be employed or encouraged? Are these scientifically sound? How could any procurement guidelines or related specifications promote the use of research-based instructional design principles?
Is there anything we should be doing to prepare trainees *before* training or better enable them to use what they have learned *after* training?
What can be done to provide trainees with the skills to *acquire additional knowledge and skills* once employed?
How will we *assess* whether the policy or program is accomplishing its intended goals? What is our training evaluation strategy?

quickly training can be pushed to more mobile platforms. For example, the question needs to be asked whether specific types of training are better suited to tablet and/or mobile platforms and, if so, how and why those types of training result in learning.

We know that experts rely on intuition and pattern recognition (Salas, Rosen, & DiazGranados, 2010). But what do we know about incorporating cues for pattern-recognition intuition into training design? What do we know about the higher order skills experts use to execute their tasks? How can we best identify and develop higher order skills (which are difficult to capture), such as meta-cognition, intuition, judgment, and decision making? There has been some research conducted to help us understand these important constructs as they relate to learning, but future science should help clarify more precisely how experts acquire their expertise, and in turn how we can systematically and efficiently develop such expertise in others.

Related to the notion of intuition is informal learning. We learn not only in the classroom but on the job. In organizational settings, informal learning is probably where most learning occurs (Tannenbaum, 1997). So future research should further explicate how we can best use informal, nonclassroom-based techniques to build tacit knowledge and promote ongoing learning. Tannenbaum et al. (2010) offered a number of useful paths for research in this arena. Studies are needed that clearly pinpoint the learning leverage points in informal learning. That is, what really matters in informal learning—what instructional action, events, or activities make a difference in skill acquisition? When and how should third parties such as coaches, supervisors, or mentors become involved to help employees accelerate or crystallize their informal learning? How can formal training experiences stimulate or prepare employees to take advantage of informal learning opportunities?

How can we best make use of training in an increasingly flat world where diverse groups must collaborate at a distance to be successful? We know that there are parallels and differences between managing local and virtual training systems (e.g., Lloyd, Persaud, & Powell, 2009; Rosen, Furst, & Blackburn, 2006; Yoon, 2010). In addition, the competencies needed to instruct (Tichon, 2007) and learn (Wang & Haggerty, 2009) in a distant, virtual context differ from those needed in a local context. Finally, massive multiplayer games (e.g., Bonk & Dennen, 2005) and virtual-world simulations (e.g., Kopp & Burkle, 2010) offer potentially "neutral" contexts for workers to acquire and practice new skills, but the transfer of these skills back to "our" world is not clear. Application in the military, government, and private industry is advancing rapidly, and we need to know more about how past research on training effectiveness translates, as well as what new challenges are emerging for enhancing and managing learning.

Finally, we believe that the new discoveries in neuroscience and cognitive modeling will change how we look at learning and training in the future. As we understand more about how trainees are "hardwired," we will probably have to rethink what we do before, during, and after training to facilitate transfer. Many challenges are ahead; but now, more than ever, the training field lives in interesting times. We look forward to what the science of training will bring in the next decades.

Concluding Remarks

Training research has come a long way. Today it is empirical in nature, and theoretically based. Moreover, it is grounded in the science of learning, has been applied to training in a variety of settings and populations, and has spawned innovative strategies and techniques. Training is now viewed as a system that is essential to promote learning and enhance on-the-job performance. It is not just an event that occurs in a classroom. We hope that training research can increasingly inform and guide the design of effective training. And so we conclude as we began and note again that well designed training works, and that what the organization does around it matters.

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