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Learning, Training, and Development in Organizations: Emerging Trends, Recent Advances, and Future Directions

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Keywords

learning, training, development, evaluation

Disciplines

Human Resources Management | Industrial and Organizational Psychology | Organizational Behavior and Theory | Training and Development

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Abstract

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In recent years, learning, training, and development in organizations has changed dramatically. Once considered a tangential activity, training and development initiatives are now viewed as playing a critical role in the development of human capital resources and an organization's ability to gain competitive advantage (Noe, Clarke, and Klein, 2014). A recent survey of chief learning officers (CLOs) found that, over the next year, 82% expect training to become even more aligned with company objectives and 70% project that it will grow more valuable to the success of their organization (Anderson, 2015). This increase in strategic importance has been accompanied by greater spending on training and development. The American Society for Training and Development (ASTD), for example, estimated that in 2012 organizations spent $164.2 billion on employee training, or about 1.3 percent of their revenue (Miller, 2013). Over half of CLOs also expect their budget to increase in the coming year (Anderson, 2015).

The evolution of training and development in organizations has created both opportunities and challenges. Although more resources than ever are being directed toward training and development, there exists greater pressure to extract maximum value from these investments. It has been estimated, for example, that upwards of 80% of training costs is spent on getting employees to training, maintaining them while there, and absorbing their lost productivity (Kozlowski, Toney, Mullins, Weissbein, Brown, & Bell, 2001). Thus, organizations are increasingly turning to technology as a way to deliver training to employees anywhere and anytime, thereby avoiding or greatly reducing these costs. In fact, it is estimated that about a third of all training today in organizations is delivered through technology (Miller, 2013). In addition to reducing costs, organizations are searching for ways to enhance the impact of their training and development initiatives, including increasing the transfer of competencies developed through formal training to the job and leveraging the informal learning that naturally takes place in the workplace (Bear et al., 2008; Blume, Ford, Baldwin, & Huang, 2010). As organizations continue to shift to team-based work structures, there is also greater recognition that training and development can serve as a valuable tool for influencing team effectiveness (Kozlowski & Bell, 2013). Finally, training departments are increasingly being asked to provide organizational stakeholders with evidence of the impact of their initiatives. As a result, assessment and evaluation have become one of the highest priorities for CLOs (Anderson, 2014).

Our goal in the current chapter is to examine how these trends are shaping, and being shaped by, research on learning, training, and development. It is important to note that we do not provide a comprehensive review of the training and development literature (see Noe et al., 2014; Salas, Weaver, & Shuffler, 2012 for excellent reviews of the field). Rather, our chapter focuses on the implications of the current trends in learning, training, and development for four areas of research: training design and delivery, team training and development, training transfer, and training evaluation. We believe the research in these four areas has been most heavily impacted by changes in training practice and also has the most to offer in terms of guiding the field as it responds to emerging opportunities and challenges. We also orient our chapter around more recent research developments rather than reviewing the history of research in these areas. We focus on more recent research in part because it provides a tighter connection to current trends, but also because we aim to build upon and extend the chapter published by Campbell and Kuncel (2001) in the first edition of the Handbook. In the sections that follow, we discuss recent advances in the four areas of learning, training, and development research and also highlight directions for future research in each area.

Training Design and Delivery

Research has provided considerable evidence of the benefits of training and development for individuals, teams, and organizations (Aguinis & Kraiger, 2009). A meta-analysis by Arthur, Bennett, Edens, and Bell (2003) also revealed that the effects of organizational training are comparable to or greater than other popular organizational interventions, such as feedback and goal setting. However, the benefits of training and development are certainly not guaranteed. Morrow, Jarrett, and Rupinski (1997), for example, examined the utility of 18 managerial and sales/technical training programs in a Fortune 500 pharmaceutical company. Although they found that, on average, the effect and utility (i.e., return on investment) of the training programs were positive, they also discovered significant variation between the effectiveness of programs. In fact, two of the managerial training programs had negative effects and five programs were estimated to have negative utility values. As they conclude, "it would be simplistic to claim that 'training is a good investment' or that 'training is a waste of time and money'" (Morrow et al., 1997, p. 112).

Effective training requires careful consideration of a variety of factors that occur before, during, and after training (Salas, Weaver, et al., 2012). During training, important considerations involve training design and in particular the selection of an instructional strategy that can deliver the training experience necessary to achieve targeted learning objectives (Kozlowski & Bell, 2007). Over the years, substantial research attention has been directed at the methods and instructional principles (e.g., feedback, practice opportunities) that underlie various instructional strategies. In the following sections, we discuss two important and interrelated developments within this research that align with the themes that opened this chapter. In particular, we examine the emergence of a more learner-centered approach to training design and discuss the evolution of research on technology-based training. We conclude with a discussion of future research directions in the area of training design and delivery.

Learner-Centered Training Design

Over the years, training research and practice has tended to treat the learner as a passive recipient to various training interventions or designs (Ford & Kraiger, 1995). This passive orientation was, in part, a product of the behavioral learning paradigm that argued that errors should be avoided during training since they serve as aversive stimuli that reduce motivation and lead to the adoption of erroneous habits (Skinner, 1953). As a result, traditional approaches to training were designed around the idea that the instructional system (e.g., instructor, computer program) should retain control over important learning decisions and guide individuals step-by-step through the complete task and its concepts, rules, and strategies (Smith, Ford, & Kozlowski, 1997). Programmed instruction and early forms of computer-assisted instruction, for example, were designed to break the procedure for achieving a training goal into a series of steps and then guide trainees through these steps so as to maximize success and minimize the number of errors committed (Ford & Kraiger, 1995; Ivancic & Hesketh, 1995). These and other proceduralized approaches to training proved effective for developing routine expertise and supporting the transfer of skills to problems or situations similar to those encountered during training (i.e., analogical transfer; Frese, 1995).

Although passive, proceduralized learning has historically dominated training research and practice, recent changes in the nature of work and learning have called this approach into question. As jobs have grown increasingly complex and dynamic, greater attention has been focused on developing adaptive expertise, or competencies that are specialized but also flexible enough to be generalized to novel problems and situations (Bell & Kozlowski, 2009). Research suggests that although proceduralized instruction can be effective for analogical transfer, it may impede the development of generalizable skills (e.g., Devine & Kozlowski, 1995). In addition, the growth in technology-based training and informal, job-embedded learning has provided individuals with greater control over their learning (Bell & Kozlowski, 2002; Brown, 2001). The result has been the emergence of a more learner-centered approach to training design that views learners as active participants in the learning experience (Bell & Kozlowski, 2009; Keith & Wolff, 2014).

There exist a number of educational philosophies and approaches, such as experiential and action learning, built around the idea of that the learner should be an active participant in the learning process (Kolb, 1984; Revans, 1982). However, much of the recent work in this area has focused on active learning approaches, which not only shift control to the learner but also use formal training design elements to systematically engage the cognitive, motivational, and emotional processes that underlie self-regulated learning. Self-regulation plays a critical role in active learning because research suggests that trainees often do not make effective use of the control they are given over their learning (DeRouin, Fritzsche, & Salas, 2004). Furthermore, research has identified metacognition, self-efficacy, and other self-regulatory processes as critical mechanisms in not only learning but also the development of adaptive expertise (Kozlowski, Toney, et al., 2001; Sitzmann & Ely, 2011). Thus, training strategies that selectively influence these processes can be effective tools for promoting adaptive learning.

Researchers have developed a number of active learning interventions. One of the first and most widely studied interventions is error management training, which involves active exploration and explicit encouragement for trainees to make errors during training and to learn from them. A recent meta-analysis by Keith and Frese (2008) revealed that error management training leads to better training outcomes than methods that do not encourage errors during training. In addition, they found that error management training is more effective for adaptive transfer than analogical transfer and that both active exploration and error encouragement are important elements of the strategy. Research has also provided evidence to support the effectiveness of a number of other active learning interventions, including mastery training (e.g., Kozlowski & Bell, 2006; Kozlowski, Gully, Brown, Salas, Smith & Nason, 2001) and guided exploration (Debowski, Wood, Bandura, 2001).

A recent study by Bell and Kozlowski (2008) aimed to integrate and extend this research by identifying the core training design elements that cut across different active learning interventions and examining their effects on trainees' learning and transfer via distinct self-regulatory pathways. The findings revealed that two of the core training design elements, exploratory learning and error framing, had a positive effect on trainees' performance, in particular their adaptive transfer. In addition, exploratory learning and error framing interacted with cognitive ability and dispositional goal orientation to influence trainees' metacognition and state goal orientation. The third training design element, emotion-control, did not have a direct impact on trainees' performance but did reduce their state anxiety. Overall, this research suggests that by shaping the nature of instruction, influencing trainees' motivational orientation, and helping trainees to manage their emotions, active learning interventions can influence trainees' cognitive, motivational, and emotional self-regulatory processes and enhance their learning and adaptive performance. In addition, the interplay of the training design elements with individual differences suggest that it is important to consider trainees' characteristics when implementing active learning interventions.

Technology-Based Training

As noted earlier, the utilization of technology-based training has expanded significantly in recent years. The American Society for Training and Development, for example, estimated that in 2012 about a third of all training in the workplace was delivered through technology (Miller, 2013). In addition, colleges and universities are increasingly using technology to train their students. Babson Survey Research Group estimated that between 2002 and 2010 online course enrollments grew at a rate of 18.3 percent (Allen & Seaman, 2011). This growth has spurred thousands of studies aimed at evaluating the effectiveness of technology-based training.

Research on technology-based training has been characterized by several notable limitations. First, there currently exists a fragmented understanding of what technology-based training means and how it should be defined. In their recent review, Brown, Charlier, and Pierotti (2012) identified forty-six distinct terms that have been used in this area, including e-learning, online learning, technology-based instruction, and computer-based simulation. Often these terms are used inconsistently across studies, which presents a challenge to those seeking to make sense of the field. Also, research in this area has suffered from a number of methodological limitations. Studies often rely on single-group pretest, posttest designs, which can inflate effect sizes (Lipsey & Wilson, 1993). Also, studies that use two-group designs often do not randomly assign participants to conditions and frequently confound differences in delivery media with differences in instruction. For example, there may be differences in curriculum materials, time spent in learning, or activity level across the technology-based and comparison conditions. The result is that it is often challenging to tease apart whether differences in achievement are due to differences in the delivery media or differences in instructional features (Bell & Federman, 2013).

These limitations notwithstanding, several recent meta-analyses have provided valuable insight into the effectiveness of technology-based training. Sitzmann, Kraiger, Stewart, and Wisher (2006), for example, compared the effectiveness of classroom and web-based instruction. They found that web-based instruction was 6% more effective than classroom instruction for teaching declarative knowledge but produced similar results in terms of procedural knowledge and trainee satisfaction. However, they also note that in studies where equivalent instructional methods were used across conditions, web-based instruction and classroom instruction were equally effective for teaching declarative knowledge. Thus, they conclude that the advantage of web-based instruction may be due to the use of more effective instructional methods rather than the media per se. Another meta-analysis by Sitzmann (2011) found that training conducted through simulation games, as opposed to other methods, led to significant gains in post-training self-efficacy, declarative knowledge, procedural knowledge, and retention. However, the results varied depending on the type of instruction provided to the comparison group, characteristics of the simulation game, and the instructional context. In particular, when instructional methods were matched in terms of activity level, simulation games and alternative instructional methods produced similar results.

Overall, these and other reviews suggest that technology-based training is, on average, as effective as more traditional forms of instruction. Perhaps more importantly, however, these reviews seem to support the position advocated by Clark (1994) and others over the past several decades, which is that learning is influenced by pedagogy, not delivery media. That is, it is the characteristics of the instructional design, such as the instructional methods used and the activity level of the trainees, that influences learning, and media are simply the vehicles through which these instructional conditions are delivered to the trainee. Given this, numerous observers have suggested that studies focused on evaluating the effectiveness of different training technologies are of limited value (Bell & Federman, 2013; Brown et al., 2012). Indeed, any technology can be effective for delivering training. The more important concern is understanding the conditions that influence the effectiveness of technology-based training.

Future Research Directions

Although recent research has advanced our understanding of learner-centered training design, more work is needed in this area. For example, there is a need to consider a broader range of individual differences that may influence how learners interact with active learning approaches (Bell & Kozlowski, 2009). Some individual differences, such as cognitive ability, have been examined in a number of active learning studies, whereas others, such as personality, have received much less attention. In addition, the few studies that have examined personality have sometimes produced conflicting findings (e.g., Cullen, Muros, Rasch, & Sackett, 2013; Gully, Payne, Kiechel, & Whiteman, 2002). This may be because past research has tended to focus on multifaceted active learning interventions, in which case the effects of individual differences will depend on the specific design elements that comprise the intervention and the emphasis these elements receive during training. For instance, individuals high in conscientiousness, who tend to be self-disciplined, careful, and thorough, may be well equipped to take advantage of the control offered by exploratory learning environments. At the same time, these individuals may react negatively if the training emphasizes that they should make errors as they explore the task. Thus, we recommend that future research adopt a more nuanced approach that examines how individual differences interact with specific training design elements, which can provide greater insight into how to design active learning interventions to meet the needs of different learners. It will also be important for research to further elaborate the process pathways through which active learning approaches have their effects. There are a number of process mechanisms, such as mental models, that have been discussed as playing an important role in active learning but have thus far received limited empirical attention (for an exception, see Kozlowski, Gully, et al., 2001). Future research is also needed to provide insight into the conditions under which the different training design components are more or less important to the success of active learning interventions. For example, Bell and Kozlowski (2008) found that although emotion-control reduced trainees' state anxiety, it did not have an effect on their performance. They suggest, however, that this may be due to the moderate levels of anxiety experienced by trainees in their experiment and that emotion-control strategies may be critical for performance in situations where trainees experience more extreme levels of stress. Finally, Keith and Wolff (2014) note that most studies have focused on active *training* as opposed to active *learning* more generally and call for research that examines other forms of active learning. For instance, recent work has focused on gaining a better understanding of experience-based learning, including examining interventions (e.g., structured reflection) that may enhance the developmental value of different experiences (DeRue, Nahrgang, Hollenbeck, & Workman, 2012). Integrating research on active learning and experience-based learning may serve to our advance of understanding of how organizations can leverage learner-centered design.

In the area of technology-based training, future research needs to shift attention from the "does it work" question to examining the instructional features and strategies that influence effectiveness. Kozlowski and Bell (2007), for example, developed a typology that specifies four categories of instructional features – content, immersion, interactivity, and communication – that can be configured to create instructional experiences in technology-based learning environments. They argue that the importance of these features in a given context depends on the instructional environment that is required to achieve the targeted learning objectives. Future research that examines the ability of different technologies to deliver these features can help ensure that the technological platform chosen for a particular training program is aligned with the learning objectives. Recent research has also provided insight into instructional strategies that can be integrated into technology-based training to support critical learning processes. For example, studies have demonstrated that prompting self-regulation (e.g., Sitzmann, Bell, Kraiger, & Kanar, 2009; Sitzmann & Ely, 2010) and providing adaptive guidance (Bell & Kozlowski, 2002; Kanar & Bell, 2013) during technology-based training can enhance learning and reduce attrition. Additional research is needed on strategies that can be used to help individuals make better use of the learner control afforded by technology-based training. Finally, from a practical standpoint it will be important for future research to consider not only the benefits but also the costs associated with different forms of technology-based training. For example, although simulations offer a number of potentially valuable instructional capabilities (e.g., high levels of immersion and interactivity), the significant costs associated with simulation development has limited their utilization in practice, particularly in smaller organizations (Bell, Kanar, & Kozlowski, 2008). Thus, future research is needed that provides insight into the cost-benefit tradeoffs associated with different configurations of technology-based training (Bowen, Chingos, Lack, & Nygren, 2012).

Team Training and Development

In recent decades, the nature of work has shifted from individual jobs to team-based work systems (Kozlowski & Bell, 2013). Teams enable organizations to bring together the diverse skills, expertise, and experience needed to solve complex problems and to stimulate creativity and innovation. Teams also allow organizations greater flexibility in how they allocate their resources, particularly as individuals increasingly belong to multiple teams simultaneously (Tannenbaum, Mathieu, Salas, & Cohen, 2012). They can be formed rapidly to respond to organizational challenges and can be quickly reconfigured as project requirements evolve or more pressing needs arise. Moreover, virtual teams – whose interaction occurs primarily through technology – allow organizations to connect individuals who are distributed across the globe so they can collaborate on assignments and share best practices (Bell & Kozlowski, 2002).

Given these many benefits, it is not surprising that teams have become "the critical unit that 'gets things done' in today's world" (Marks, 2006, p. i). This is especially true in settings where quality and high reliability are paramount, since team members can serve as redundant systems to help mitigate errors (Salas, Wilson, Murphy, King, & Salisbury, 2008). Yet, it is also widely acknowledged that teams can and often do fail (Bell & Kozlowski, 2011). As Salas, Kosarzycki, Tannenbaum, and Carnegie (2004) observe, "On the one hand, it is clear that teams can accomplish great things, but it is equally apparent that subfunctioning teams have the potential to fail spectacularly" (p. 98).

The proliferation of teams combined with the evidence of their fallibility has stimulated significant research aimed at understanding and influencing team effectiveness. A recent review of the literature by Kozlowski and Ilgen (2006) identified three interventions or levers – team design, training and development, and leadership - that can be used to shape and align team processes and thereby improve team effectiveness. In the next section, we review what we know about the effectiveness of a range of team training and development interventions, highlighting recent developments as well as future research needs.

Team Training and Development Interventions

Team training is defined as "a set of strategies that create a context in which team skills can be practiced, assessed, and learned" (Salas & Cannon-Bowers, 1997, p. 274). The effectiveness of team training depends, in part, on the type of team training, training content, delivery method, and training task that an organization employs (Kozlowski & Ilgen, 2006). Training researchers and practitioners alike are interested in knowing the differential impact of training interventions on organizational outcomes. Hence, significant research attention has been focused on identifying the most effective type of team training interventions for improving various team process and outcomes. In what follows, we describe four of the most prevalent team training and development interventions and review the research evidence of their effectiveness.

Cross-training. Although there are many different types of cross-training (see Blickensderfer, Cannon-Bowers, & Salas, 1998 for a review), in general the approach is designed to help a team achieve operational readiness and promote teamwork by training team members to take on the tasks, roles, responsibilities, and functions of their teammates (Cannon-Bowers, Salas, Blickensderfer, & Bowers, 1998; Kozlowski & Ilgen, 2006). This goal is achieved through the creation of interpositional knowledge (IPK). According to Volpe, Cannon-Bowers, Salas, & Spector (1996), "IPK can be described as a type of 'role' knowledge held by team members" (pp. 87-88). Additionally, this approach focuses on developing shared team mental models and skills for enhanced team coordination. For example, Marks, Sabella, Burke, and Zaccaro (2002) empirically examined the effect of three types of cross-training (e.g., positional clarification, modeling, and rotation) on shared team-interaction mental models, coordination (i.e., back-up behavior), and performance. They found across two studies that cross-training helped to facilitate the development of shared team-interaction models. In addition, the more in-depth forms of cross-training (positional modeling and rotation) resulted in more shared mental models than positional clarification, although there were no significant differences between the positional modeling and positional rotation approaches. Additionally, they also found that the effect of cross-training on team performance was mediated by shared team-interaction mental models and team backup and coordination processes. Similarly, a study by Cooke et al. (2003) found that teams exposed to full cross-training exhibited greater gains in taskwork and teamwork knowledge than teams exposed to a conceptual version of cross-training.

Several meta-analyses have also examined the effects of cross-training, although they have sometimes yielded mixed findings. Salas, Nichols, and Driskell's meta-analysis (2007) indicated that cross-training does not have a significant effect on team effectiveness ($r = -.09$), whereas Salas et al. (2008) found that cross-training has a moderate positive effect on team outcomes ($\rho = .44$). The difference in findings may be due to the fact that many of the studies included in Salas et al. (2007) examined multiple components of team training, making it difficult to tease apart the effects of a particular strategy. Salas et al. (2008) appear to provide a cleaner test of the effects of cross-training, although the number of effect sizes ($k = 14$) is small. Ultimately, the authors call for more empirical research that examines the effectiveness of this team training strategy.

Adaptation-coordination-CRM training. Within this category, there are two team training strategies. The first strategy, *team adaptation and coordination training (TACT)*, is used in an effort to develop teamwork skills needed to enhance coordination and decision-making processes and to teach team members how take advantage of idle periods to anticipate and discuss potential problems (Salas et al., 2007). This training approach is commonly used in military tactical decision-making training programs (Cannon-Bowers et al., 1998). Two meta-analytic studies provide evidence for the effectiveness of this team training strategy. Salas et al.'s (2007) meta-analysis showed that TACT training was effective at improving team performance (r =.61). However, they note that studies that employed high levels of TACT tended to also employ relatively high levels of team self-correction training (r = .71), again making it somewhat difficult to tease apart the effects of a particular strategy. Salas et al.'s (2008) meta-analysis also demonstrated that TACT has a positive effect on team outcomes (ρ = .56), although this finding is based on a small number of effect sizes (k = 6). The second training approach within this category is *crew resource management (CRM) training.* CRM training interventions have been widely adopted in the military and aviation environments (see Flin, O'Connor, & Mearns, 2002) and are increasingly being used in medical settings. This method takes into account a wide range of KSAs such as interpersonal communication, situational awareness, problem-solving, leadership, decision making, and teamwork (Salas & Prince, et al., 1999). The ultimate goal of this method is to improve safety by enhancing teamwork, skill integration, and coordination. Numerous researchers have demonstrated that CRM is effective (e.g., Fisher, Phillips, & Mather, 2000; O'Connor & Flin, 2003; Salas, Wilson, Burke, & Wightman, 2006). O'Connor, Campbell, Newton, and Melton et al. (2008) demonstrated that CRM training had a moderate positive effect on trainee knowledge evaluation (d_{mean} = 0.59) and a strong positive effect on trainee attitudes (d_{mean} = 0.94) and behaviors (d_{mean} =1.18). However, they could unequivocally confirm a significant effect of CRM training only for trainee attitudes since the confidence intervals for behavior and knowledge bounded zero. Coordination/CRM training was the most popular training strategy in Salas et al.'s (2008) database (k =33) and they found it had a positive effect on team outcomes (ρ = .47). Overall, these findings support the effectiveness of CRM training.

Team self-correction training. The focus of this training technique is to develop a team's KSAs to diagnose and self-correct team attitudes, behaviors, and cognitions (Blickensderfer, Cannon-Bowers, & Salas, 1997). The goals of this training approach are to enhance a team's ability to reflect on prior performance, identify errors, solve problems, and plan for future improvement (DeChurch & Haas, 2008). Although the bulk of relevant research has been conducted on guided or facilitator-led self-correction training, Blickensderfer et al. (1997) compared unguided with guided team self-correction training. Their findings revealed that guided team self-correction training was more effective at developing teamwork processes and shared task expectations than unguided team self-correction. However, team performance was not significantly different for either unguided or guided team self-correction training. A recent study by Smith-Jentsch, Cannon-Bowers, Tannenbaum, and Salas (2008) found that teams that participated in facilitator-led guided team self-correction organized around an expert model of teamwork had more accurate mental models and greater teamwork processes and performance than teams that participated in more traditional military briefings and debriefings. The meta-analyses by both Salas et al. (2007) and Salas et al. (2008) provided evidence of the effectiveness of self-correction training (r = .45 and ρ = .27, respectively), although the number of studies examining this form of training were small (k = 2 in Salas et al., 2008).

Team building. Klein et al. (2009, p. 183) define team building as "a class of formal and informal team-level interventions that focus on improving social relations and clarifying roles, as well as solving task and interpersonal problems that affect team functioning." As this definition suggests, team building encompasses a diverse array of developmental interventions, although there is consensus that there exists four basic approaches or models of team building: goal-setting, interpersonal relations, role clarification, and problem-solving (Salas, Rozell, Mullen, &

Driskell, 1999). A meta-analysis by Klein et al. (2009) revealed that team building had an overall positive effect across all team outcomes ($\rho = .31$). In addition, they found that team building had stronger effects on affective ($\rho = .44$) and process ($\rho = .44$) outcomes than cognitive ($\rho = .13$) or performance ($\rho = .26$) outcomes. There were also some differences across the four types of team building, with goal setting ($\rho = .37$) and role clarification ($\rho = .35$) components generally having stronger effects than either interpersonal relations ($\rho = .26$) or problem solving ($\rho = .24$) components. Finally, they found that team building tended to be more effective for large teams (> 10 members; $\rho = .66$) than either medium teams (5-10 members; $\rho = .27$) or small teams (< 5 members; $\rho = .28$). Overall, these results suggest that team building training interventions are effective for improving team effectiveness.

Future Research Directions

The empirical and meta-analytic evidence reviewed above for the relative impact of the various training interventions on team outcomes is promising and should provide researchers with fruitful directions for future research. As noted by Salas and colleagues (2007), "we have a relatively small body (but growing in aviation, military, and medical domains) of empirical results that hint at the components of team training that drive enhancements to team performance (Salas et al., 2006). Researchers interested in the problems of bolstering team performance might direct and channel primary level research efforts into these promising directions" (pp. 485-486).

These results also point to the fact that not all training interventions are effective for all teams and that different types of interventions lead to different team outcomes; thus those interested in improving team performance would benefit from more research on specific training interventions that would enable decisive comparisons (Salas et al., 2007, 2008). For example, in spite of the popularity of cross-training in organizations, relatively few empirical studies have examined its effectiveness and a number of these studies used laboratory settings or student samples. Given the variety of extant team work arrangements (i.e., virtual teams, multinational teams) future research needs to evaluate the effectiveness of cross-training and other team training interventions for influencing the functioning of different types of teams.

Recent work by Tannenbaum et al. (2012) also highlights recent changes in the nature of teams that have potentially important implications for team training and development. For instance, Tannenbaum and colleagues note that modern teams increasingly are characterized by a dynamic composition. Whereas in the past teams had well-defined and stable memberships, today they are much more fluid and changes in membership are common. In addition, teams are more diverse, highly specialized, and globally distributed, and increasingly they utilize multiple-team memberships and other more contemporary team work arrangements. These progressive and on-going changes in the nature of teams (e.g., the way teams are designed, implemented, used, and transitioned) require concurrent advances in research on team training and development. For example, the trend toward dynamic team composition suggests that greater attention may need to be devoted to strategies that can be used to develop generic teamwork skills that members can transport across different team environments (Ellis, Bell, Ployhart, Hollenbeck, & Ilgen, 2005). Also, methods that encourage more self-directed learning, such as team-led debriefing techniques, may enable teams to respond more quickly to developmental needs created by changes in team membership (Eddy, Tannenbaum, & Mathieu, 2013).

Training Transfer

In an effort to improve employee work performance and as a strategy for gaining competitive advantage, organizations make significant investments in training and development (Adler & Kwon, 2002; Barney & Wright, 1998; Cutcher-Gershenfeld & Ford, 2005). The intent of this investment is to develop capabilities that employees will transfer to their jobs, improving performance and quality of service (Zumrah, Boyle, & Fein, 2013). However, despite major investments in training, many organizations report that the bulk of training expenditures seemingly do not transfer to the job (Baldwin & Ford, 1988; Burke, 2001; Cheng & Ho, 2001; Ford & Weissbein, 1997; Goldstein & Ford, 2002; Grossman & Salas, 2011) or improve organizational performance (Broad, 1997). In fact, some estimates suggest that only 10 percent of training expenditures result in transfer to the job (Georgenson, 1982).

Increasing organizational investments in training combined with the evidence that much of what is trained is not applied in the work setting has resulted in growing interest in what is known to researchers and practitioners alike as the *transfer problem* (Baldwin & Ford, 1988). Understanding transfer provides an important nexus of training research since it is considered the point where training influences individual, group, and organizational outcomes (Goldstein & Ford, 2002; Kozlowski, Brown, Weisbein, Cannon-Bowers, & Salas, 2000). Such research focuses on identifying the factors that influence the extent to which newly acquired KSAs developed during training transfer effectively to the job and result in positive changes in work performance (Grossman & Salas, 2011). For example, numerous reviews (e.g., Baldwin & Ford, 1988; Baldwin, Ford, & Blume, 2009; Burke & Hutchins, 2007; Cheng & Hampson, 2008; Cheng & Ho, 2001; Grossman & Salas, 2011), meta-analyses (e.g., Blume et al., 2010), and models (e.g., Burke & Hutchins, 2008; Kozlowski & Salas, 1997; Thayer & Teachout, 1995) have examined predictor-transfer relationships. We have made meaningful progress, but a number of important and unanswered questions remain. In the next section, we review what we know about training transfer and where we need to go. First, we define training transfer and discuss the evolution of the concept over time. Second, we review research that has examined the predictors of training transfer. Lastly, expanding on prior research, we identify future directions that should further enhance our understanding of the transfer of training.

The Evolution of Training Transfer

Baldwin and Ford (1988) defined transfer as “the degree to which trainees effectively apply the knowledge, skills, and attitudes gained in a training context to the job” (p. 63). Transfer has traditionally been conceptualized as a function of two conditions: (1) generalization of learning to settings/situations on the job and, (2) maintenance of the learning over a period of time (Baldwin & Ford, 1988; Cheng & Hampson, 2008; Ford & Weissbein, 1997). In recent years, a number of researchers have extended Baldwin and Ford’s (1988) conceptualization of transfer. For example, Yelon and Ford (1999) proposed a multi-dimensional perspective of training transfer which suggests that transfer is dependent on the nature of training content, skills trained, and degree of supervision on the job. In particular, they conceptualize transfer along two dimensions: open versus closed skills (task adaptability) and heavy supervision versus autonomous supervision (degree of supervision). Training for open skills is focused on developing skills that allow for greater variability in how they are performed, whereas training for closed skills is highly prescribed and offers limited variation in how the task is performed. Barnett and Ceci (2002) developed a taxonomy consisting of two global factors - content (i.e., what is transferred) and context (i.e., when and where it is transferred from and to) – which are subdivided into nine dimensions along which transfer can occur. They argue that the application of the taxonomy provides greater clarity about whether and what form of transfer has occurred. Finally, a few researchers have discussed the concept of upward or vertical transfer across organizational levels (Kozolowski, Brown, et al., 2000; Tharenou, Saks, & Moore, 2007). More specifically, vertical transfer focuses on how individual training outcomes emerge to the team and organizational level (Kozlowski, Brown, et al., 2000). To date, most work has focused on horizontal transfer, or transfer across different settings or contexts within the same level.

Predictors of Training Transfer

Over the years a number of models and conceptual frameworks have been developed in an effort to understand the factors that influence the transfer of training. For example, Baldwin and Ford's (1988) seminal model of training transfer identified the importance of three categories of training-input factors as critical for influencing transfer: (1) trainee characteristics (e.g., motivation), (2) training design (e.g., sequencing), and (3) work environment (e.g., support). The majority of research on the predictors of training transfer has focused on variables that fall within these three categories. More specifically, according to Blume et al., (2010), the nine training inputs most commonly examined are *individual* (i.e., locus of control, self-efficacy), *motivational* (i.e., career/job attitudes, organizational commitment, decision/reaction to training, post-training interventions) and *environmental* (i.e., supports in organization, continuous-learning culture, task constraints) variables. In this section, we review the current evidence for the relationship between these predictors and transfer.

Trainee characteristics. Trainee characteristics include such factors as ability, personality, skill, and motivation. According to Grossman & Salas (2011), there is research evidence to demonstrate that cognitive ability, self-efficacy, motivation, and perceived utility of training have the strongest relationship with training transfer. For example, numerous researchers have shown that cognitive ability positively impacts transfer through its effects on skill acquisition and post-training self-efficacy (e.g., Colquitt, LePine, & Noe, 2000). It has also been consistently demonstrated that self-efficacy is a predictor of training performance and transfer (e.g., Ford, Smith, Weissbein, Gully, & Salas, 1998; Gist, Stevens, & Bavetta, 1991; Mathieu, Martineau & Tannenbaum, 1993). Additionally, there is considerable research that has demonstrated the influence of motivation to learn on training transfer (Colquitt et al., 2000). A recent meta-analysis by Blume et al., (2010) found evidence of moderately strong relationships between transfer and cognitive ability ($\rho = .37$), voluntary participation ($\rho = .34$), conscientiousness ($\rho = .28$), pre-training self-efficacy ($\rho = .22$), trainee motivation ($\rho = .23$), and neuroticism ($\rho = .19$).

Training design. According to Blume et al. (2010), training design factors have received more attention in the transfer literature than any other training input. For example, meta-analytic reviews have examined the relationship between transfer and different training delivery methods (Arthur et al., 2003) and learning principles (e.g., overlearning; Driskell, Willis, & Copper, 1992). In addition, recent meta-analyses have provided evidence that behavior modeling (Taylor, Russ-Eft, & Chan, 2005) and error management training (Keith & Frese, 2008) are effective training methods for facilitating transfer. However, as noted by Blume et al. (2010), "…missing from current meta-analytic studies on training design and transfer is consideration of the training objectives or goals of the training program on transfer" (p. 1069). Blume et al. (2010) also examined the effects of three transfer interventions, optimistic preview, goal-setting, and relapse prevention, and found them to have small to moderate effects on transfer. However, they caution that relatively few studies have examined these interventions and there may be moderators that influence their effectiveness

Work environment. The work environment includes such factors as climate and support. The post-training work environment has been shown to have a major influence on the transfer of training to the job (Tracey, Tannenbaum, & Kavanagh, 1995; Velada, Caetano, Michel, Lyons, & Kavanagh, 2007). Blume et al. (2010) found evidence for a positive relationship between transfer and the overall work environment ($\rho = .23$), and the work environment had a stronger effect on the transfer of open skills ($\rho = .26$) than closed skills ($\rho = .04$). Furthermore, they found that transfer climate ($\rho = .27$) had the strongest relationship with transfer when compared with other elements of the work environment. In addition to transfer climate, researchers have demonstrated that peer, social, subordinate, and supervisor support affects transfer (e.g., Burke & Baldwin, 1999; Tracey et al., 1995). For example Blume et al., (2010) found overall support ($\rho = .21$) had a positive impact on transfer, and subsequent analyses suggested that supervisor support ($\rho = .31$) may be more important for transfer than peer support ($\rho = .14$). Additionally, providing trainees with the opportunity to use what they learn in training on the job has been shown to positively influence transfer (Ford, Quiñones, Sego, & Sorra, 1992; Gaudine & Saks, 2004; Lim & Morris, 2006). Blume et al. (2010) found a weak relationship between organizational constraints ($\rho = .05$) and transfer, although it was based on only two studies.

Future Directions

Looking ahead, it will be important for future research to address some of the limitations that have characterized prior research on the transfer of training. Blume et al. (2010), for example, provide evidence that the relationships observed in a number of transfer studies have been biased by same-source and same-measurement-context effects. Thus, future research should collect predictor and transfer variables from different sources and should incorporate time lags between training and transfer measures. Blume et al. (2010) also note that the median time between training and the transfer measures for the studies they examined was 1 day for lab studies and 7.5 weeks for field studies. This suggests that much of what we currently know about transfer is based on an examination of a relatively brief window of time following training.

Future research that examines transfer over an extended period may reveal that some predictors become more or less important as time passes. In addition to addressing these issues, there are several new directions that hold considerable potential for advancing our understanding of the transfer of training. Below we discuss two that we see as most promising.

Multi-level perspective on transfer. Kozlowski and Salas (1997) developed a multilevel model for training implementation and transfer that distinguishes among the different levels that comprise the organizational system (i.e., individual, team, organization) and specifies linkages between the factors and processes at the different levels. The model considers not only how the effects of training at the individual level aggregate to affect higher level outcomes but also how higher levels serve as a context that shapes the effects of training at lower levels. Kozlowski, Brown, et al. (2000) further developed the concepts of horizontal (same-level) and vertical (cross-level) transfer and the top-down contextual effects and bottom-up emergent processes that are implicated in the transfer of training across levels. As discussed earlier, the vast majority of research has focused on horizontal transfer, although there have been numerous calls to focus more attention on vertical transfer. Future research that adopts a multilevel perspective of training transfer is needed to test and refine the cross-level linkages between training activities, trainees' learning processes, work environment factors, and outcomes at different levels of the organizational system (team, unit, or organization).

Social network perspective on transfer. Given the importance of social support to the transfer of training, a social network perspective may provide valuable insight into trainees' organizational network relationships in the work context (Hatala, 2006). To date, a limited number of scholars have used social network analysis (SNA) to examine learning (e.g., Borgatti & Cross, 2003; Cross, Parker, Prusak, & Borgatti, 2001; Reffay & Chanier, 2000; Van den

Bossche, Segers, & Jansen, 2010). However, social network analysis examines the interpersonal mechanisms and social structures (e.g., centrality, position, strength of ties, cohesion, and division) that connect interacting units (i.e., small groups, large groups, departments, units, within organizations, between organizations) and thus may serve as a useful lens for exploring how relationships between actors, subgroups of actors, or groups affect learning outcomes at various levels of analysis (Scott, 2011; Wasserman & Faust, 1994). By measuring and mapping the connections and interactivity between trainees and others within the organization, researchers can examine the network structure prior to, during, and after a training intervention and the exchange patterns that lead to differential transfer outcomes (Hatala, 2006; Ibarra & Andrews, 1993). In addition to serving as a methodological approach, SNA also holds promise for theory building (Wasserman & Faust, 1994, Hatala, 2006). For example, the use of both attribute and relational data via SNA should help to answer a number of open research questions regarding the level of centrality and connectedness and the type of post-training interaction patterns that best facilitate positive transfer. Moreover, longitudinal transfer studies could leverage SNA to examine the effect of network changes on transfer over time.

Training Evaluation

Introduction

Evaluation is a necessary and critical component of effective training programs. It provides input for making decisions about training, including determining whether a program should be retained and identifying changes that can be made to improve current and future programs (Kraiger, 2002). In addition, evaluation data can be used to market training to both internal and external stakeholders, including upper management, future trainees, and outside agencies. The importance of these decision-making and marketing activities becomes even more salient when recalling the magnitude of organizational spending on employee training (Miller, 2013). It is surprising then that only a small percentage of organizations succeed in establishing effective internal training evaluation processes (Brown & Gerhardt, 2002; Swanson, 2005). In fact, evaluation continues to be one of the most neglected aspects of the training process. For example, a recent study by ASTD found that although 91.6% of organizations assess trainee reactions and 80.8% assess learning, only 54.5% evaluate behavior (i.e., transfer) and 36.9% evaluate results, even though the data collected through assessments of behavior and results was perceived to be of significantly greater value than that collected through assessments of reactions and learning (Wentworth, Tompson, Vickers, Paradise, & Czarnowsky, 2009). These findings may help explain why only 43 percent of Chief Learning Officers (CLO) report being satisfied with their organizations' training evaluation and learning measurement practices (Anderson, 2012). However, it is also clear that there exists a growing desire to reverse these trends. For example, 30 percent of CLOs report plans to develop measurement programs to track the impact of learning on employee capability and nearly 80 percent intend to increase evaluation of their learning and development programs (Anderson, 2012). Additionally, numerous observers have called for greater research attention to issues surrounding training evaluation (e.g., Edkins, 2002; Littrell, Salas, Hess, Paley, & Riedel, 2006; Kraiger, McLinden, & Casper, 2004). In the following sections, we discuss the two major types of training evaluation – formative and summative – and review the dominant frameworks and models within each area. In addition, we discuss recent advances in each area and conclude with a discussion of potential future research directions.

Types of Training Evaluation

Training researchers typically classify evaluation into two broad categories, formative evaluation and summative evaluation (Brown & Gerhardt, 2002; Rossi, Freeman, & Lipsey, 1999). Each approach provides a unique conceptualization of evaluation (i.e., purpose, timing, and outcome). More specifically, in an effort to achieve the intended training objectives, formative evaluation provides information (i.e., quantitative and qualitative data) about how to improve the quality of a training intervention that is being developed (Beyer, 1995; Scriven, 1991). Formative evaluation occurs throughout the training design and development process. For example, a formative evaluation would identify weaknesses in learning objectives, training materials, or methods with the goal of developing solutions during training design and development (Brown & Gerhardt, 2002).

In contrast, summative evaluation practices are used to evaluate the effectiveness of completed training interventions with the goal of providing suggestions about their use (Brown & Gerhadt, 2002; Scriven, 1991). Summative evaluation occurs after design and development, and it can be further classified into short-term and long-term outcome evaluation (Wang & Wilcox, 2006). This approach centers on identifying individual and organizational training outcomes and supports decision-making for future training and development investments (Alvarez, Salas, & Garofano, 2004; Kraiger, 2002). For example, a summative evaluation would utilize measurements (i.e., pre-post metrics) to assess training outcomes and report an overall conclusion regarding the effectiveness of the training.

Formative Evaluation Models

There are several perspectives on how best to conduct formative evaluation and each highlights a number of potentially important considerations (e.g., involvement of stakeholders in training design and development, identification of the critical training components, the use of established scales). In general, there are three main models to consider (Brown & Gerhardt, 2002). The Geis Method Model by Geis (1987) uses two main methods, developmental testing and expert review, to gather feedback for improving a training program. For example, development testing would utilize test subjects who possess characteristics (i.e., cognitive ability) similar to those of the target training group to evaluate training material. In contrast, the expert review method involves selecting experts of various types (eight types of experts are identified) to evaluate and critique training materials with a focus on errors, omissions, and improper emphasis. The Stage Model by Dick and Carey (1996) outlines three steps of formative evaluation (i.e., one-on-one, small group, and field test) and provides the specific purpose, criteria, methods, and procedures for each stage of evaluation. Finally, the Component Model by Weston, McAlpine, and Bordonaro (1995) outlines the evaluation goals and practical constraints for each of the major components during formative evaluation: participants (i.e., nature and level of expertise), roles (i.e., evaluator, learner, critic, reviser), methods (i.e., techniques ant tools), and situation (i.e., the evaluation context). Brown and Gerhardt (2002) suggest that each of these models has both benefits and limitations and they propose an integrative model that leverages the strengths of the different perspectives on formative evaluation. In particular, their model focuses on four stages of the design and development process – concept, design, prototype, and pilot – and describes what to measure in each stage as well as who should be involved in the effort. They argue that their integrative approach to formative evaluation offers a number of potential practical and scientific benefits and may be most effective when combined with summative evaluation. Unfortunately, very little research has tested or compared the utility of these different approaches for improving the effectiveness of training in organizations. Thus, more research is needed in order to fully understand how to utilize formative evaluation procedures and to determine the conditions under which the different approaches are most effective.

Summative Evaluation Models

The summative evaluation approach has dominated both training research and practice (Brown & Gerhart, 2002). Most summative evaluation efforts have used or extended Kirkpatrick's four-level framework (1994, 1996). Reactions evaluation (Level 1) provides information on participants' thoughts about training. Learning evaluation (Level 2) is measured during training and focuses on the acquisition of desired knowledge and skills. Behavior evaluation (Level 3) is concerned with the transfer of knowledge and skills to the job and thus is measured at some point after training. The final level, Level 4, measures the tangible results of a program in terms of reduced costs, improved quantity or quality of output, or other valued organizational outcomes. In practice, it is often assumed that each level is caused by the previous level (e.g., improving reactions will increase learning; Kraiger, 2002). However, there is limited empirical evidence for casual relationships among the four levels, which is cause for concern when using one of the levels as the sole criterion of training effectiveness or inferring changes at one level from changes in another level of the hierarchy (Alliger, Tannenbaum, Bennett, Traver & Shotland, 1997; Alliger & Janek, 1989; Mathieu, Tannenbaum, & Salas, 1990).

Kirkpatrick's four training criteria are still consistently used in training evaluation research (Salas, Tannenbaum, & Kraiger, & Smith-Jentsch, 2012), although there have been a number of extensions, improvements, and clarifications over the years. Kraiger, Ford, and Salas (1993), for example, utilized cognitive theory in an effort to broaden existing models of training evaluation. In particular, they developed a classification scheme that positioned learning as a multidimensional construct that could be evaluated through cognitive, skill-based, and affective outcomes. Their article underscored the importance of being clear about, and choosing appropriate measures to assess, not only the objectives of training (e.g., declarative knowledge) but also the processes required to achieve them (e.g., mental models, metacognition). Kraiger's decision-based model (2002) built on this earlier work and emphasized that evaluation efforts should be guided by a consideration of why the evaluation is being conducted (i.e., how the information will be used). Depending on the reasons for doing the evaluation, trainers may target one or more of the following areas: training content and design (e.g., design, delivery, and content validity), changes in learners (e.g., affective, cognitive, and behavioral), and organizational payoffs (e.g., transfer, performance, and results).

Despite being the most frequently used evaluation criterion in research and practice, trainee reactions have limited theoretical grounding and are also poorly understood (Brown, 2005; Colquitt, et al., 2000). However, recent meta-analyses have helped to clarify the antecedents and consequences of trainee reactions. Brown (2005) found that reactions have a hierarchical structure, such that different reaction facets (e.g., relevance, technology satisfaction) are related through an overall satisfaction construct. In addition, reactions were influenced by both person constructs (e.g., content interest) and situation constructs (e.g., delivery media) and related to the learning process (e.g., engagement) and outcomes (e.g., learning). More recently, Sitzmann, Brown, Casper, Ely, & Zimmerman, (2008) found that reactions primarily captured perceptions of the training environment (e.g., instructor style) but were also influenced by trainee characteristics and perceived organizational support. Further, their results demonstrated that reactions were most strongly related to affective learning outcomes (e.g., motivation, self-efficacy), although they also exhibited moderate relationships with cognitive learning outcomes (e.g., declarative and procedural knowledge). Overall, these findings provide insight into the factors that influence trainees' reactions and also suggest that the influence of reactions on other learning outcomes may be greater than previously thought.

Future Research

Training evaluation research, although not necessarily training evaluation practice, has evolved from its reliance on Kirkpatrick's four-level model of outcome evaluation to a multidimensional framework of learning outcomes (Kraiger et al., 1993). Consistent with this advancement in training evaluation is a more construct-oriented approach that incorporates psychological constructs (Kraiger, 2002), casual relationships (Holton, 1996) and more precise evaluation methodologies (e.g., Kraiger et al., 1993; Tannenbaum & Woods, 1992) to understand whether or not a given training intervention has worked. This shift is attributed largely to Kraiger et al.'s (1993) multidimensional learning taxonomy. Kraiger et al. (1993) argued that "to advance the science and practice of training evaluation, it is necessary to move toward a conceptually based classification scheme of learning based on such a multidimensional perspective" (p. 312).

Ford, Kraiger, and Merritt (2010) reviewed training evaluation research that was conducted since Kraiger et al. (1993) introduced the multidimensional perspective and identified four trends as well as directions for future research. The first trend involved acknowledging that a majority of researchers have adopted a multidimensional approach in their empirical examination of training evaluation. Second, evaluation researchers have sharpened their focus on cognitive and affective learning outcomes relative to skill-based outcomes (e.g., Kraiger & Ford, 2007; Yeo & Neal, 2004). Third, researchers are measuring not only declarative knowledge but also more cognitive learning outcomes (e.g., strategic knowledge and knowledge structures). Lastly, in an effort to expand our understanding of trainee reactions, researchers have started using alternative measures of affective outcomes (e.g., Hsieh & Chao, 2004) and examining learning across levels of analysis. Despite these advancements, Ford et al. (2010) argue that future research is needed to expand our understanding of cognitively and affectively based learning outcomes. In particular, they suggest examining metacognition as a learning outcome and its changes over time as well as changes in trainee motivational disposition and attitudes (e.g, measures of explicit and implicit attitudes) as a function of training.

As Kraiger (2002) notes, there are often alternative methods available to evaluate a particular target and these methods can vary in terms of how easy they are to implement, time and resources required, and validity. We believe that future research that examines different evaluation methods or approaches can help researchers and practitioners navigate these options. For example, a recent meta-analysis by Sitzmann, Ely, Brown, and Bauer (2010) examined the construct validity of self-assessments of knowledge. Given that it can be time consuming and challenging to develop objective measures of learning, it is common for organizations to rely on self-report measures that ask trainees' to estimate how much they know (i.e., knowledge level) or have learned about (i.e., knowledge gain) a specific domain (Lopker & Askeland, 2009). However, the meta-analytic findings of Sitzmann et al. (2010) suggest that trainees generally have difficulty self-assessing their learning. Specifically, they found that learners' self-assessments of their knowledge level were only moderately correlated with measures of cognitive learning, and self-assessments of knowledge gain did not correlate with cognitive learning. Further, they found that self-assessments of knowledge related more strongly to affective training outcomes (e.g., satisfaction, motivation) than cognitive training outcomes. Overall, these findings raise serious concerns about using self-assessments to measure learning, although Bell and Federman (2010) note that before a definitive conclusion can be reached additional research is needed on several issues, including differences among the various types of self-assessments and the conditions that may enhance or inhibit the accuracy of self-assessments.

Conclusion

The past decade has witnessed significant changes in learning, training, and development in organizations. Training and development initiatives are now seen as critical to achieving company objectives and training expenditures have increased accordingly. The costs and challenges associated with offering formal training have prompted greater utilization of technology to deliver training and have sparked interest in harnessing the potential of informal and self-directed learning. Team training and development interventions that were once used almost exclusively in aviation and the military are now being deployed across a wide range of industries to influence collective performance. And now more than ever there is interest in bridging the gap between learning and on-the-job performance and in evaluating the impact of investments in training and development.

In this chapter, we have examined how these trends and changes are shaping research in the field of training and development. Table 1 provides a summary of our key conclusions and highlights that significant advances have been made in each of the four research areas we reviewed. However, the table also points to the need for future research to continue to evolve if the science of training is to remain relevant to the realities of contemporary organizations. Fortunately, we believe there is a strong foundation on which to build and look forward to future progress in both training research and practice.

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Table 1

Summary of Research Advances and Future Directions

Training Design and Delivery

Research Advances

- Support for the effectiveness of several active learning interventions; core training design elements identified and some process mechanisms mapped.
- Meta-analytic support for the effectiveness of technology-based training

Future Directions

- Identify individual differences that interact with active learning approaches and elaborate process pathways; examine alternative forms of active learning
- Focus on the instructional features and strategies that influence the effectiveness of technology-based training

Team Training and Development

Research Advances

- Meta-analytic support for the effectiveness of several team training and development interventions

Future Directions

- Continue to evaluate and refine team training strategies across different types of teams; explore new training and development strategies that can respond to changes in the nature of teams

Training Transfer

Research Advances

- Expanded conceptualization of transfer; meta-analytic support for influence of numerous trainee, training design, and work environment factors on transfer of training

Future Directions

- Examine transfer over extended periods; adopt a multilevel perspective of training transfer; apply social network analysis to the study of training transfer

(cont.)

Training Evaluation

Research Advances

- Multidimensional and decision-based models of training evaluation; clarification of structure and nomological network of trainee reactions

Future Directions

- Expand understanding of cognitive and affective learning outcomes; examine different formative and summative evaluation methods