AN EMPIRICAL EXAMINATION OF E-LEARNING DESIGN: THE ROLE OF TRAINEE SOCIALIZATION AND COMPLEXITY IN SHORT TERM TRAINING

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ABSTRACT

This study examined how the use of a pre-training socialization activity and task complexity affected e-learning outcomes. Results indicated that those who received face-to-face socialization outperformed those who received either online socialization or no socialization. Those who received simpler training outperformed those who received more complex training. Implications are discussed.

INTRODUCTION

The use of technology to support corporate training continues to grow, with some estimating that the global e-learning market will be nearly $50 billion this year (Adkins, 2011). One way technology is supporting training is through e-learning. E-learning is a form of training where “learning material [is provided] in online repositories, where course interaction and communication and course delivery are technology mediated” (Johnson, Hornik, & Salas 2008: 357). It is also argued to improve training efficiency, reduce costs, and offer greater learning flexibility (Welsh, Wanberg, Brown & Simmering, 2003; Salas, DeRouin, & Littrell, 2005). However, the implementation of e-learning has not automatically resulted in increased training efficacy (Goldstein & Ford, 2002). There are potential drawbacks to e-learning that can affect its effectiveness, such as a sense of isolation and lower learner engagement (Welsh et al., 2003; Salas et al., 2005). Thus, it should not be surprising that many students, faculty, and professionals have indicated that they prefer face-to-face (FtF) courses over online courses (Means, Toyama, Murphy, Bakia, & Jones, 2010). Some scholars have therefore argued that e-learning is less effective than FtF training because it is simply an adaptation of other training tools and inferior to the original delivery method (Barton & Delbridge, 2001). Ultimately, maximizing the advantages of e-learning while mitigating its drawbacks is less about technology, and more about applying sound training principles and using technology in a manner that best supports these design principles (Sitzmann, Kraiger, Stewart, & Wisher, 2006). Therefore, the goal of this study was to investigate two design considerations for short-term e-learning design: trainee socialization and training complexity.

Research has shown that purposeful interaction and the development of stronger interpersonal relationships between trainees improves e-learning outcomes (e.g., Arbaugh & Benbunan-Fich, 2006; Johnson et al, 2008; Johnson, Gueutal, & Falbe, 2009), and this is true even for short-term teams (Druskat & Kayes, 2000). Therefore, it is important to investigate mechanisms for designing e-learning that enhances the likelihood that members gain stronger
interpersonal relationships and a shared learning environment. One way to potentially build peer connections early in the training is through pre-training socialization. Pre-training socialization occurs when learners are provided with an introductory socialization period where they have the opportunity to get to know each other, develop relationships, and develop a sense of peer trust.

In addition to socialization, it has been argued that some material may be too complex to effectively communicate in an online environment (Welsh et al, 2003; Salas et al., 2005). Learning complexity is a reflection of the information load, information diversity, and rate of information change involved in training (Sweller, 1988). But only limited empirical work on the role of complexity and e-learning exists. Therefore a second goal of this study is to investigate the role of learning complexity. Finally, research has also argued that the more individuals have a shared understanding and communication environment, the greater the complexity of tasks that they can complete electronically (Markus, 1994; Zack & McKenney, 1995). Even though complexity can make learning more challenging, these previous studies suggest that peer connections and a shared learning environment may be even more important when the training tasks are more complex. Therefore, the final focus of this study was to investigate whether learning complexity and trainee socialization were interactively related to learning.

HYPOTHESIS DEVELOPMENT

Trainee Socialization

Although there is a rich understanding of the importance of peer collaboration in e-learning (e.g., Arbaugh & Benbunan-Fich, 2006; Johnson et al., 2008), what is less well known is how to develop and encourage deeper interactions in short term-training courses such as certification courses. Given the importance that CEOs are putting on training length in adoption decisions (Skillsoft, 2012), it is important to better understand this issue.

One potential way to increase purposeful trainee interactions is by providing pre-training peer and group socialization opportunities. In this initial socialization period, trainees have the opportunity to get to know each other and become comfortable communicating with one another. This initial socialization period may improve levels of group cohesion and trust (Yalom, 1995; Suchan & Hayzak, 2001), which have been linked to positive outcomes such as increased cooperation, enthusiasm, group support, and group performance (Yalom, 1995; Jarvenpaa & Leidner, 1999). Socializing thus provides learners with an early opportunity to establish stronger relationships and to establish learning communities earlier in training. Development of a shared community can affect knowledge acquisition in several ways such as a richer exchange of information (McGrath, Arrow, Gruenfeld, Hollingshead, & O'Connor, 1993), increased attention to information shared (Sahay, 2004; (Mackie, Worth, & Asuncion, 1990), and improved learning (Alavi et al, 2002; Johnson et al, 2008; Johnson et al, 2009).

Research also suggests that face-to-face socialization may be even more effective than online socialization in improving e-learning outcomes. When socialization occurs in person, trainees have the potential to utilize multiple and simultaneous cues to convey information and emotions (e.g. tone of voice, body language, or gestures visual cues) as they build relationships with others, but when socialization occurs online, written cues are heavily relied upon (Daft & Lengel, 1986). As a result peer trust can be more difficult to develop online than in person (Hawthorn, 1998). The availability of multiple verbal and nonverbal cues is particularly important in new groups because they have not yet developed shared experiences and history
Therefore, we believe that individuals who receive online socialization will demonstrate higher learning than those who receive no socialization and those who receive face-to-face socialization will demonstrate higher learning than those who received online or no socialization.

**H1:** Pre-training socialization will be positively related to learning such that individuals who receive face-to-face pre-training socialization will have the highest learning, followed by those who receive online pre-training socialization and then by those who received no pre-training socialization.

### Training Complexity

According to cognitive load theory (CLT) (Sweller, 1988), the complexity of a task increases as it contains greater information load, information diversity, or rate of information change. As learning tasks become more complex, the number of elements that must be processed increases as well as the interconnectivity of these elements (van Merrienboer, Kester, & Paas, 2006). In addition, Bloom’s Taxonomy (Bloom & Krathwohl, 1956), argues that the complexity of tasks can be classified on a continuum ranging from more simple, lower order, cognitive processes such as knowledge recall and comprehension to more complex, higher order, cognitive processes such as analyzing or differentiating and evaluating or explaining. As learning material becomes more complex, the focus shifts from the recall of factual information to the evaluation, application, and integration of knowledge to new contexts. Thus, research has shown actual and perceived complexity to negatively impact with both task and learning (Fisher & Ford, 1998).

For this reason, both researchers and professionals have argued that e-learning may be less appropriate for more complex and abstract topics than for simpler and more factual-based topics (Salas et al., 2005; Welsh et al, 2003). Concerns about using e-learning for more complex training include the complexity stemming from the technology itself (Hillman et al, 1994), and the relatively limited cues available to the trainee during online interactions (Daft & Lengel, 1986). For trainees this means that a portion of their cognitive resources will be required to navigate the learning environment, leaving fewer cognitive resources to focus on the training itself. For simple training, this may not be an issue as they may have the cognitive resources available to process both the training material and navigate the electronic environment. But when the material becomes more complex, the cognitive effort may be too large to effectively focus on both the material and environment, reducing the level of learning. Thus, the following hypothesis was investigated:

**H2:** Training complexity will be negatively related to learning such that more complex training will be associated with lower learning.

### Interaction Effect

Although an initial socialization period can provide trainees with the opportunity to connect with peers and to develop needed relationships, its importance may be magnified when training is more complex. When the training is simpler, the trainees may feel that the cognitive load associated with learning the material is light enough that they do not need to interact with peers, to share information, ask questions, or rely on the knowledge of others to learn. But, when
the training becomes more complex, the cognitive load associated with learning may be high enough that they have to rely more on their peers. Relationships developed during an initial socialization period can help trainees feel that they can trust their peers to share valuable information and they can then attend to it more fully (Mackie et al., 1990). This can reduce the cognitive load on a trainee because they can rely on peers to fill gaps in their knowledge. Those who were socialized more richly should be more likely to develop stronger relationships and a, which should also improve outcomes relative to those who are less richly socialized. For this reason, we argue that socialization and complexity will be interactively related to learning.

H3: Pre-training socialization and complexity will be interactively related to learning such that performance differences in the socialization groups will be larger in the complex training condition than for the simple training condition.

METHOD

Participants

The sample for this study consisted of 143 individuals (78 males, 63 females, 2 participants did not indicate gender), drawn from a required core undergraduate business course. The mean age of the sample was 19.8 years (range = 18 – 52). Most participants used computers on a daily basis (96%), had over 4 years of experience with computers (95%), and had completed at least three courses that used the Blackboard Learning System (91%). Conversely, the majority of the participants had not completed an online course prior to the experiment (72%).

Manipulation

A controlled laboratory study using a 3 × 2 (Socialization: Face-to-Face, Online, and None X Complexity: high/low) between-subjects experimental design was conducted to examine the hypotheses. Both the FtF and online socialization groups completed a twenty minute long group socialization exercise where participants introduced themselves to one another and shared three statements about themselves. Two statements were truthful and one was a lie. The other group members then took turns guessing which statement was the lie. The only difference between these two conditions was that in the online condition all communication was mediated through Blackboard and occurred online, whereas in the FtF condition participants completed the task in the same room. In the no socialization group, participants worked on an unrelated task.

The simple and complex training conditions both focused on employment law and major equal employment opportunity legislation in the United States. Consistent with Bloom’s taxonomy (Bloom & Krathwohl, 1956), the simple training focused on two lower order cognitive processes (remembering and understanding), and factual knowledge. The complex training included both lower and higher order processes. A pilot study was conducted to test the complexity manipulation. The results indicated that participants in the simple condition found it to be simpler and performed better than those in the complex condition.

Procedure

The experiment took approximately 90 minutes to complete and utilized Blackboard for the delivery of course materials and peer communication. The experiment was managed by three
proctors, each of whom managed a single room. To ensure consistency across all sessions each proctor followed the same protocol, utilized a prepared script, and synchronized the timing of each section of the experiment. All participants in the experiment were randomly assigned to groups of three based on the computer stations at which they sat upon arrival. In the no socialization and online socialization condition, each team member was placed in a separate room before the experiment began, whereas in the FtF socialization, participants were initially placed in the same room and then moved to separate rooms for the duration of the experiment.

Upon arriving at the training session, each participant signed in, completed an informed consent form, and a pre-test questionnaire that assessed participants’ motivation to learn. The twenty minute socialization manipulation then occurred, as described above. Next, participants in the FtF socialization condition moved to adjacent rooms to separate them during training, ensuring that all training interactions occurred online. Next, to assess baseline employment law knowledge, participants completed a ten minute pre-training employment law quiz. Finally, the participants received either simple or complex training.

The training itself also consisted of multiple stages. First, participants completed a self-paced learning module on employment law. Participants could use the chat function in Blackboard to discuss anything they wished with other group members. Second, participants completed a short hands-on learning module where they acted as a judge in an employment discrimination lawsuit and made a discrimination ruling. Those receiving simple training had to determine whether someone had been wrongfully terminated and, if so, which law(s) had been violated. Participants in the complex condition additionally had to determine the type of discrimination, if any that occurred. As in the first phase, participants in each condition were able to work with their group members via chat to identify the correct solution. Finally, participants were asked to close out the training module in Blackboard and to complete a 15-question multiple choice post-training quiz and a questionnaire regarding their training experiences.

Measures

Pre- and Post-experiment employment law knowledge was measured with a 15-item multiple choice quiz, and scores on quiz could range from 0 – 150 points. Although the tests were similar for the simple and complex learning tasks, each reflected the material covered during the training. Motivation to learn (MTL) was used as a covariate in this study. MTL was measured with a seven-item subset of Noe & Schmitt’s (1986) scale and utilized a 7-point, Likert-type scale with anchors ranging from 1 (Strongly Disagree) to 7 (Strongly Agree) and was scored so that higher scores reflected higher motivation to learn.

RESULTS

Analysis

The hypotheses were tested using ANCOVA, with pre-experiment knowledge, motivation to learn, and online course experience as covariates. Results of the ANCOVA are presented below. First, the results show that both pre-training employment law knowledge (F (1,132) = 6.50, p < .05) and motivation to learn (F (1,132) = 14.00, p < .001) were statistically significantly related to post-training knowledge. But, online course experience was not statistically significantly related to post-training knowledge (F (1,132) = 1.07, p > .05).
Hypothesis 1 proposed that pre-training socialization would be positively related to learning. The initial results support this hypotheses ($F (2, 138) = 3.15, p < .05$). Given the significant $F$, a post-hoc Scheffe Test (1953) was conducted, with means adjusted for unequal sample sizes. The results of this analysis indicated that the group that received face-to-face socialization outperformed ($M=102.4$) those who received either online socialization ($M = 90.9$) ($F (1,132) = 6.08, p < .05$) or no socialization ($M = 93.8$) ($F (1,132) = 3.38, p < .05$). But the results did not support a statistically significant difference between the online socialization and no socialization groups ($F (1,132) = 0.34, p = n.s.$). Thus, H1 was partially supported. In support of H2, individuals with more complex training ($M = 93.1$) performed less well than those who received less complex training ($M = 98.03$) ($F (1, 132) = 4.85, p < .05$). Finally, the results did not find support for an interaction between training complexity and socialization ($F (2, 132) = 0.32, p > .05$).

**DISCUSSION**

This study makes several contributions to our knowledge of e-learning. First, it extends our understanding of the role socialization plays in e-learning. For example, although previous research has highlighted the importance of a shared learning space in e-learning, this study compared the use of three forms of pre-training socialization: no socialization, online socialization, and FtF socialization. This allowed for a richer understanding of the relationship between socialization and learning. Second, the study contributed to our understanding of the role of training content complexity in an e-learning environment. The findings of this study suggest that increased cognitive load associated with trying to communicate and navigate in the online space may mean trainers may need to incorporate additional technological support to help trainees overcome difficulties associated with communicating and sharing information online.

In addition, the findings suggest that trainers and designers should develop mechanisms for trainees to get to know their fellow trainees in person prior to training when possible. In addition, trainers, teachers, and professors should consider the level of difficulty of learning content when designing online training initiatives. One way to address this complexity is to break training into smaller modules, which can allow trainees to concentrate on mastering smaller sets of information before moving on to the next module. Finally, on-demand virtual mentors and interactive videos (Zhang et al., 2004; Zhang, Zhou, Briggs, & Nunamaker, 2006) could be used to supplement learning, providing trainees with the ability to review more difficult or detailed information at their convenience.

**CONCLUSION**

This study was motivated by the desire to better understand how pre-training socialization (e.g. face-to-face, online, or no socialization), training complexity, and their interactive relation affected learning in an e-learning setting. Using a controlled laboratory experiment, the results indicated that both training complexity and socialization affected learning. This illustrates the importance of understanding the complex set of relationships between design, trainees and training outcomes. Only by understanding these relationships, will we be able to more effectively design e-learning to meet the needs of all trainees.

**REFERENCES AVAILABLE FROM THE AUTHORS**