Industrial and Organizational Psychology, **1** (2008), 496–500.

The Role of Technology in Enabling Third-Generation Training and Development

DEBORAH E. RUPP
University of Illinois at Urbana–Champaign

ALYSSA MITCHELL GIBBONS
Colorado State University

LORI ANDERSON SNYDER
University of Oklahoma

Third-generation learning requires and is maximized by rich communication. The ability of Web-based instruction (WBI) to provide this richness represents one challenge to the development of high-tech social constructivist approaches to learning. Media richness theory (Daft & Lengel, 1986) has long argued that communications vary in richness—that is, the degree to which they allow the use of multiple channels (such as verbal and nonverbal communication), offer opportunity for immediate feedback, and are personal, allowing social interaction that may promote constructivism. Face-to-face communication has traditionally been viewed as the richest medium.

The use of rich media is expected to be most important in situations that are ambiguous and unfamiliar or that cannot be solved by simply following rules or procedures. This suggests that the very domains that Kraiger (2008) identifies as most amenable to social constructivist approaches to instruction—those where "there is very often more than one way to carry out one's job, and performance is determined as much by social norms as job descriptions" (p. 461)—may be those that suffer the most from a loss of media richness. The traditional tools of WBI, such as e-mail, discussion boards, and chat, have limited richness. However, advances in technology have enabled Web-based communication that is as rich as or *richer than* face-to-face communication and that is uniquely suited to facilitating dialogue and the social construction of information. We wish to highlight two such innovations—avatar-based instruction (which may incorporate virtual reality [VR] technology) and video- and Web-enabled developmental assessment centers (DACs)—and explain how

Correspondence concerning this article should be addressed to Deborah E. Rupp. E-mail: derupp@illinois.edu

Address: Institute of Labor and Industrial Relations, Department of Psychology, University of Illinois at Urbana–Champaign, 504 East Armory Avenue, Champaign, IL 61801

Deborah E. Rupp, Institute of Labor and Industrial Relations, Department of Psychology, University of Illinois at Urbana–Champaign; Alyssa Mitchell Gibbons, Department of Psychology, Colorado State University; Lori Anderson Snyder, Department of Psychology, University of Oklahoma.

The authors would like to thank Myungjoon Kim, The Korean Psychological Testing Institute, Inscape Software, Jon Bricker, Mark Johnson, Erik Young, and Autumn Krauss for their assistance with this project.

these technologies may be even more suited to third-generation instruction than the methods Kraiger describes.

Avatar-Based Instruction and VR

In one variant of VR instruction, teachers and learners attend a traditional looking simulated classroom environment (or other appropriate training setting) via the computer. The learners can see the instructor's avatar, as well as the avatars of the other learners sitting with them in the classroom.

Learner–instructor construction of knowledge. Research suggests that learning can be enhanced above and beyond what is possible with traditional classroom instruction because of the ability of the systems to strategically filter behaviors displayed by instructors and learners in a way that maximizes learning (Bailenson, 2008). For example, research at Stanford's Virtual Human Interaction Lab (2008) has shown that learning is enhanced when students receive moderate amounts of eye contact from the instructor. Through the use of VR and avatar-based instruction, the instructor avatar can be programmed to give every learner that optimal level (which well surpasses the eye contact capacity of any one instructor). Similar positive effects on learning outcomes have been found for facial mimicry. That is, algorithms have been written so that the learner receives facial expressions similar to those he/she is displaying, leading to increased attention and interest. Instructor behavior may also be tailored to individual needs in other ways, such as identifying readiness for learning and facilitating exploration of the topic in a way that matches learner style.

These opportunities capitalize on the capabilities of WBI to enhance the learning of individuals through modifying techniques and approaches to best match individual capacities and current knowledge. It also provides an opportunity to maximize interaction between student and instructor, moving beyond video-based lecture and training, to supply true learner–instructor social construction of knowledge. What is especially exciting is that because this is a virtual environment, this can be done for every single learner and among learners—again showing strategic improvements over traditional classroom training.

Learner–learner construction of knowledge. The development of multifaceted self-representations and complex social interaction provides an opportunity for establishing shared meaning through negotiation and collaboration among learners. In VR settings, learners may speak and hear one another, create and share written or visual information, and display and interpret nonverbal cues. WBI scenarios can thus achieve levels of richness that may be present in real-life training environments, such as a group of trainees achieving a common understanding by discussing and mapping concepts related to effective presentation skills, and practicing acting as presenters as well as audience members for other trainees.

Other means of creating third-generation learner–learner environments described by Kraiger are possible as well. Although social constructivism is commonly viewed as development of common understanding of a group of novice individuals through active collaboration and negotiation, individuals may also develop knowledge through social means by interacting with others who already possess more complex understanding of the topic. Vygotsky's (1978) notion of more capable peers, often referred to as *More Knowledgeable Others* (MKOs) represents this possibility, proposing that in their efforts to create an internal understanding of the topic, individuals will seek out information from MKOs, often compiling expertise from multiple sources, which can then be used to create integrated comprehension (Tomei, 2007). The instructor may be seen as an MKO, although in many scenarios, peers in the work or training environment possess substantial knowledge of varying types. In a virtual world, learners may be surrounded with virtual colearners, confederate avatars programmed to interact with the learner in a variety of media. These avatars may represent different approaches to

https://doi.org/10.1111/j.1754-9434.2008.00095.x Published online by Cambridge University Press

problem solving and possess varying types and levels of knowledge, such as modeling a successful customer service interaction or introducing a discussion of approaches to dealing with difficult customers in the virtual breakroom. Through gaining exposure to a spectrum of individuals with knowledge of the topic, the individuals' understanding grows via social interaction.

Applications of avatar/VR instruction. The use of VR may assist in the development of social skills and competencies in addition to job-related knowledge. The Stanford research group has found that individuals come to identify with their avatars and translate situations experienced by the avatar into the real world. Thus, VR has implications for diversity training in that the use of avatars allows for one's physical identity to change—giving people the opportunity to "walk in others' shoes" through virtual interaction with other avatars. After orienting themselves with their virtual identity, demographic features of the avatar can be changed, allowing for a reidentification process. This can also occur during social interactions to build identification in team building or diversity training. The Stanford lab has shown that the efficacy that is built in the virtual world transfers to efficacy in the real world, showing obvious implications for disadvantaged groups (e.g., the physically impaired).

Developmental Assessment Centers

Although not traditionally a method for socially constructed learning, we propose that contemporary formulations of the DAC method (Thornton & Rupp, 2005), coupled with technological advances made in this area (Rupp, 2006, 2008), also allow for third-generation learning via a rich communication medium. Traditionally, a DAC is more objectivist than constructivist, in that competencies and exercise content are predetermined, and both assessment and feedback are generally standardized. That is, DACs are essentially experiential training programs where simulation exercises are used as a means of working with job-relevant competencies and quick and rich feedback is given to participants, tailored to their individual development needs (Rupp et al., 2006). However, when DACs are used solely for development purposes (rather than for personnel decision making), the need for standardization is relaxed, allowing for the inclusion of features that promote socially constructed learning through learner–content, learner–assessor, and learner–learner interaction.

The social construction of competencies and content. For example, rather than presenting the competencies to participants, a DAC may be designed to allow competencies to emerge through a collective discovery process, thus further facilitating the social construction of knowledge. Indeed, Rogers (2005) has shown that DAC participants can and do show alpha, beta, and gamma change in dimension ratings, indicating not only an improvement on objective criteria but also a deepening in their conceptualization of the competencies themselves. Future research might seek to track collective gamma change in third-generation DACs where competencies emerge and are defined collectively through shared experiences. Content can also be socially constructed: One of the present authors is currently developing a DAC in which exercises will be generated based on scenarios described by the participants.

Learner–instructor construction of knowledge. Self-assessment is increasingly common in DACs, encouraging learners to examine their own understanding of the competencies and take part in generating their own feedback (Griffiths & Goodge, 1994). This facilitates a constructivist approach to feedback, in which learner–instructor interaction takes the form of participant and assessor working together to create, communicate, and evaluate the meaning of successful performance across dimensions. Indeed, in some DACs, the participants themselves function as the assessors (Povah, 1986) or perform their own integration of feedback from multiple

https://doi.org/10.1111/j.1754-9434.2008.00095.x Published online by Cambridge University Press

sources (Oliver, 2006). Provision of specific behavioral feedback by assessors is based on personalized communication and strategies, as well as individualized goal setting to maximize motivation and engagement. Assessors thus provide the counseling, supporting, and advising role necessary to learner–instructor interaction in third-generation instruction.

Learner-to-learner construction of knowledge. DAC exercises often include peers and role players. These individuals may influence social construction of the meaning of competencies by modeling examples of both positive and negative performance. Peer assessment and feedback may also be incorporated. When participants function as assessors and complete frame-of-reference training together, the meaning of the dimensions is socially constructed even if the dimension labels are predefined by the organization. In addition, some DACs incorporate group-based development planning and follow-up, where participants share and discuss their learning experiences with one another (Ballantyne & Povah, 2004). Others make networking an explicit objective of the DAC process, encouraging participants to develop relationships during the program and remain in contact afterward, essentially creating a community of practice among a cohort of DAC participants (Mongillo, 2008).

Technology and third-generation DACs. Recently, several technological advances have been presented with regard to DAC methodology (Rupp, 2006, 2008). Simulation exercises are being delivered via the Web and computer-adaptive in-baskets, also video-based situational judgment tests (SJTs) are being developed and validated (Olson-Buchanan & Drasgow, 2006). Real-time, secure, and high-quality Web streaming allows for learners and assessors to come together from remote locations. Avatar-based simulation exercises and SJTs are more realistic and affordable than they have ever been before (Inscape Software, 2008). Such advances stand to further facilitate the development and use of DACs designed to promote third-generation learning through high-fidelity communication media, the ability to virtually observe real interactions, and the facilitation of contact between participants and assessors for feedback and follow-up development planning. Further, software is available that can enable the social construction of knowledge through consensus discussions, the delivery of feedback, the formation of development plans, and the carrying out of follow-up activities. Web-based video recordings can facilitate assessor, self-, and peer assessment and feedback, as well as follow-up development and post-DAC learner communities, with participants sharing tips and asking advice over technologies such as e-mail, discussion lists, instant messaging, or video conferencing.

Conclusions

Kraiger's efforts to catalyze a movement toward embracing third-generation instruction and incorporating social constructivist approaches to organizational training and development are timely and important. Our ability as a field to address the technological developments that enable third-generation learning is based on developing and maintaining awareness of and fluency with technology as individuals and as a field, as well as strengthening connections between researchers and practitioners who may have increased contact with such tools. As we have outlined above, sophisticated learning technologies are already being implemented in organizations. We must not lag behind in establishing the validity and utility of such methods.

However, it is important to note that such technologies are not a panacea for the age-old problem of establishing training effectiveness (Kraiger, Ford, & Salas, 1993). The American Psychological Association (APA) has been heavily involved in the creation of standards to guide industrial and organizational professionals who want to incorporate technology into their practices (Naglieri et al., 2004). Whereas these standards recognize that technologically enhanced human resources practices can serve many benefits

https://doi.org/10.1111/j.1754-9434.2008.00095.x Published online by Cambridge University Press

(e.g., cost, speed, convenience, accuracy, scalability), they also advise practitioners to carefully adhere to current ethical guidelines and validation standards. However, the APA acknowledges that new methodologies that are made possible by emerging technologies will "push the boundaries of current psychometric theory, and it is up to psychologists to test and expand the limits of psychometrics to keep pace with the innovations." Thus, a model for developing and validating the effectiveness of third-generation training programs will require the social construction of job-related competencies, the development of learning infrastructures for the collective acquisition of knowledge and skill, the development or outsourcing of technology for delivering the content, the collection of learning data (which will be far more vast in size than what is generated via traditional practices) that must be handled scientifically employee confidentiality), and the evaluation of training effectiveness.

References

Bailenson, J. (2008, April 8). Why digital avatars make the best teachers. *The Chronicle of Higher Education, 54*(30), p. B27. Retrieved April 4, 2008, from chronicle.com/weekly/v54/i30/30b00601.htm

Ballantyne, I., & Povah, N. (2004). Development centres. In I. Ballantyne & N. Povah (Eds.), *Assessment and development centres* (pp. 142–161). Aldershot, Hampshire, UK: Gower.

Daft, R. L., & Lengel, R. H. (1986). Organizational information requirements, media richness, and structural design. *Management Science, 32*, 554–571.

Griffiths, P., & Goodge, P. (1994). Development centres: The third generation. *Personnel Management, 26*(6), 40–43.

Inscape Software Products. (2008). Retrieved June 9, 2008 from www. inscapesoftware.com

Kraiger, K. (2008). Transforming our models of learning and development: Web-based instruction as enabler of third-generation instruction. *Industrial and Organizational Psychology: Perspectives on Science and Practice, 1*, 454–467.

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

Mongillo, M. (Chair). (April 2008). *Leadership development along the pipeline: design, development, and integration*. Symposium conducted at the 23rd annual meeting of the Society for Industrial and Organizational Psychology, San Francisco.

Naglieri, J. A., Drasgow, F., Schmit, M., Handler, L., Prifitera, A., Margolis, A., et al. (2004). Psychological testing on the Internet: New problems, old issues. *American Psychologist, 59*, 150–162.

Oliver, K. (September 2006). *Are "learning centres" the true development centres?* Paper presented at the 33rd annual International Congress on Assessment Center Methods, London.

Olson-Buchanan, J. B., & Drasgow, F. (2006). Multimedia situational judgment tests: The medium creates the message. In J. A. Weekley & R. E. Ployhart (Eds.), *Situational judgment tests: Theory, measurement, and application* (pp. 253–278). Mahwah, NJ: Lawrence Erlbaum.

Povah, N. (1986). Using assessment centres as a means for self-development. *Industrial and Commercial Training, 18*(2), 22–25.

Rogers, A. D. (2005). *Gamma, beta, and alpha change in individuals following a developmental assessment center*. Unpublished doctoral dissertation, Colorado State University.

Rupp, D. E. (2006). *The future is here: Recent advances in assessment center methodology*. Invited talk presented at the Society for Industrial and Organizational Psychology 2nd Annual Leading Edge Consortium, Charlotte, NC.

Rupp, D. E. (2008). *Using technology to enhance assessment and development programs*. Workshop presented at the 23rd annual conference of the Society for Industrial and Organizational Psychology, San Francisco.

Rupp, D. E., Gibbons, A. M., Baldwin, A. M., Snyder, L. A., Spain, S. M., Woo, S. E., et al. (2006). An initial validation of developmental assessment centers as accurate assessments and effective training interventions. *Psychologist-Manager Journal, 2*, 171–200.

Stanford's Virtual Human Interaction Lab Projects. (2008). Retrieved June 9, 2008 from vhil.stanford.edu/

Thornton, G. C., III, & Rupp, D. E. (2005). *Assessment centers in human resource management: Strategies for prediction, diagnosis, and development*. Mahwah, NJ: Lawrence Erlbaum.

Tomei, L. A. (2007). A theoretical model for designing online education in support of lifelong learning (pp. 122–145). In Inoue, Y. (Ed.), *Online Education for Lifelong Learning*. Hershey, PA: Idea Group.

Vygotsky, L. (1978). *Mind in society: The development 7 of higher psychological processes*. Cambridge, MA: Harvard University Press.

https://doi.org/10.1111/j.1754-9434.2008.00095.x Published online by Cambridge University Press