Trainer Opinions of Selected Computer-Based Training Methods

GUNDARS KAUPINS
Boise State University
Boise, Idaho

ABSTRACT. In this study, the author surveyed 138 business professors concerning their opinions of various training methods. The respondents' ratings of computer-based training methods, such as Web-based ones, were lower than the ratings they gave more participative methods, such as internships and live cases. The professors gave higher ratings to Web course options that required more interaction between students and instructors and lower ratings to those involving less interaction, such as typed lectures and videos. The author uses andragogy theory to discuss the implications of these findings.

Technological changes have led universities and corporations to a great reliance on computers and other new technologies. About 70% of 4-year colleges in the United States offer Web courses using WebCT, Blackboard, and related software (Kaeter, 2000). At least 74% of companies with 100 or more employees have used the Internet, and 87% have used CD-ROMS in training (Galvin, 2001).

Researchers have undertaken comparative studies of computer-based and other training methods. Most of them have investigated the usefulness of one or two training methods in accomplishing a few teaching objectives such as learning effectiveness (Burke & Day, 1986; Cooper, 2001; Maul & Spotts, 1993). Relatively few researchers have compared numerous training methods and aggregated them in one easy-to-read chart. Noe (1999) rated 20 training methods on how well they achieved 10 training objectives. He presented his 200 (20 x 10) ratings on a grid to provide training practitioners with a guide showing which training methods work best for different training objectives. He based his ratings on his experience and a literature review.

Grid surveys provide a more empirical analysis because they may include many raters' comparisons on effectiveness regarding several training objectives. Survey results are displayed in one simple chart for training practitioners.

Literature Review

Grid Survey Research

Several researchers have used grid surveys training method comparisons (Carroll, Paine, & Ivancevich, 1972; Kaupins, 1997, 1998; Mayo & DuBois, 1987; Newstrom, 1980). The surveys have been included in management textbooks, training guides, and training programs as a basis for comparing training methods (Goldstein, 1974; Good, 2000; Hodgetts & Kroeck, 1992; Wexley & Latham, 1981). They also have been incorporated in the literature reviews of experiments on the effectiveness of various training methods (Bowman, 1978; Erffmeyer, 1992).

Through surveys of training practitioners, Carroll et al. (1972), Newstrom (1980), and Kaupins (1997, 1998) compared the effectiveness of training methods in fulfilling at least six training objectives. The six objectives that they studied in common were knowledge acquisition, problem solving, participant acceptance, changing attitudes, interpersonal skills, and knowledge retention. Television lectures scored lowest on accomplishment of most objectives. Highly rated training methods included role plays, games, and conferences. Kaupins (1997, 1998) also included highly rated live cases and internships.

The results of these grid surveys support the major principles of andragogy theory, also known as the study of adult learning. Knowles (1984) suggested that adults learn more effectively through active training methods (e.g., role plays) and application of knowledge based on real-life events (e.g., internships, live cases). Keyes (1990) suggested that adults learn best through active involvement in the classroom, though many methods of training are acceptable. Computer-based instruction might provide some of the participation, active involvement, and realism endorsed by andragogy theory.

Computer-Based Training Research

Previous grid research has only involved computer conferencing (Kaupins, 1997; 1998) and computers in general (Mayo & DuBois, 1987). Computer conferencing in Kaupins's studies ranked 15th overall out of 20 teaching methods. Instructors using computers, however, have various options that influence the amount of participant involvement and interaction: CD-ROMs, diskettes, internal networks, and Web courses. Through the Web, students can receive lecture materials via audio, video-on-demand interactive video, typed lectures, and online chats (Lundsten & Doiel, 2000).

Research on the effectiveness of Web courses, CD-ROM use, and other computer-based training methods has shown mixed results. For example, Dominguez and Ridley (1999) compared the effect of Web courses with that of traditional training (including lectures, discussions) on student learning. They found no significant differences in grades between the online and offline sections of the same courses. In a study of 77 business students, Selwyn, Marriot, and Marriot (2000) found that students' attitudes toward the Web courses, though generally positive, were influenced by their initial introduction to the Web. Extended introductions tended to lead to more positive feelings associated with the Web.

Coinciding with much grid survey research and andragogy theory, other research has shown that greater human interaction helps students solve problems. Web courses that have such interaction have been associated with greater problem-solving capabilities (Jareka, Bonk, & Lehtinen, 1999), and greater interaction with the instructor and fellow students has been associated with improved student attitudes to Web-based courses (Cooper, 2001; Ryan, Carlton, & Ali, 1999; Teh, 1999). The lack of direct physical connection between the trainee and the trainer may be a significant barrier to a student's developing a positive attitude to computers.

Purpose

My goal in this study was to investigate trainer perceptions of various Web options, compare Web options with other common training methods, and present the analysis in an easy-to-read grid for potential use by training practitioners. Web courses can involve a large range of participation through the inclusion of videos, interactive videos, online chats, and audio. Prior grid or other research has not focused on the effectiveness of Web options in helping instructors achieve training objectives. Web courses with more personal interaction with the instructor tend to be given higher ratings than are courses involving less interaction.

Method

Sample

Respondents were 138 business professors randomly obtained from the membership directory of the American Society for Training and Development (2000) in Spring 2001. Previous grid researchers have also included corporate trainers in their studies (Carroll et al., 1972; Kaupins, 1997; Newstrom, 1980). Respondents averaged 9 years of training experience; 74% trained both managers and nonmanagers. Sixty-two percent worked in companies with 500 or more employees, and about 20% had taken or had taught Web courses. The return rate was 31% (450 letters sent).

Questionnaire

Using a scale ranging through 1 (*not effective*), 2 (*limited effectiveness*), 3 *(moderately effective*), 4 (*quite effective*), 5 (*highly effective*), and X (*no opinion*), respondents rated the effectiveness of 20 training methods regarding six objectives: knowledge acquisition, problem solving, participant acceptance, changing attitudes, interpersonal skills, and knowledge retention. Respondents gave 120 ratings (20 training methods x 6 training objectives). These objectives have been used in previous grid research (Carroll et al., 1972; Kaupins, 1997; 1998; Newstrom, 1980).

In this study, I incorporated some of the training methods from prior grid research (e.g., Carroll, et al., 1972, Kaupins, 1997) such as lectures, role-plays, and sensitivity training. New training options added to the present research include CD-ROMs, interactive videos, and Web-based training using on-line chats, videos, audio, or typed lectures.

Performing 120 ratings (e.g., "3" ratings for each training method across all training objectives) could lead to respondent fatigue or boredom and result in no responses or highly patterned ones. To reduce such potential fatigue effect and increase reliability, I asked about half of the respondents to rate the training methods in one order and the other half in reverse order.

Results

Main Survey

The data in Table 1 show that internships scored the highest among the 20 training methods for every training objective. Internships received the highest overall average, 4.53 on the 5-point scale. This was the average across the six dimensions of the survey. One-on-one instruction received the second highest overall rating, and live cases scored third.

Computer-based training generally ranked in the lowest half among the 20 training methods. Web courses with typed lectures ranked 17th overall (averaging the six training objectives), with audio ranking 19th, video 15th, and interactive television 13th. Programmed instruction ranked 14th. The only exceptions to low rankings for computer-based methods were Web courses with online chats (8th) and CD-ROMs (9th).

Many technology-based training methods scored especially low in development of interpersonal skills. Ratings of 2 or under on this dimension occurred with almost every type of Web course, television (broadcast and interactive), video, and radio training option. Radio's interpersonal skills rating was the lowest at 1.61.

Survey Comparability

The results of this study appear to be comparable to those of Kaupins (1997, 1998), Carroll et al. (1972), and Newstrom (1980). In Table 2, I summarize the Spearman Rho correlations among the rankings of the five training grid

studies for the six training methods that overlap among the studies. All the Spearman Rho correlations were significant (at the .05 two-tailed level) between the present study and the four other studies. The strongest correlation, .96, occurred between the present study and Newstrom (1980). Case studies and role-plays ranked high in all of the studies. Lectures appeared to receive higher ratings in the Kaupins (1997, 1998) studies and the present study than they did in the earlier studies.

Statistical Checks

Respondent level of Web familiarity might be a factor associated with Web course ratings. However, in this study, correlations between respondent experience with the Web and Web ratings failed to show many significant correlations. Of 24 unique correlations possible (4 Web course methods x 6 training objectives), 5 correlations were significant (.05 two-tail level). Three of the 5 were positive correlations between Web course experience and interpersonal skills ratings for Web methods: The correlation for videos was .22, that for Web with typed lectures was .25, and that for Web with audio, .21. Trainee experience, company size, and level of

TABLE 1. Training Method Ratings: Means and Ranks (in Parentheses)

Teaching methods	Sample size[a]	Knowledge acquisition	Problem solving	Participant acceptance	Changing attitudes	Interpersonal skills	Knowledge retention	Overall scores[b] and (ranks)
Case study, live case	122	4.34 (3)	4.38 (2)	4.09 (3)	3.92 (3)	4.14 (3)	4.33 (3)	4.20 (3)
Case study, simulated	123	3.76 (5)	4.01 (4)	3.58 (7)	3.42 (6)	3.44 (6)	3.81 (6)	3.67 (5)
CD-ROM	125	3.26 (8)	2.95 (9)	2.81 (11)	2.79 (9)	2.44 (10)	3.06 (9)	2.89 (9)
Games	122	3.69 (7)	3.78 (6)	3.75 (4)	3.44 (5)	3.55 (5)	3.82 (5)	3.50 (6)
Internships	130	4.63[d] (1)	4.61[c] (1)	4.47[c] (1)	4.29[c] (1)	4.52[c] (1)	4.64[d] (1)	4.53 (1)
Lecture with questions	138	3.94 (4)	3.20 (7)	3.65 (6)	3.14 (7)	3.02 (8)	3.45 (7)	3.40 (7)
One-on-one instruction	124	4.61 (2)	4.20 (3)	4.19 (2)	4.00 (2)	4.18 (2)	4.44 (2)	4.27 (2)
Programmed instruction	111	3.12 (13)	2.92 (10)	2.74 (13)	2.59 (13)	2.09 (13)	2.97 (12)	2.74 (14)
Radio	120	2.45 (20)	1.93 (20)	2.23 (20)	2.22 (20)	1.61 (20)	2.39 (20)	2.14 (20)
Roleplays	112	3.71 (6)	3.98 (5)	3.70 (5)	3.58 (4)	4.02 (4)	3.99 (4)	3.83 (4)
Self-study materials	109	3.26 (9)	3.13 (8)	2.88 (10)	2.65 (12)	1.94 (14)	3.33 (8)	2.87 (10)
Sensitivity training	96	2.59 (19)	2.69 (14)	2.69 (14)	3.07 (8)	3.20 (7)	2.81 (16)	2.84 (11)
Television–broadcast	118	2.95 (15)	2.27 (18)	2.66 (15)	2.47 (18)	1.87 (15)	2.82 (15)	2.51 (16)
Television–interactive	112	3.23 (10)	2.75 (12)	2.88 (9)	2.71 (10)	2.38 (11)	2.98 (10)	2.82 (12)
Videos	127	2.91 (16)	2.17 (19)	2.59 (17)	2.55 (16)	1.83 (19)	2.80 (17)	2.47 (18)
Web with audio	101	2.88 (17)	2.49 (17)	2.47 (18)	2.49 (17)	1.86 (17)	2.69 (19)	2.31 (19)
Web with interactive videos	94	3.12 (12)	2.61 (15)	2.75 (12)	2.57 (14)	2.17 (12)	2.98 (11)	2.80 (13)
Web with chats	97	3.18 (11)	2.89 (11)	3.03 (8)	2.66 (11)	2.67 (9)	2.94 (13)	2.90 (8)
Web with typed lectures	100	2.88 (18)	2.54 (16)	2.46 (19)	2.41 (19)	1.85 (18)	2.73 (18)	2.48 (17)
Web with videos	98	3.00 (14)	2.71 (13)	2.63 (16)	2.56 (15)	1.86 (16)	2.84 (14)	2.60 (15)

[a]Average sample size per training method across the six training objectives. [b]Average training method rating across the six training objectives based on scale ranging through 1 (*not effective*), 2 (*limited effectiveness*), 3 (*moderately effective*), 4 (*quite effective*), and 5 (*highly effective*). [c]Top ranked method rated more effective than methods ranked 2 or lower for this objective at .05 level of significance. [d]Top ranked method rated more effective than methods ranked 3 or lower for this objective at .05 level of significance.

TABLE 2. Correlations Between Ranks of Five Training Grid Studies[a]

	Carroll et al. (1972)	Newstrom (1980)	Kaupins (1997)	Kaupins (1998)	Present study
Carroll, Paine, & Ivancevich (1972)	1.00	.79*	.54*	.07	.54*
Newstrom (1980)		1.00	.66*	.43*	.96*
Kaupins (1997)			1.00	.64*	.75*
Kaupins (1998)				1.00	.73*
Present study					1.00

[a]Each correlation represents the Spearman Rho correlation between the ranks of nine training methods in common between five training grid studies (Kaupins, 1998; Kaupins, 1997; Newstrom, 1980; Carroll, et al., 1972; present study). The training methods are case studies, lectures, games, programmed instruction, role plays, sensitivity training, and television lectures.

*Spearman Rho correlations significant at .05 level (two-tailed test).

trainees failed to show many significant correlations.

A potential problem with training grid research is multicollinearity among training method ratings across training objectives. Training methods that were rated low overall had low ratings across all training objectives. In the present study, all correlations between training objectives shown on Table 1 were statistically significant ($p < .01$; $N = 20$ training methods). The Kaupins (1997, 1998) studies' results for the six training objectives in common with the present study also had statistically significant correlations between all training objectives ($p < .01$, $N = 20$ training methods). Carroll et al. (1972) and Newstrom (1980) found similar high correlations, but significance tests were limited because of a low sample size ($N = 9$ training methods).

Removal of all patterned responses (same ratings given for a training method across all training objectives) yielded no significant differences in any of the grid ratings ($p < .05$). Removal of patterned responses resulted in an average drop of 26 responses (by 138 respondents) for each of the grid ratings.

Discussion

Andragogy theory might suggest why electronic-based training methods using the Web, radio, and interactive television did not rank higher than eighth overall. Technology-based training methods might not be as participative or "real-life" as internships and live cases. The lower ratings for the training equipment concurred with observations by Maul and Spotts (1993) and Keyes (1990), who found that instructor-led training tended to obtain higher scores than technology-led training in measures of amount learned and popularity.

It appears that the Web course options involving the most interaction between students or with the trainer received higher rankings (online chats and interactive television). Typed lectures, the Web course that may involve the lowest sensory contact for students, had the lowest ranking among the Web options.

In this study, the participants gave Web courses, programmed instruction, television, CD-ROMs, videos, and self-study materials relatively high ratings for knowledge acquisition and knowledge retention but low ratings for interpersonal skills development. For example, self-study materials scored below 2 for interpersonal skills development but close to 3.5 for knowledge acquisition and knowledge retention. These results appear similar to those of Carroll et al. (1972) and Newstrom (1980), who found that programmed instruction, movies, and other training methods using equipment received higher marks for knowledge acquisition and retention than for interpersonal skills.

In the present study, Web and non-Web technologies received comparable rankings. For example, Web courses with audio ranked 19th overall, whereas radio ranked 20th. Web courses with videos ranked 15th overall, whereas videos ranked 18th. Web courses with interactive videos ranked 13th, and interactive television ranked 12th.

Future Research

Limitations of this study and the Carroll et al. (1972), Newstrom (1980), and Kaupins (1997, 1998) studies could be a guide for future investigations. CD-ROMs received the highest overall scores among the computer-based training methods. However, there are many types of CD-ROMs, which can include videos, audio, typed lectures, and cartoons.

Researchers can further study multicollinearity across training objectives by investigating additional training objectives. Speed, preparation time, cost, acceptability, verbal information, intellectual skills, cognitive strategies, motor skills, meaningfulness, feedback, and Kirkpatrick's (1976) four levels of training evaluation (reaction, learning, behavior, results) can be measured. Some of these measures might be negatively associated with the training objectives of this study. For example, Kaupins (1997) showed a negative correlation between "reducing training costs" and most of the training objectives ($p < .05$, $N = 20$ training methods).

Multicollinearity across training objectives could also be studied through measures of respondent fatigue. In the present study, respondents made 120 ratings on a grid (20 training methods x 6 training objectives). High correlations might be reduced if respondents rated fewer training methods and focused on each training method in more detail.

Besides the many other training objectives that can be investigated, numerous other training methods and samples can be compared. Some computer-based training methods include diskettes, Intranet, virtual reality, and statistical packages. Future research can also focus on other populations, such as training experts, professors, students, and managers, with commensurate control variables such as gender, level, age, and training method familiarity.

Summary

The four Web-course options in this study received overall rankings ranging from 8th to 19th among 20 training methods. More participatory Web options, such as chats, scored higher than the less participative options, such as audio. CD-ROMs ranked 9th overall. These results are supported through andragogy theory, which suggests that adults prefer more participative and interactive training methods.

REFERENCES

American Society for Training and Development. (2000). *American Society for Training and Development membership directory*. Available: http://www.astd.org

Bowman, J. S. (1978). Managerial theory and practice: Transfer of knowledge in public administration. *Public Administration Review, 38,* 567–570.

Burke, M. J., & Day, R. R. (1986). A cumulative study of the effectiveness of managerial training. *Journal of Applied Psychology, 71,* 232–245.

Carroll, S. J., Paine, F. T., & Ivancevich, J. J. (1972). The relative effectiveness of training methods—Expert opinion and research. *Personnel Psychology, 25,* 495–509.

Cooper, L. W. (2001). A comparison of online and traditional computer applications classes. *T.H.E. Journal, 28,* 52–58.

Dominguez, P. S., & Ridley, D. (1999). Reassessing the assessment of distance education courses. *T.H.E. Journal, 27,* 70–76.

Erffmeyer, R. C. (1992). Experiential socialization: Some effects of positive personal reinforcement upon socializing rebellious learners. *Industrial Marketing Management, 21,* 71–85.

Galvin, T. (2001). Industry 2001 report. *Training, 38,* 40–72.

Goldstein, I. L. (1974). *Training: Program development and evaluation*. Belmont, CA: Wadsworth Publishing.

Good, L. (2000). *Merchandising management: Human resources and professional practice* (syllabus). Available: http://www.msu.edu/course/hed/362/good/

Hodgetts, R. M., & Kroeck, K. G. (1992). *Personnel and human resource management*. Fort Worth: Dryden Press.

Jareka, S., Bonk, C. J., & Lehtinen, E. (1999). A theoretical analysis of social interactions in computer-based learning environments: Evidence for reciprocal understandings. *Journal of Educational Computing Research, 21,* 363–388.

Kaeter, M. (September 2000). Virtual cap and gown. *Training, 37,* 114–122.

Kaupins, G. E. (1998). Management professor opinions of twenty teaching methods. *International Journal of Business Disciplines, 8,* 62–74.

Kaupins, G. E. (1997). Trainer opinions of popular corporate training methods. *Journal of Education for Business. 73,* 5–8.

Keyes, J. (1990, October 22). Stimulating students: Technology-driven instruction can spice up training sessions. *Computerworld, 24,* 113.

Kirkpatrick, D. L. (1976). Evaluation of training. In R. L. Craig (Ed.), *Training and development handbook* (2nd ed., Chapter 18). New York: McGraw-Hill.

Knowles, M. S. (1984). *The adult learner: A neglected species* (3rd ed.). Houston: Gulf Publishing.

Lundsten, A., & Doiel, R. (2000). Digital video and Internet2: Growing up together. *Syllabus, 14*(August), 12–16.

Maul, G. P., & Spotts, D. S. (1993). A comparison of computer-based training and classroom instruction. *Industrial Engineering, 25,* 25–27.

Mayo, G. D., & DuBois, P. H. (1987). *The complete book of training: Theory, principles, and techniques.* San Diego: University Associates.

Newstrom, J. (1980). Evaluating the effectiveness of training methods. *Personnel Administrator, 25,* 58.

Noe, R. A. (1999). *Employee training and development.* Boston: McGraw-Hill.

Ryan, M., Carlton, H., & Ali, N. S. (1999). Evaluation of traditional classroom teaching methods versus course delivery via the World Wide Web. *Journal of Nursing Education, 38*, 272–277.

Selwyn, N., Marriot, N., & Marriot, P. (2000). Net gains or Net pains? Business students' use of the Internet. *Higher Education Quarterly, 54,* 166–186.

Teh, G. P. (1999). Assessing student perceptions of Internet-based online learning environments. Geography classroom environment inventory. *International Journal of Instructional Media, 26,* 397–402.

Wexley, K. N., & Latham, G. P. (1981). *Developing and training human resources in organizations*. Glenview, IL: Scott, Foresman.