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EXPERIENTIAL LEARNING AND LEARNING ENVIRONMENTS: THE CASE OF ACTIVE LISTENING SKILLS

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Social work education research frequently has suggested an interaction between teaching techniques and learning environments. However, this interaction has never been tested. This study compared virtual and face-to-face learning environments and included active listening concepts to test whether the effectiveness of learning environments depends on teaching techniques. This study evaluated the effectiveness of two learning environments (virtual, face-to-face) and two teaching techniques (experiential, lecture plus discussion) on satisfaction, perception of learning gains, and learning of listening skills. Findings support that both virtual and face-to-face experiential learning are teaching techniques that can develop listening skills, but the interaction was the opposite of that originally predicted. Face-to-face learning environments provided better results than virtual learning environments only when experiential learning techniques were used.

VIRTUAL LEARNING ENVIRONMENTS (VLEs) are computer- and Internet-based software systems that facilitate the management and delivery of educational content for instructors and learners. These environments allow students, without limitation of time and place, to access learning content. They also provide tools and learning resources to assist instructors in delivering and managing course content, such as discussion boards, document sharing systems, uploading and downloading

of content, and student assessment (Van Raaij & Schepers, 2008). Two popular VLEs are Blackboard and Moodle. This article concerns content delivery rather than the course management features of a multimedia, game-based virtual environment. It addresses two related subjects in the social work education literature: the effectiveness of virtual environments for learning and the potential to use experiential learning in Mexican social work schools.

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Background

Since 2001, Council on Social Work Education (CSWE) guidelines have called for outcomes showing that distance education is comparable to face-to-face (F2F) education (Moore, 2003). As a result, a growing corpus of evidence has supported equivalent learning outcomes in comparison studies between virtual and F2F learning environments in terms of student satisfaction, performance (Frey, Yankelov & Faul, 2003; Moore, 2003), perceptions of learning (Siebert, Siebert, & Spaulding-Givens, 2006), and skills acquisition (Ouellette, Westhuis, Marshall, & Chang, 2006; Siebert et al., 2006). F2F learning environments are classroom settings where instructors and students interact to achieve course objectives. F2F education is used here for comparison with VLEs, which are computer- and Internet-based software systems that facilitate the management and delivery of educational content for instructors and learners.

Equivalent learning outcomes are a double-edged sword. Some authors (Brabazon, 2002) state that equivalent learning outcomes suggest no reason to invest in educational technology beyond a "customer service" approach. In opposition to that stance, other researchers suggest that technology can help to improve teaching effectiveness (Schoech & Helton, 2002). Russell (1999) reviewed 355 research reports comparing different kinds of educational technologies before stating a conclusion called the "no significant difference phenomenon." According to this principle, it is not technology, but the teaching techniques behind it that produce different learning outcomes. This important distinction has often been overlooked in the social work

literature that explores equivalent learning outcomes between virtual and F2F learning environments.

Since the 1990s, experiential learning has been a teaching technique extensively used to teach social workers' skills in the United Kingdom and the United States (Goldstein, 2001; Taylor, 2004). Experiential learning (EL) proposes that effective learning is influenced by a cycle of experimentation, reflection, research, and exercising (Gibbons & Gray, 2002; Goldstein, 2001; Horwath & Thurlow, 2004). According to Horwath and Thurlow (2004), studies showing the effectiveness of EL on research outcomes are in their infancy. However, because EL is supported by hands-on practice frameworks such as active learning (Chickering & Gamson, 1999) and reflective thinking (Dewey, 1998), it seems plausible to construct VLEs that incorporate EL (i.e., Abell & Galinsky, 2002; Cummins, Sevel, & Pedrick, 2006; McCarty & Clancy, 2002). Whereas research suggesting success from EL is still in the early stages of development, initial findings from that perspective suggest its plausibility (Rocha, 2000).

The setting for this study is the Autonomous University of Nuevo Leon (UANL). UANL (Mexico) established its bachelor in social work (BSW) program in 1968, Mexico's first master of social work (MSW) program in 1971, and Mexico's first PhD program in social work in 1997. The PhD program was funded by initiative of the University of Texas at Arlington (UTA), School of Social Work (SSW), and started as a dual program between UTA and UANL. UANL started a PhD program with courses all in Mexico in 2003. The main focus of UANL's social work programs is in

community, for practice (BSW), administration (MSW), or research (PhD). The BSW program at UANL SSW was reshaped in 2006 to mirror international educational changes in the social work arena. Two main changes in the 2006 curricula were a focus on human development, in addition to the traditional concerns of social work, and a skill-based profile for graduates. According to UANL guidelines, the skill-based curriculum provides students a focus on communication, technology, and evaluation by using a hands-on practice teaching approach delivered throughout the curriculum.

EL as a teaching technique for skills training has no antecedents in Latin America. Because CSWE guidelines and social work educators have conceived EL and training in skills for social workers as a unit (Horwath & Thurlow, 2004; Miller, Kovacs, Wright, Corcoran, & Rosenblum, 2005; Wilson et al., 2005), the new curricula in Mexico provided a unique opportunity to test the effectiveness of EL principles in F2F and VLEs to teach social workers basic skills and more specifically, to teach basic active-listening skills (ALS).

Active Learning

Active learning (AL) is a synonym for the learning-by-doing stage of the EL model. AL is defined as a framework of five principles for effective teaching: (1) contact between students and faculty, (2) contact among students, (3) active experiential learning, (4) more time on task, and (5) respect for different ways of learning (Chickering & Gamson, 1999). DeBard and Guidera (1999/2000) postulated that principles of AL may be successfully extrapolated to virtual learning environments because

asynchronous communication (e.g., e-mail, electronic mailing lists) and tools to construct a sense of community in innovative learning environments (e.g., helping and peer-tutorial tools) led to greater satisfaction, perception of learning, and cognitive learning. A typical teaching technique is to deliver a lecture and then open the floor for a discussion around the lecture subject. This technique is defined in this article as the lecture-plus-discussion approach (L+D). L+D is the traditional way to teach, not just in social work but also throughout the social sciences as a whole. This teaching technique also may be used in VLEs, for example, by presenting a PowerPoint presentation and then starting a chat or electronic mailing list discussion.

Measuring Learning

Learning is not just a combination of inputs and outputs; it also involves the process or learning environment as a key factor. That is why evaluating the role of learning environments has recently become an issue in measuring learning. In exploring the relationship between environments and learning, a recent comprehensive meta-analysis offered evidence that human contact and satisfaction with this contact (affective components) are not preconditions of effective learning (Witt, Wheelless, & Allen, 2004).

Other meta-analyses comparing distance and F2F education support the general conclusions that satisfaction is slightly higher in F2F than in distance education (Allen, Bourhis, Burrell, & Mabry, 2002), but otherwise performance is slightly higher in distance education than in F2F education (Allen et al., 2004; Waxman, Connell, & Gray, 2002). Goldstein

(2001) distinguished four kinds of learning, and corresponding learning environments in social work, as (1) affective, (2) perceptual, (3) cognitive, and (4) behavioral. This classification is consistent with Mayer (2001), which proposed a multimedia cognitive theory. According to that theory, principles of learner-centered construction of multimedia learning environments should derive from cognitive theory, be consistent with empirical research, and be feasibly applied to new multimedia learning situations. Mayer stated that the human brain learns by joining what people hear and see, then processes in terms of remembering and understanding.

In summary, a corpus of evidence suggests that, beyond learning environments, teaching techniques differentiate learning. EL supporters have maintained that better learning environments influence whether learners enjoy the experience. They suggest that, as a result of enjoying learning experiences, learners become more satisfied and also perceive that they learn more. However, the available evidence has not clearly demonstrated that variables such as satisfaction and perception of learning gains are related to how much people learn.

This research tested the effectiveness of two different learning environments, virtual and F2F, with two teaching techniques, EL and L+D. Based on the no significant difference hypothesis and comparison studies in social work education, it was hypothesized that direct effects, or outcomes, should come from different teaching techniques and also from different learning environments. Although comparison studies suggest an interaction between teaching techniques and learn-

ing environments, that interaction has not been tested. This research addressed the research question: What are the main and interaction effects of using experiential learning versus L+D in F2F and virtual learning environments that teach the principles of active-listening skills?

Method

Hypotheses

Based on the review of the literature, a study was designed with the following hypotheses to test the main and interaction effects of four interventions involving two learning environments and two teaching technologies.

Hypotheses on teaching techniques. EL has been used extensively in social work education and has been proposed by the CSWE as the most effective way to teach social work skills. Consequently, the hypotheses on teaching techniques are as follows:

- H1. Exposure to experiential learning (EL) relates to statistically higher scores on satisfaction than exposure to L+D.
- H2. EL relates to higher scores on perception of learning gains than L+D.
- H3. EL relates to statistically higher scores on learning than L+D.

Hypotheses on learning environments. The no-significant difference hypothesis suggests that no significant differences exist in the technologies used to build learning environments. The same literature states that differences rely on students' satisfaction and perceptions of learning (virtual students frequently score higher), but not on actual learning. Conse-

quently, the hypotheses of learning environments are stated as follows:

- H4. Exposure using a virtual learning environment (VLE) relates to statistically higher scores on satisfaction than exposure using an F2F learning environment.
- H5. VLE relates to higher scores on perception of learning gains than F2F.

Interaction hypotheses. The literature review suggests that teaching techniques and the kind of learning environment used in teaching are related; constructivist approaches seem related more to technology because of their hands-on practice approach. However, it is hard to find evidence of research that combines the test of those variables. Consequently, the interaction hypotheses are stated as follows:

- H6. A VLE relates to statistically higher scores on satisfaction when using EL rather than L+D.
- H7. A VLE relates to higher scores on perception of learning gains when using EL rather than L+D.
- H8. A VLE relates to higher scores on learning when using EL rather than L+D.

Research Design

The research design was a 2×2 nonrandomized multiple comparison groups design with pretest from each group (Shadish, Cook, & Campbell, 2002). This design tested the relationships among teaching technique, learning environment, and three dependent variables (satisfaction, perception of learning gains, and learning). *Learning environment* (A) was manipulated by using two levels, F2F (A1) and vir-

tual (A2). *Teaching technique* (B) manipulated two levels: experiential learning and L+D. Four experimental (educational intervention) groups resulted in combined cells by using A and B variables. Learning was used in both a pretest (preknowledge) and a posttest (learning). Satisfaction and perception of learning gains were measured by only a posttest and a self-administered questionnaire. In other words, learning was measured in a design pretest–stimulus–posttest, but the other measures were assessed by using a design stimulus–posttest.

Participants

Participants in this study were mainly freshmen (2nd semester) social work students from UANL. Sophomore (6th semester) students were also invited to participate.

The BSW sample was recruited mainly from the whole freshman population. That population was distributed in five classroom groups of unequal sizes. They were also two classroom groups of sophomores for a total of seven classroom groups as the final sample size. Members of those classroom groups were randomly assigned to the research groups. The whole population in the pretest sample was 174 participants, 145 of them freshmen. Most of the participants were female ($n=164$), and most of them were between 17 and 21 years of age ($n=160$). Despite differences between gender and age groups, sample distribution was homogeneous across experimental conditions. Because some participants did not partake in all required sessions, the total population in the posttest sample was 138 participants. Each group, both pretest and posttest, contained at least 20 participants. Students were invited to

participate as volunteers. F2F groups met in a standard classroom. Virtual groups met in the computer lab. Students were informed of the experimental nature of the research in accordance with the clearance received from UTA’s Institutional Review Board. The final sample size was composed of at least 132 cases for each dependent variable (see Table 1).

Internal and External Validity

Authors such as Abrami and Bernard (2006) and Shadish and colleagues. (2002) have proposed that design quality is a moderator of research findings. The no-significance effects in comparative literature may be due to a tradition of nonrandomized studies and small samples. Following Abrami and Bernard, research findings can be organized around credibility (to what extent the research design really finds what is proposed or the probability that results are due to rival explanations) and applicability (generalization) of the conclusions. The Limitations section elaborates

more about research design limitations and implications for issues such as control and generalization.

Two pilot tests showed that a randomized experimental design was not feasible. Students at the school of social work were in community practicum half of their time, and their mornings were dedicated to attending courses. To conduct a randomized process for each participant would have taken more weeks than were available, thus involving a time threat because of mortality or memory. Alternative explanations by Abrami and Bernard (2006) and Shadish and colleagues. (2002) suggest that a three-step procedure may be used to control chance when randomized experiments are not an option, such as (1) a pretest, (2) equivalence in one or more conditions that potentially constitute a threat, and (3) statistical controls. It is cautioned that nothing replaces experimental control, but this three-step procedure is a reasonable approach to gain both internal and external validity.

TABLE 1. 2×2 Final Sample Size

	L+D	Experiential
F2F	Previous knowledge ^a ($n_1=22/n=154$)	Previous knowledge ^a ($n_2=46/n=154$)
	Satisfaction ^b ($n_1=18/n=134$)	Satisfaction ^b ($n_2=44/n=134$)
	Perceived learning ^b ($n_1=18/n=133$)	Perceived learning ^b ($n_2=43/n=133$)
	Learning ^b ($n_1=18/n=132$)	Learning ^b ($n_2=42/n=132$)
Virtual	Previous knowledge ^a ($n_3=48/n=154$)	Previous knowledge ^a ($n_4=38/n=154$)
	Satisfaction ^b ($n_3=38/n=134$)	Satisfaction ^b ($n_4=34/n=134$)
	Perceived learning ^b ($n_3=38/n=133$)	Perceived learning ^b ($n_4=34/n=133$)
	Learning ^b ($n_3=38/n=132$)	Learning ^b ($n_4=34/n=132$)

Note. F2F=face-to-face; L+D=lecture plus discussion

^aPretest.

^bPosttest.

In this study, participants were not randomly assigned, and the groups did not result in matched samples. Following Abrami and Bernard (2006), a one-way analysis of variance (ANOVA) was conducted to estimate any differences between group means at pretest. Significant differences were not found ($F(3)=0.902, p>0.05$) at the pretest designed to measure Previous Knowledge. The students from the four groups did not differ significantly at the start of the intervention, despite the unequal sample size and freshmen/sophomore distribution. Following Abrami and Bernard, statistical controls were run to test the influence of covariates in the variate. Even by using those three steps (pretest, equivalence in previous knowledge, and statistical control for covariates), results should be viewed with caution because of the non-randomized process of participant selection. That being said, no other plausible influences are considered sources of secondary variance.

Variables and Measures

For measures and whole instruments, contact the first author. Independent variables were *teaching technique* (experiential learning, L+D) and *learning environment* (F2F, virtual). Dependent variables were *satisfaction*, *perception of learning gains*, and *learning*. Control variables were *self-reported grade point average* (GPA) and *days spent between the pretest and the posttest*.

Teaching technique was defined as participation in experiential learning groups or participation in L+D groups.

Learning environment was defined as participation in F2F or virtual learning environments.

Satisfaction was defined as the sum of the scores on a five-item satisfaction index.

Perception of learning gains was defined as the students' perceptions of the extent to which the students learned. This scale used the sum of scores in a 10-item scale. Participants scored from 10 (scoring 1 point for each item) to 50 (scoring 5 points for each item).

Learning of active listening concepts and skills was operationalized as to what extent participants recalled definitions and concepts of active-listening skills (Mayer, 2001). This measure reflected the total of the correct answers to 16 items.

Validity and Reliability

Two training/pilot sessions were run in a convenience sample of bachelor in psychology (BPsych) students in November 2006 and February 2007. Those training sessions were specifically useful for three purposes. First, they validated that instructors understood the nature and logic of the intervention. Second, time assumptions from the evaluation could be evaluated in real settings. Third, posttest data gathered in February 2007 allowed validity, reliability, and item analyses to be run. The posttest was applied in just one pilot session (February 2007).

Validity and reliability results were as follows.

Satisfaction. An exploratory factor analysis was performed to test construct validity for the Satisfaction measure. Principal factors extraction with varimax rotation was performed on the five-item Satisfaction scale for a sample of 41 BPsych students. The factor was internally consistent and well defined by the variables. Cronbach's alpha was 0.78.

Perception of learning gains. This measure was analyzed to ascertain content validity. Cronbach's alpha was 0.813.

Learning. Kuder-Richardson Formula 21 was performed to measure internal consistency. The internal consistency coefficient was 0.77. Item analysis was performed for this specific measure. Four items were discarded from the original measure after computations of Discrimination index (*d*) and Item Difficulty index (*p*). The final score was composed of 16 items.

Procedure

The complete intervention phase lasted during four different sessions along a 4-week period on March 2007. There were three different stages: a pretest, three intervention sessions, and the posttest.

Interventions. Interventions were designed to deliver contents on nine basic active listening skills: (1) empathic responding, (2) self-disclosure, (3) positive feedback, (4) summarizing responses, (5) reflecting feelings, (6) paraphrasing, (7) nonverbal behavior, (8) eye contact, and (9) encouragement. Licensed clinical social workers volunteered to act as professionals on videos used in all the learning environments.

Learning environments. Contents were the same throughout all the groups and were delivered by using the same PowerPoint presentation. Also all groups watched the same video examples of role-plays between a clinical licensed social worker and a social work PhD student. Before starting, an introduction with directions was provided to all participants. In the F2F environments a verbal introduction was provided, followed by asking participants whether they had completely understood the directions. A written introduction was provided in the VLE sessions. F2F discussions took

place between instructors and students about the course's content in all the groups, including virtual groups. Discussion stimuli were kept equal in all conditions. VLEs were delivered by compact disk.

Teaching techniques. In experiential learning groups, each session from the educational intervention consisted of a four-step procedure as follows.

1. Participants observed a 3-minute video example of two persons talking in a neutral setting. Licensed social workers using professional reality-based dialogues and active-listening skills took part in the video.
2. Participants discussed the video using several discussion guidelines.
3. Participants received a lecture on listening supported with a visual presentation.
4. Participants performed experiential exercises.

L+D groups were equal in steps 1, 2, and 3. When F2F, participants were assigned to five-member groups and performed role-plays, interchanging professional or client roles throughout the intervention sessions. When in the virtual environment, participants watched role-play videos and then chose one answer from three available options. Participants received feedback that the option selected was either correct or incorrect. The complete intervention strategy and component table is presented in Table 2. The interventions were applied by two "blind" instructors, who were PhD candidates with master's degrees in social work. These two PhD candidates also had similar professional backgrounds. Three

training sessions were performed in November 2006 and February 2007 to ensure that the instructors had a comprehensive understanding of the contents and teaching techniques to be used in the F2F and virtual learning environments. Instructors were randomly assigned to the experimental conditions. After the interventions, the posttest was given to participants in the classrooms.

Results

A two-way between-subjects multivariate ANOVA (MANOVA) was conducted on the three dependent variables—satisfaction, perception of learning gains, and learning. The independent variables were teaching techniques (experiential, L+D) and learning environments (F2F, virtual). Distance measures, skewness and kurtosis

TABLE 2. Description of Groups and Component Table

Group	Stage From Kolb Cycle	Learning Environment Components and Activities
Group 1 F2F and experiential learning (EL)	Concrete experience	Role-play. Participants observed a 3-minute video of a social worker and a client talking in a neutral setting. Licensed social workers using professional, reality-based dialogues with active-listening skills (ALS) performed in the video.
	Reflection/discussion	Discussion. Participants discussed the video using several discussion guidelines; facilitator called for agreements and critiques with ALS.
	Research/lecture	Lecture. Facilitator lectured on ALS supported with PowerPoint (PPT) presentations.
	Exercising	Role-play. Participants were assigned to five-member groups and role-played, either randomly selected to act as a professional or client. Students scored the role-play using a paper-and-pencil form in terms of ALS exhibited. Students exchanged papers at the end of each role-play and graded the papers to provide a feedback score. Roles were changed in the same group; at the end, all members had participated in each role.
Group 2 F2F and L+D	Research/lecture	Reading. Participants read paper-based lessons on active listening concepts.
	Research/lecture	Lecture. Facilitator lectured on ALS supported with PPT presentations.
	Reflection/discussion	Discussion. Participants discussed the contents using several discussion guidelines; facilitator called for agreements and critiques with ALS.

Continued

values, Kolmogorov–Smirnov tests, and normal Q-Q plots confirmed that all model assumptions fit well. A bivariate correlation was computed to test the association among the dependent variables. Pearson correlation was also used to test the variables hypothesized to influence the dependent variables (covariates). The analysis found linearity between satisfaction and perception of learning gains (0.590, $p<0.001$) and

also between satisfaction and learning (0.446, $p<0.001$). Also, perception of learning gains and learning were positively associated (0.296, $p<0.001$). Pearson coefficients showed that covariates of high school GPA, and days spent between the last day that participants received the intervention and the questionnaire did not influence satisfaction, perception of learning gains, or learning.

TABLE 2. Cont.

Group	Stage From Kolb Cycle	Learning Environment Components and Activities
Group 3 Virtual and EL	Concrete experience	Role-play. In a compact disc (CD) environment, participants observed a 3-minute video of a social worker and a client talking. Licensed social workers using professional reality-based dialogues with ALS participated in the video.
	Reflection/discussion	Discussion. Participants discussed the contents using several discussion guidelines; facilitator called for agreements and critiques with ALS.
	Research/lecture	Lecture. In a CD environment participants read a PPT lecture on ALS.
	Exercising	Video game. In a CD environment participants ran an exercise. They watched a video and then selected one of three options. They received feedback that the option selected was correct or incorrect.
Group 4 Virtual and L+D	Concrete experience	Role-play. In a CD environment participants observed a 3-minute video of two people (social worker and client) talking in a neutral setting. Licensed social workers using professional reality-based dialogues with ALS performed in the video.
	Reflection/discussion	Discussion. Participants discussed the contents using several discussion guidelines; facilitator called for agreements and critiques with ALS.
	Research/lecture	Lecture. In a CD environment participants read a PPT lecture on ALS.

Note. F2F=face-to-face; L+D=lecture plus discussion approach.

The Box test of equality of covariance matrix was statistically significant (Box's $M=37.114$, $p=0.009$) indicating inequality of variance-covariance matrices of the dependent variables across levels of the independent variables. In the case of heterogeneity Pillai's criterion was appropriate instead of Wilk's criterion to evaluate the significance of the multivariate effect, as suggested by some authors (Meyers, Gamst, & Guarino, 2006; Tabachnick & Fidell, 2007). Using Pillai's criterion (Table 3), the overall model (dependent variate) composed from satisfaction, perception of learning gains, and learning was significantly affected by the main effects of teaching techniques, Pillai's trace=0.178, $F(3, 123)=8.87$, $p<0.001$, partial $\eta^2=0.178$. Also, the dependent variate was significantly affected by the main effects of learning environment, Pillai's trace=0.132, $F(3, 123)=6.24$, $p<0.001$, partial $\eta^2=0.132$. In addition, the dependent variate was significantly affected by the main effects of the interaction, Pillai's trace=0.128, $F(3, 123)=6.02$, $p<0.001$, partial $\eta^2=0.128$. This finding partially supported hypotheses 1, 2, and 3. In other words, exposure to different teaching techniques (H1), different learning environments (H2), and an interaction between different teaching techniques and different learning environments (H3) did result in different scores in satisfaction, perception of learning gains, and learning.

Teaching Technique Effects on Satisfaction, Perception of Learning Gains, and Learning

Univariate ANOVAs were conducted separately on each dependent measure to determine the locus of the statistically significant

multivariate main effect of teaching techniques. From Table 3 it was observed that teaching technique weakly but significantly affected satisfaction, $F(1, 125)=20.884$, $p<0.001$, partial $\eta^2=0.143$; perception of learning gains, $F(1, 125)=10.599$, $p<0.001$, partial $\eta^2=0.08$; and learning, $F(1, 125)=13.187$, $p<0.001$, partial $\eta^2=0.10$. A post hoc inspection of teaching techniques groups' means suggested that indeed experiential learning students had higher scores in satisfaction ($M=22.76$, $SE=0.319$) than did L+D students ($M=20.43$, $SE=0.40$). It also suggested that experiential learning students had higher scores in perception of learning gains ($M=44.6$, $SE=0.5$) than did L+D students ($M=42.8$, $SE=0.63$). In addition, experiential learning students had significantly higher scores in learning ($M=12.7$, $SE=0.22$) than did L+D students ($M=11.76$, $SE=0.28$). The result of the significant omnibus MANOVA and the post hoc procedures helped derive the preliminary conclusion that H1, H2, and H3 were supported.

Learning Environment Effects on Satisfaction, Perception of Learning Gains, and Learning

Univariate ANOVAs were conducted separately on each dependent measure to determine the locus of the statistically significant multivariate main effect of learning environment. The findings in Table 3 suggest that learning environment weakly but significantly affected satisfaction, $F(1, 125)=12.887$, $p<0.001$, partial $\eta^2=0.093$; perception of learning gains, $F(1, 125)=11.797$, $p<0.001$, partial $\eta^2=0.08$, and learning, $F(1, 125)=7.566$, $p<0.001$, partial $\eta^2=0.06$. A post hoc inspection of learning environment groups' means suggested that indeed

virtual students had significantly higher scores in satisfaction ($M=22.5$, $SE=0.33$) than did F2F students ($M=20.68$, $SE=0.39$). Virtual students also had significantly higher scores in perception of learning gains ($M=44.7$, $SE=0.52$) than did F2F students ($M=41.9$, $SE=0.62$). Likewise, virtual students had significantly higher scores in learning ($M=12.5$, $SE=0.23$) than did F2F students ($M=11.58$, $SE=0.27$). The result of the significant omnibus MANOVA and the post hoc procedures helped derive the preliminary conclusion that H1 and H2 were supported. Also, an unpredicted relationship was found concerning differences between virtual and F2F learning environments on learning. The next section elaborates on this finding.

Interaction Effects on Satisfaction, Perception of Learning Gains, and Learning

There was an interaction effect between learning environment and teaching technique. Findings in Table 4 suggest that the interaction weakly but significantly affected satisfac-

tion, $F(1, 125)=14.311$, $p<0.001$, partial $\eta^2=0.103$; perception of learning gains, $F(1, 125)=6.075$, $p<0.05$, partial $\eta^2=0.05$; and learning, $F(1, 125)=9.356$, $p<0.001$, partial $\eta^2=0.07$. A post hoc inspection of the interaction group means found that F2F students using L+D resulted in the lowest outcome scores across all groups. F2F students using L+D consistently scored lower in satisfaction ($M=18.55$, $SE=0.65$) than all the other students ($M=22.30$, $SE=0.46$). Also F2F students using L+D scored lower in perception of learning gains ($M=39.61$, $SE=1.03$) than F2F students using an experiential teaching technique ($M=44.24$, $SE=0.68$), virtual students using L+D teaching technique ($M=44.38$, $SE=0.73$), and virtual students using an experiential teaching technique ($M=45.02$, $SE=0.75$). In addition, F2F students using the L+D teaching technique scored lower in learning ($M=10.38$, $SE=0.45$) than F2F students using experiential learning ($M=12.75$, $SE=0.3$), virtual students using the L+D teaching technique ($M=12.44$, $SE=0.32$), and virtual students using an experiential teaching technique ($M=12.64$, $SE=0.33$).

TABLE 3. Multivariate and Univariate Analysis of Variance for Satisfaction, Perception of Learning Gains, and Learning

Source	Multivariate	Univariate		
	<i>F</i>	Satisfaction	Perception of Learning Gains	Learning
Teaching technique	8.867*	20.884*	10.599*	13.187*
Learning environment	6.235*	12.887*	11.797*	7.566*
Teaching technique*	6.019*	14.131*	6.075	9.536*
Learning environment				
Virtual			19.131	3.652

Note. *df* =1, 125.

* $p<.01$.

Limitations

The main limitation for this study is the lack of a randomized procedure for assigning students to the four groups. Recently, some authors have been accepting a limited use of nonrandomized designs (Abrami & Bernard, 2006; Shadish et al., 2002). Following those authors' recommendations, three conditions were observed before the statistical analysis. First, a pretest was applied. Second, experimental groups were evaluated for previous knowledge, and no significant difference was found between groups. Third, in facing the probability of students' previous performance or memory losses affecting learning gains, those measures were introduced as statistical controls. It is true that nothing replaces experimental control, but there are

no rival plausible explanations other than the educational interventions that emerged from the literature review. In addition, assumptions from the statistical tests and variate (satisfaction, perceptions of learning gains, learning) were not fully observed, mainly relating to homogeneity of sample sizes and variance. This violation increased the probability of a type I error. Because no consensus exists about how to gain homogeneity or whether corrections are appropriate at all (Meyers, Gamst, & Guarino, 2006; Tabachnick & Fidell, 2007), Pillai's criteria were used in place of Wilk's criteria. Results were the same for each statistic, but caution should be taken when reviewing the MANOVA results because the assumptions' violations confound the interpretations of effect size.

TABLE 4. Interaction Between Teaching Technique and Learning Environment

Dependent Variable	Teaching Technique	Learning Environment	<i>M</i>	<i>SE</i>	99% Confidence Interval	
					Lower Bound	Upper Bound
Satisfaction	L+D	F2F	18.55	0.648	17.274	19.837
		VLE	22.30	0.458	21.399	23.212
	Experiential	F2F	22.80	0.429	21.956	23.654
		VLE	22.70	0.471	21.773	23.638
Perception of learning gains	L+D	F2F	39.61	1.031	37.571	41.651
		VLE	44.38	0.729	42.946	45.832
	Experiential	F2F	44.24	0.683	42.892	45.596
		VLE	45.02	0.750	43.545	46.514
Learning	L+D	F2F	10.38	0.450	9.497	11.280
		VLE	12.44	0.319	11.814	13.075
	Experiential	F2F	12.75	0.298	12.165	13.347
		VLE	12.64	0.328	11.998	13.296

Note. L+D=lecture plus discussion; F2F=face-to-face; VLE=virtual learning environments.

Discussion

Summary and Theoretical Implications of Findings

Teaching techniques. A review of the literature resulted in our hypothesizing that learning environments based on experiential learning would have higher scores in terms of satisfaction, perception of learning gains, learning, and skills acquisition than learning environments based on lecture plus discussions. All hypotheses for teaching techniques were supported. Experiential learning was more effective than L+D for all dependent measures, even after controlling for previous knowledge, high school GPA, and days spent between intervention and posttest. Those findings are consistent with previous research that examined experiential learning outcomes (i.e., Rocha, 2000). This replication is important because there are no experiential learning outcomes in Mexico. However, the effect sizes were not large enough to warrant consideration of this study as conclusive even though hypotheses were supported. An interesting result is that teaching technique accounted for 14% of the variance of satisfaction. In other words, results seemed to confirm that a constructive teaching technique indeed affects students' willingness to learn, which potentially would have effects on retention and learning.

Learning environment. It was hypothesized that VLEs would have higher scores than F2F learning environments in terms of satisfaction and perception of learning gains, but not in terms of learning. The study found that virtual environments resulted in higher scores than F2F learning environments in terms of satis-

faction, perception of learning gains, and learning. As a result, hypotheses for learning environment on satisfaction and perception of learning gains were supported, but not for the main effects on learning. Again, although these findings were significant, small effect sizes make it necessary to use caution in applying the results to curriculum design.

Interaction. It was hypothesized that teaching technique would interact with learning environment. In other words, the virtual environment would result in higher scores in terms of satisfaction, perception of learning gains, and learning when using experiential learning rather than lecture plus discussions. The teaching technique interacted with the learning environment in the direction predicted for satisfaction, perception of learning gains, and learning. In other words, a VLE was more effective than an F2F learning environment when used with experiential learning techniques in terms of satisfaction, perception of learning gains, and learning. Again, effect sizes were weak. The most interesting effect size was that the interaction accounted for 10% of the variance in satisfaction. The whole of the interactive tests showed that an experiential learning approach has better outcomes than an exposure-plus-discussions approach. And this effect was bigger when using an F2F environment than when using a VLE, suggesting that a hands-on practice approach is more effective than a more passive one, either in the teaching technique or in the learning environment. Although an interaction for teaching technique was suggested in the literature, confirmation of the interaction hypotheses are seen as this study's main contribution to the field of learning environments. One possible explana-

tion for the fact that F2F learning environments using experiential learning techniques accounted for better results than VLEs using experiential learning is that the F2F educational intervention was more interactive than the virtual environment. That is, the F2F/experiential learning intervention developed role-play exercises that were performed by all students participating in that group. However, the virtual/experiential learning intervention did not develop any interactive exercises between students, only between students and their computers. In other words, students watched a video and then interacted with the computer to solve some exercises. This finding might suggest that student role-playing is a more robust and powerful educational tool than a mildly interactive computer exercise. As a result, despite the fact that hypotheses for interaction effects were supported for satisfaction, perception of learning gains, and learning, more research is needed to validate the suggested conclusions presented earlier.

Conclusion

The use of VLEs and experiential learning must have further research. Although this study did not provide results that could be applied to the general population, there is some indication that combining VLEs with experiential learning could be an effective strategy to educate Mexican students about social work communication skills. In a country with a large rural population underserved by universities and where universities frequently lack faculty members with good credentials and training in the competences students require to meet the challenges of the 21st century, it is important to know that vir-

tual environments have the potential to deliver distance education.

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