Perceptions of Online Learning Quality given Comfort with Technology, Motivation to Learn Technology Skills, Satisfaction, & Online Learning Experience

Michael C. Rodriguez and Ann Ooms
University of Minnesota

Marcel Montanez
New Mexico State University

Yelena L. Yan
University of Minnesota

April, 2005

Paper presented at the annual meeting

of the American Educational Research Association, Montreal, Canada.

Abstract

Online courses are appearing at a high rate, increasing the competitiveness of the distance learning market. Reluctance to invest in this area is due to cost and quality concerns. This study reports the findings of a survey of 700 professional and graduate education students regarding their comfort with technology, satisfaction with those experiences, and perceived quality, given their experience with online or hybrid courses. A structural equation model yielded strong fit to the data. For students with Online course experience, comfort with technology was related to satisfaction with online course experience which was related to perceived quality; motivation to learn more about technology was also related to satisfaction of online learning experience. For students with hybrid online course experience (WebCT), comfort was related to satisfaction and motivation; motivation was also related to satisfaction; and satisfaction was ultimately related to perceived quality. In this group (WebCT), comfort was also directly related to perceived quality. Finally, among students with no online course-related experiences, comfort was related to motivation to learn about technology, but neither of these factors were related to perceived quality of online courses. For students with limited or no online course experience, perceptions of online course quality were more difficult to explain.

Introduction

Technological advances since the 1990s have led to the increasing integration of web-based and web-enhanced resources into instructional practices. It is difficult to find a higher education course that does not employ or take advantage of technology in some way. At one extreme, the number of online courses offered by different colleges and universities is growing at an astonishing rate. During the 2000-2001 academic year, 56% of all 2-year and 4-year degree granting institution offered online courses while an additional 12% were planning on offering online courses within the following three years; this included 127,400 online courses attracting an enrollment of over three million (NCES, 2003).

Colleges and universities have been investing a great deal of effort and resources to modify existing face-to-face courses to meet the specific characteristics of online learning environments. Financial costs have been the largest source of reluctance: 26% of institutions reported that program development costs kept them from starting or expanding online course offerings. For the 31% of institutions that did not offer online courses, reasons included lack of fit with mission (44%), development costs (33%), concerns about course quality (26%), limited technological infrastructure (24%), and lack of perceived need (22%) (NCES, 2003).

Higher education institutions face a tremendous challenge of designing effective and sustainable online courses. Numerous studies have attempted to compare the quality of online versus traditional, face-to-face instruction. The meta-analysis conducted in 2004 by Bernard, Abramy, Lou, Borokhovski, Wade, Wozney, Wallet, Fiset, and Huang, focused on student achievement, attitudes, and retention. The results indicated small significant effects favoring distance education on all three measures; yet effect sizes of all measures varied a great deal which calls for a careful interpretation of these findings.

There has been extensive discussion to identify the key components of successful instructional design to increase the outcomes of online learning (Gunawardena, Lowe, & Carabajal, 2001; Kreijns, Kirschner, & Jochems, 2003; Mallen, Day, & Green, 2003). Researchers have created specific evaluation models to measure the outcomes of online learning (Jones & Paolucci, 2000; Gunawardena, Carabajal, & Lowe, 2001). Nonetheless, the success of online courses may rest in the perceptions of the student. And as with any product, educational or otherwise, perception in an open marketplace, much like the educational course-taking marketplace, may ultimately determine whether students continue to enroll in online courses.

Purpose

The focus of this paper is the identification of variables that may impact the degree of students' satisfaction with online learning experiences and learning outcomes or perceived quality. These variables could be considered during an online course instructional design and instruction to promote high quality online course development and marketing. Early identification of relevant variables could be used to increase the likelihood of positive online learning experiences. For example, if a limited level of technical skills jeopardizes attainment of positive learning experiences, students would be referred to the appropriate resources to gain the essential technical skills before they enroll for an online course.

The model includes the following variables:

1. Level of comfort with technology, including various online-related computer operations;
2. Motivation to learn technology tools;
3. Level of satisfaction with previous online learning experiences; and
4. Perceived quality of online courses.

The model includes multiple outcomes and multiple moderators. We assessed their interrelationships with a structural equation model to provide a more complete picture (described below). Primary outcomes included satisfaction with the learning experience and perceived quality of the learning experience. Finally, there are three relevant groups of students for comparison purposes, including (a) students with online course experience, (b) students with hybrid course experience (typically in the form of courses using WebCT, an online course-support tool), and (c) students with no online-related course experience.

Perspectives

Engaging in an online learning process requires a certain level of comfort with computer and web technologies (Lee & Witta, 2001). In order to fully participate in online instructional activities, to access instructional materials, and to interact with an instructor and peers, students need to be able to use a variety of modern hardware and software applications. Online learners lacking the required technical skills are at risk of suffering from computer anxiety (Loyd & Gressard, 1984). Those students must invest extra effort in learning the necessary technical skills while being expected to master new course content.

There has been some controversy regarding the relationship between the level of comfort of using the Internet and the degree of student satisfaction with online courses. DeBourgh (1999) studied student satisfaction with online learning and reported that being at ease with the World Wide Web was not a predictor variable for satisfaction with online learning. This finding was confirmed by Westbrook (1999). However, Stokes (2003) found a significant relationship between the two variables; students who felt more at ease using Internet were more likely to be satisfied with their online learning experiences, than those students who did not feel comfortable using internet.

Similarly, Wright (1999) found that the students taking an online course were more satisfied with their learning experiences than students enrolled in a similar course delivered in a face-to-face format. In addition, St. Pierre and Olson (1991) identified student willingness to take an online course again and their willingness to recommend an online course to a friend as the best measures of student satisfaction.

Stokes (2003) concluded that satisfaction with online learning was not influenced by the quantity of previous online learning experiences; yet there is a significant difference between more- and less-experienced users in this context. However, Wagner, Holloway, and Garton (1999) suggested that there might be a connection between a student's first online learning experiences and their satisfaction. This area of inquiry is quickly becoming complex.

Methods

A survey was developed, reviewed by instructional technology experts and researchers, and piloted with a sample of the target audience prior to publication online. This survey was conduced online. Pre-survey e-mail notices about the survey were sent to the approximately 3000 enrolled students in a post-BA, professional, and graduate school of education. The survey was made available via the Internet for four weeks. During that time, students were invited to complete the survey through an initial email messages and one reminder two weeks later, both of which contained the website address of the survey. This resulted in 721 completed surveys for a 24% response rate. We expect that the functional response rate was likely over 50% as many of the 3000 students were inactive or no longer attending (there was no way to easily remove these students without additional authorization). In all, 698 surveys were usable in this project, as 23 contained significant missing responses.

Survey responses were factor scored (based on a principal-axis factor analysis) to create the comfort with technology scale. Scores for other variables were used as reported on the survey. All responses were submitted to a structural equation model employing AMOS 4.0 (Arbuckle, 1999). Other descriptive analyses were completed using SPSS.

Results

Among the 698 students with complete surveys, 39% were 16 to 25 years old, 38% were 26 to 35, 13% were 36 to 45, and 10% were 46 or older. There were no statistical significant age differences between those students with online experience and those without.

Most students felt comfortable with basic computer-based technology activities, such as using email, typing, accessing the Web, sending, receiving, and downloading documents. Fewer students felt comfortable with more advanced activities, including downloading multimedia materials, listening to audio or viewing video on the computer (see Table 1).

Table 1

Comfort Level with Computer-Based Technology Activities

	Mostly uncomfortable	Somewhat uncomfortable	Somewhat comfortable	Mostly comfortable
Using email	5%	0%	2%	92%
Typing, key boarding	6%	1%	6%	87%
Accessing the Web	6%	1%	6%	88%
Sending documents electronically	8%	8%	21%	63%
Receiving documents electronically	7%	5%	22%	66%
Downloading documents	8%	10%	27%	55%
Downloading multimedia materials	15%	23%	34%	29%
Listening to audio on the computer	13%	15%	28%	44%
Viewing video on the computer	17%	19%	31%	33%

Comfort with technology, as described above, was not related to online course taking behavior; students with online course experience, hybrid course experience, or no online course experience reported the same level and range of comfort (F[2,695]=0.01, p=.99). In addition, there was a nonsignificant correlation between comfort and number on online courses taken (r=.08, p=.30), which further suggests no relationship between comfort with technology and online course taking behavior.

Students reported high levels of motivation to learn more about using computer-based technology; 31% reported excellent motivation, 44% good motivation, 22% fair motivation, 3% poor motivation. There were small correlations between level of comfort and motivation to learn with the more advanced activities (Spearman rho ≈ .25 to .28). There was a weak correlation between motivation to learn and age (Spearman rho ≈ .19). All Spearman correlations between age and comfort levels with computer-based technology activities were less than .15.

Nearly three-fourths of all students (73%) had some experience with WebCT (Web-based course support tools). Of these students, the perceived helpfulness of WebCT for learning was not unanimous; 14% reported that WebCT was very helpful, 39% moderately helpful, 36% a little helpful, and 11% not helpful at all.

Fewer students, nearly one-fourth (24%), had experience with online courses. Of those who had taken online courses, 22% had taken more than one. Satisfaction with online courses was relatively high (Table 2).

Table 2

Satisfaction with Online Courses (*n*=168)

	Percent
Completely dissatisfied	1.8
Mostly dissatisfied	8.9
Somewhat dissatisfied	11.9
Somewhat satisfied	24.4
Mostly satisfied	39.9
Completely satisfied	13.1

Students reported to like several aspects of online courses (Table 3). Mostly, they appreciated the flexibility of study time (48%) and less need to go to campus (24%). On the other hand, students least liked the limited face-to-face interaction (49%).

Table 3

What do you like most or least about taking Online Courses? (Percentages Reporting)

	With online course experience		Without online course experience	
	Like Most	Like Least	Like Most	Like Least
The online delivery methods	1.8	11.4	3.0	7.0
Limited face-to-face interaction	3.0	49.1	0.6	67.9
Flexibility of study location	14.9	0.6	19.7	0
Reliance on my own self-discipline	4.8	12.6	3.4	14.6
Flexibility of study time	47.6	0.6	31.7	0
Spending less time on the computer	0	9.0	0.6	6.1
Less need to go to campus	23.8	0.6	38.5	0.2

When asked to imagine taking an online course, students without online course experience reported to imagine liking the fact that there would be less need to go to campus (39%), flexibility of study time (23%, half compared to students with online course experience [48%]), and flexibility of study location (20%, similar to those with online course experience).

On the other hand, students reported to imagine not liking the limited face-to-face interaction (68%) at a higher rate than student with online course experience (49%) and being reliant on their own self-discipline (13%, similar to those with online course experience; see Table 3).

Among students who had online course experience, half (52%) reported to agree that online courses meet the same quality standards as classroom courses (Table 4). Even so, 89% reported that they would consider registering for another online course; 11% would not.

Again, when asked to imagine taking an online course, fewer students (about 21%) with limited (hybrid) or no online course experience reported to agree that online courses would meet the same quality standards as classroom courses compared to student with online course experience (52% agreeing; see Table 4).

Table 4

Online Courses Meet the same Quality Standards as Classroom Courses

	With Online course experience	With hybrid (WebCT) course experience	With NO online course experience
Disagree	22.2	38.5	33.1
Tend to disagree	22.8	34.6	36.6
Tend to agree	33.5	15.6	18.0
Agree	18.0	5.6	4.1
Do not know	3.6	5.6	8.1
n	168	358	172

Structural Equation Models

As an initial set of analyses to understand the relations among the primary explanatory variables, we found independence between comfort with basic computer operations and advanced computer operations as well as between comfort with technology (basic and advanced) and motivation to learn about technological tools. In our sample, 70% of students had experienced hybrid courses, where some component of the course was delivered online (typically

an online discussion board, online quizzes, and online assignment submission). In all 22% had taken online courses, ranging between 1 online course (77%) to 4 or more online courses (4%).

Structural models were examined for three groups. Group one (WebCT; *n*=358) was comprised of students who had experience using WebCT and had not previously taken an online course. Group two (Online; *n*=168) were the students who had previously taken on online course. The third group (None; *n*=172) had neither WebCT nor online course experience. The following is a comparative description of the fit of the structural model and path coefficients for the three groups.

To determine the degree of fit, absolute, relative and parsimonious fit were assessed. To determine absolute fit, the chi-square (χ^2) goodness of fit test was used. Because chi-square statistic is dependent on sample size, two additional indices were also examined (Floyd & Widaman, 1995; Reise, Widaman, & Pugh, 1993). The Goodness of Fit (GFI), the Adjusted Goodness of Fit (AGFI) (Joreskog & Sorbom, 1989), and the Root Mean Square Error Approximation (RMSEA; Steiger & Lind, 1980) indices were also examined. The GFI and AGFI indices range between 0 and 1 and .90 is a suggested acceptable value. An RMSEA value of .05 or less indicates a close fit to the data; .05-.10 a moderate fit; and above .10 is a poor fit (Browne & Cudeck, 1993). Overall the model fit was good for all groups. Table 5 is a summary of the indices of fit for the three groups.

Figure 1 represents the structural equation model for the Online group. Noteworthy features of this model include the positive relationship between comfort and satisfaction as illustrated by the statistically significant standardized path coefficient (.15). The relationship between satisfaction and quality is also positive, significant, and much stronger (.51). Taken together this indicates that students who are more comfortable with technology are also more

likely to be satisfied with online courses. This, in turn predicts higher levels of perceived quality with online courses. There is not a direct relationship between comfort with technology and perceived quality of online courses (effect is nonsignificant). There is an indirect path from motivation to satisfaction (direct effect of .16) and finally to perceived quality (indirect effect of motivation on quality = .16 × .51 = .08). All paths were positive and significant indicating that students with higher levels of motivation are more likely to be satisfied with online courses and will ultimately have more positive perceptions of quality of online courses.

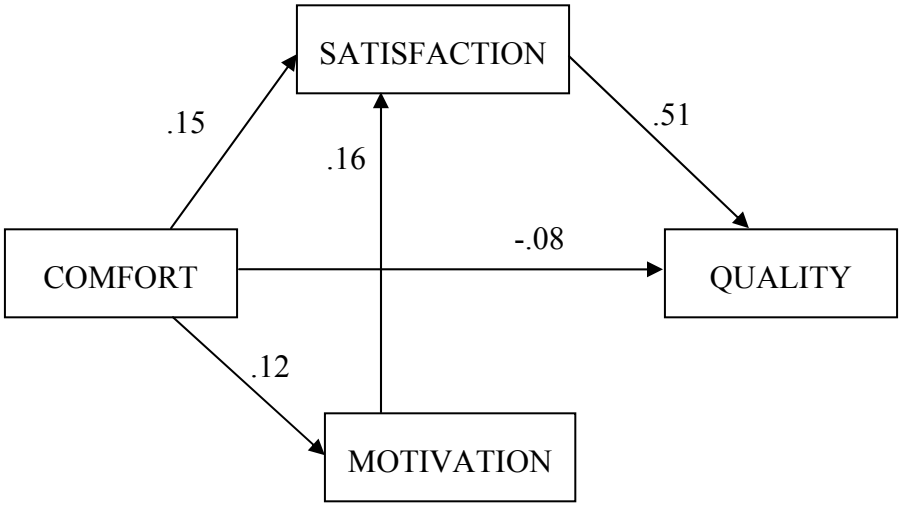

Figure 1. SEM model with standardized path coefficients for students with online course experience (Online).

Figure 2 is a representation of the structural equation for the WebCT group. Significant paths were noted from comfort to motivation (.26), motivation to satisfaction (.14) and satisfaction to quality (.12). There was a positive, significant path from comfort to quality in this group. In this group, satisfaction was not predicted by comfort.

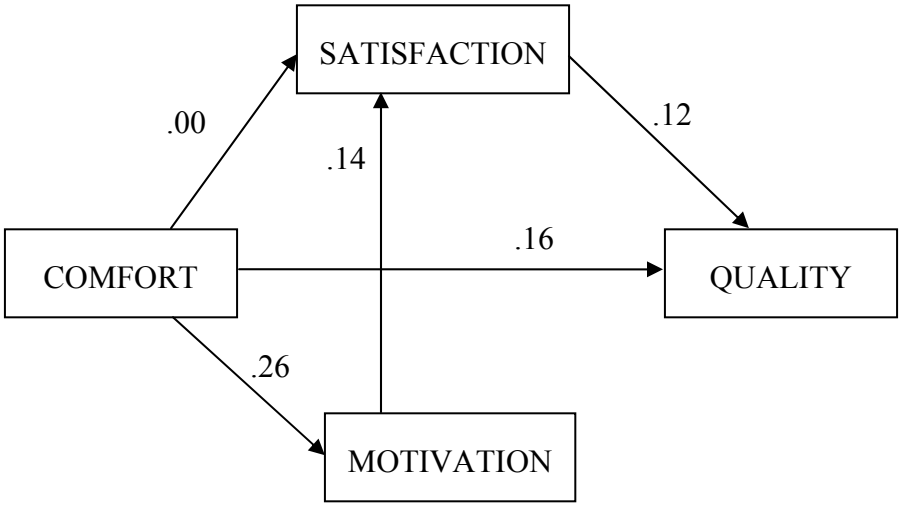

Figure 2. SEM model with standardized path coefficients for students with hybrid-online course experience (WebCT).

The model for the group with no experience was simplified (Figure 3) because no satisfaction variable was available with this group. In this model the path from comfort to motivation was positive and significant (.38). Comfort did not predict perceived quality for the no experience group, nor did motivation predict quality. For students with no online-related course experience, perceptions of quality remain unexplained by comfort with technology and motivation to learn about technology.

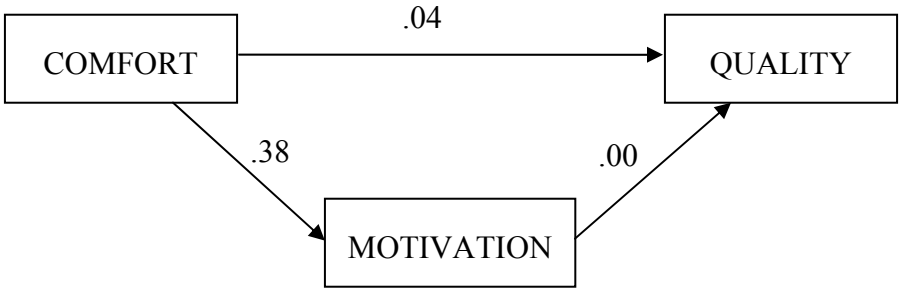

Figure 3. SEM model with standardized path coefficients for students with no online course experience (None).

Table 6 can be used to compare standardized path coefficients between groups. Comfort was a significant predictor of perceived quality for the WebCT group but not for the Online course group. The strength of the relationship between satisfaction and quality is nearly four times higher for the Online group than the WebCT group. These coefficients indicate that for students who have never taken an online course, comfort with technology is predictive of motivation to learn more about online learning tools. When students have previously taken on online course, the relationship is not significant. For these students, comfort is significantly related to satisfaction with online learning and in turn is predictive of a positive perception of quality of online courses.

Table 5

Fit Statistics

Fit Statistic	Group		
	Online	WebCT	None
GFI	.999	.998	1.00
AGFI	.995	.982	.826
CFI	1.00	.993	1.00
RMSEA	.000	.029	.213
Chi-Square, df, p	.166, 1, p=.68	1.303, 1, p=.25	.000, 0

Table 6

Standardized Path Coefficients

Paths	Group		
	Online	WebCT	None
Comfort → Satisfaction	.15*	.003	-
Comfort → Quality	-.08	.16*	.04
Comfort → Motivation	.12	.26*	.38*
Motivation → Satisfaction	.16*	.14*	-
Satisfaction → Quality	.51*	.12*	-
Motivation → Quality	-	-	.00

* p<.05

Discussion

With models like these, measurement questions prevail: Are we measuring the right constructs? Are we measuring the constructs correctly? Only through replication and modification can we begin to answer these questions. This study advances this simple goal.

Comfort with computer operations and online-technology tools does not appear to be related to online course taking behavior (number of online courses taken). This finding counters common expectations: comfort with technology does not limit who enrolls for online courses.

However, we also found a negative relationship between the number of online courses taken and satisfaction. In all, 23% of the students who had online course experience were dissatisfied at some level, whereas 47% reported that the online components of hybrid courses (WebCT) were less than helpful. This indicates an important area for study—satisfaction with online learning experiences may prevail as a determining factor for the success of online courses in the future.

This is even more important with the finding of the relation between satisfaction and perceived quality of online courses. For students with online course experience, satisfaction with their experiences was a much stronger predictor of perceived quality of the courses than comfort with technology or motivation to learn technology; whereas both comfort and motivation were related to satisfaction.

For students with only hybrid course experience (WebCT), comfort was not related to satisfaction with those courses and more strongly related to motivation, which in turn was related to satisfaction. For this group, comfort was slightly more related to perceived quality of online courses than was satisfaction with their hybrid course experience.

Finally, for students with no online or hybrid course experience, comfort was strongly related to motivation to learn, whereas neither were related to perceived quality. For student with limited or no online course experience, perceptions of online-course quality were harder to predict. For those with online experience, satisfaction with such experiences was the overriding predictor. Recall from Table 3, that for students with online course experience, the most liked aspects included flexibility of study time, study location, and less need to go to campus. These were also the expected favorite aspects of students with no online course experience. In addition, both groups reported to be less favorable about the limited face-to-face interaction, but those

with no online course experience were much more unfavorable (68%) about this aspect of online courses compared to students with online course experience (49%).

In today's technologically oriented, information dependent economy, the availability of online courses will continue to increase. The success of higher education institutions entering the distance learning market will depend on greater understanding of the contexts investigated here. Further research in this area will also help target deeper research as we begin to understand components of perceived and realized satisfaction and quality of online learning experiences. Being able to understand the needs of students, support students in online courses, and promote successful learning experiences will be critical in the overall success of the online learning arena.

References

Browne, M.W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K.A. Bollen & J.S. Long (Eds.), *Testing structural equation models* (pp.136-162). Newbury Park, CA: Sage.

DeBourgh, G.A. (1999, February). *Technology is the tool, teaching is the task: Student satisfaction in distance learning*. Paper presented at the international conference of the Society for Information Technology & Teacher Education, San Antonio, TX.

Floyd, F.J., & Widaman, K.F. (1995). Factor analysis in the development and refinement of clinical assessment instruments. *Psychological Assessment 7*(3), 286-299.

Gunawardena, C.N., Lowe, C.A., & Carabajal, K. (2000, February). *Evaluating online learning: Models and methods*. Paper presented at the international conference of the Society for Information Technology & Teacher Education, San Diego, CA.

Gunawardena, C.N., Carabajal, K., & Lowe, C.A. (2001, April). *Critical analysis of models and methods used to evaluate online learning networks*. Paper presented at the annual meeting of the American Educational Research Association, Seattle, WA.

Iannacone, P., Silverman, G., Silverman, S., Catalano, V., Hazen, R., Jemiola, L., & Steinfeldt, B. (2000). *Standards for online learning.* Retrieved online May 14, 2004 at http://www.nassauboces.org/cit/OnlineGrant/TheFourLevelsofOnlineCoursesFinal.pdf

Jones, T.H., & Paolucci, R. (2000). Research framework and dimensions for evaluating the effectiveness of educational technology systems on learning outcomes. *Journal of Research on Computing in Education, 32*(1), 17-27.

Joreskog, K.G., & Sorbom, D. (1989). *LISREL 7: A guide to the program and applications* (2nd ed.). Chicago: SPSS.

Kreijns, K., Kirschner, P.A., & Jochems, W. (2003). Identifying the pitfalls for social interaction in computer-supported collaborative learning environments: A review of the research. *Computers in Human Behavior, 19*, 335-353.

Lee, C., & Witta, L. (2001, November). *Online students' perceived self-efficacy: Does it change?* Paper presented at the national convention of the Association for Educational Communications and Technology, Atlanta, GA.

Loyd, B.H., & Gressard, C. (1984). The effects of sex, age, and computer experience on computer attitudes. *AEDS Journal, 18*(2), 67-77.

Mallen, M.J., Day, S.X.., & Green, M.A. (2003). Online versus face-to-face conversations: An examination of relational and discourse variables. *Psychotherapy: Theory, Research, Practice, Training, 40*, 155-163.

NCES. (2003). *Distance Education at Degree-Granting Postsecondary Institutions: 2000–2001*. Retrieved online July 30, 2004 at http://nces.ed.gov/surveys/peqis/publications

Reise, S.P., Widaman, K.F., & Pugh, R. H. (1993). Confirmatory factor analysis and item response theory: Two approaches for exploring measurement invariance. *Psychological Bulletin, 114*(3), 552-566.

Steiger, J.H., & Lind, J.M. (1980, June). *Statistically based tests for the number of common factors.* Paper presented at the annual meeting of the Psychometric Society, Iowa City, IA.

St. Pierre, S., & Olson, L.K. (1991). Student perspectives on the effectiveness of correspondence instruction. *The American Journal of Distance Education, 5*(3), 65-71.

Stokes, S.P. (2003). *Temperament, learning styles, and demographic predictors of college student satisfaction in a digital learning environment*. Paper presented at the annual meeting of the Mid-South Educational Research Association, Biloxi, MS.

Westbrook, T.S. (1999). Changes in student attitudes toward graduate instruction via Web-based delivery. *Journal of Continuing Higher Education, 47*(2), 32-38.

Wright, V. (1999). *A Comparison of the achievement and perceived satisfaction of graduate students in synchronous and asynchronous courses*. Unpublished doctoral dissertation, The University of Alabama. Dissertation Abstracts International, 60, 06A.