A Proposed Conceptual Model of Learning in Web Courses

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This study explored a conceptual model of learning in Web courses which proposed relationships between self-regulated learning skills, course structure, computer technology experience, and satisfaction with perceived learning in Web courses. Results indicated that self-regulated learning skills are directly related to satisfaction with learning at a significant level, that computer technology experience may function as a moderating variable, and that course structure may function as a mediating variable in satisfaction with perceived learning in Web courses.

Keywords: Self-Regulated Learning, Distance Learning, Web-Based Training

Introduction

The World Wide Web has the potential to change the way that training and education are provided. Industry reports indicate that three out of four organizations employing over 100 workers have used the Web to provide training (Galvin, 2001; Kaupins, 2002). In spite of widespread use, trainers continue to rate Web-based training methods low in meeting training and learning objectives (Kaupins, 2002; Noe, 1999). One reason that Web-based training may be rated lower than other training methods is that many adult learners are unable to self-regulate their learning in novel learning situations (Winne, 1995; Woolfolk, 2004; Zimmerman, 2002), including the Web.

There is evidence that courses offered at a distance lack the modeling, social, and environmental influences that provide the support required to improve self-regulatory learning skills (Perry, 2002; Winne, 1995; Zimmerman, 2000). Brooks (1995, cited in McMahon 2002) claims that learners who are not competent self-regulators can be "slaughtered" in Web-based distance learning courses. These studies indicate that there are many adults who lack the self-regulatory learning skills required to successfully learn in Web courses. If three out of four organizations with more than 100 employees are providing training via the Web, yet research indicates that many adult learners lack the self-regulatory skills required for learning in Web courses, self-regulation in Web courses requires further investigation.

The conceptual model of learning in Web courses proposed in this study, based on Moore's proposed theory of transactional distance (Moore, 1993; Moore & Kearsley, 1996, 2005), Guolla's (1999) work on learning satisfaction, and Zimmerman's (1989, 2002) socio-cognitive theory of self-regulated learning, is:
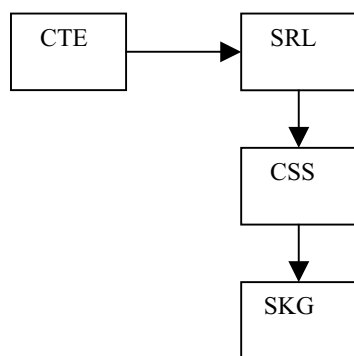
Figure 1. *Conceptual Model of Perceived Learning in Web Courses*

The model indicates that the ability to self-regulate learning (SRL) in Web courses is moderated by the learner's computer technology experience (CTE). The linear combination of the ability to self-regulate learning and the course structure (CSS) provided by the course instructor results in a level of satisfaction with perceived knowledge gained (SKG) in the Web course.

Transactional distance theory (Moore, 1993, Moore & Kearsley, 1996; 2005) suggests that if the course structure is inflexible, and the interactions are low, there should be higher transactional distance resulting in greater potential for misunderstanding of the course materials resulting in lower satisfaction with knowledge gained. In a mixed methods study investigating course structure, course interactions and learner perceived satisfaction with knowledge gained, the quantitative results indicated a strong positive relationship between course structure and satisfaction with perceived learning (Stein, Wanstreet, Calvin, Overtoom, & Wheaton, 2005). The study also indicated that course interactions were correlated to course structure. However the qualitative results indicated that learners desired greater structure in their courses and that learners struggled with learning throughout their online courses (Stein & Wheaton, 2002). Consequently, a further quantitative analysis of course structure was required. In addition, an explanation for the reported struggles with learning in an online environment was required.

For this study, the constructs of course structure flexibility and planned course interactions were combined into the variable course structure. Self-regulated learning theory was chosen as a possible explanation for whether learners were comfortable learning in an online environment or not. The theory suggests that high self-regulators would not require the support of course structure or course interactions in order to learn course materials and that the learners would have the cognitive skills required to learn successfully in an online environment. The conceptual model suggests then that satisfaction with perceived knowledge gained is a result of the combination of ability of the learner to self-regulate in the course and the course structure provided for the student. The model also suggests that the level of computer technology experience a student has will moderate the learner's ability to self-regulate learning in an online course.

This was an exploratory study, set in a large Midwestern university. However, the findings of this study have implications for those who provide training to adult workers via the Web. The study focused on exploring the relationship between the structure of the courses we provide, the adult learner's ability to self-regulate their learning and whether these variables can explain satisfaction with the learning that takes place in Web based courses.

Using quantitative methods, the study explored five research questions: 1) What is the relationship of course structure with learner's satisfaction with perceived knowledge gained in Web-based courses? 2) What is the relationship of self-regulated learning skills with learner's satisfaction with perceived knowledge gained in Web-based courses? 3) What is the relationship between a learner's experience with computer technology and learner's satisfaction with perceived knowledge gained in a Web-based course? 4) What is the relationship between self-regulated learning and computer technology experience? and, 5) Which independent variables explain and predict the greatest amount of variance in the level of a learner's satisfaction with perceived knowledge gained in a Web-based course?

Literature Review

There has been relatively little investigation into the pedagogy of learning in Web environments, and there are few theories of online pedagogy (Garrison, 2000). The studies that examine learning in Web courses indicate that many learners are not able to adapt to Web learning environments as they lack the required learning skills (Hartley, 2001; Song, 2002). However, the flexibility that Web courses offer busy adults provides an opportunity to pursue lifelong learning that would not otherwise exist (Derrick, 2003).

As one of the few pedagogical theories of distance learning (Garrison, 2000), Moore's proposed theory of transactional distance, has been examined with mixed results. Of the studies utilizing Moore's proposed theory as a conceptual scheme, most have focused on the construct of dialogue as the primary variable affecting learning outcomes (Chen, 2001a; Chen 2001b; Gunawardena, 1999; Hirumi, 2002; Stein, et al., 2005). Fewer studies have examined the course structure construct of Moore's proposed theory (Kanuka, 2001; Saba, 1988; Saba & Schearer, 1994; Stein et al., 2005). Dialogue, or interaction, was described by Moore (1993; Moore & Kearsely, 1996; 2005) as planned into the course, while structure was described as the degree to which the course components can be flexible in meeting individual student needs. The studies utilizing Moore's proposed theory indicate that while dialog is crucial in learning, it must be planned into the course to provide learning benefits. As a result this study included a measure of both planned dialogue and course flexibility in the scores assigned for course structure. Moore also postulates that if there is little flexibility in the course structure, and if interactions are few, the learner will have to be more autonomous in order to reduce transactional distance. However, very few studies have examined learner autonomy in distance learning from Moore's conceptual framework (Chen & Willits, 1999;

Huang, 2002) and these studies did not attempt to measure learner autonomy. There has, however, been some investigation done on self-regulation in Web courses (Azevedo, R., Cromley, J. G., & Seibert, D.; Hargis, 2000).

Zimmerman and LeBeau (2000) equate socio-cognitive self-regulated learning theory with self-directed learning and autonomy. Self-regulated learning theories suggest that if learners are motivated, able to set their own goals, able to select appropriate cognitive strategies, able to monitor their own progress, and able to evaluate their success, learning is more likely to occur (Zimmerman, 1989, 2000; Winne, 1995; Corno & Boekaerts, 2005). Thus, if students have these self-regulating abilities, they would still be able to learn in Web courses where interactions are sometimes limited, and there is often little flexibility in course requirements. Consequently, the variable of self-regulated learning was added to the conceptual model examined in this study.

Early studies of learning on the Web indicated that new computer and Internet technologies interfered with the ability to learn, and often resulted in high drop out rates among Web learners (Campbell-Gibson, 1995; Howard, 1986). However, more recent studies have shown mixed results regarding computer and Internet skills (Ford & Chen, 2000; Stein & Wheaton, 2002). While these studies examining the direct impact of computer skills on learning outcomes in Web courses found mixed results, there is research in self-regulated learning that indicates that computer and Internet skills do influence the ability to self-regulate learning in Web courses (Azevedo et al., 2004; Lim, 2001; Joo, Bong, & Choi, 2000). That is, having high computer technology experience may allow a learner to be more autonomous in learning on the Web. Consequently, computer technology experience was added to the conceptual model examined in this study.

Methods

All student data were collected from the participants via the Web. Two instruments were placed on a Web site devoted to collecting data for this study. The first instrument, the Learner Profile, consisted of two parts: the Demographic Questionnaire (Stein & Wheaton, 2002) and the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich, Smith, Garcia, & McKeachie, 1991). The Demographic Questionnaire (Part A) collected information on the students and included a subscale on computer technology experience. The MSLQ (Part B) is an 81 item instrument that measures a learner's ability to self-regulate their learning in a particular course. The second instrument was the Satisfaction Questionnaire (Stein & Wheaton, 2002) which asks participants to rate their satisfaction with course structure, satisfaction with course interactions, and overall satisfaction with perceived knowledge gained in the course. Syllabi were collected from the course instructors and were analyzed for course structure by three independent instructional designers using the Course Structure Rubric (Calvin, 2005). Reliability coefficients for all instruments were within acceptable levels.

The study included 68 undergraduate students enrolled in fourteen courses designated as "distance learning" in the university master schedule and taught via the Web (with no face-to-face class meetings) during Winter Quarter 2005 at a large Midwestern university. The student participants included freshmen (7.1%), sophomores (14.3%), juniors (28.6%), seniors (48.6%) and continuing education students (1.4%). The participants were predominantly white (80%) and female (68.6%). 7.1% were African American, 7.1% were Bi- or Multi-Racial, and 4.3% were Asian. Most participants were in their early 20's with the range of ages from 18-40 years. Sixty percent of the participants were enrolled in 100 level courses, 15.6% were enrolled in 200 level courses, 10% were enrolled in 300 level courses, none were enrolled in 400 level courses, 8.6% were enrolled in 500 level courses, and 5.8% were enrolled in 600 level courses. The courses included in the study represented eight colleges throughout the university, including the sciences, arts, humanities, education and engineering.

Response rates for the study were low. To participate students had to be: undergraduates or continuing education students; enrolled in a course where the instructor agreed to participate by providing their course syllabus; and willing to make their email address public. This limited the number of potential participants to 658 once duplicate names were removed from the sampling frame. The sample size was determined using the recommendations of Hair, Anderson, Taham, & Black (1998) to have from 10-20 cases for each independent variable to provide adequate statistical power in the multiple regression analysis at an alpha level of .05 and a power level of .8. There were two independent variables and one potentially moderating variable in the analysis; consequently a sample size of 60 students was required. However, participation in the study was voluntary and response levels on surveys can be as low as 25% (Newton & Rudestam, 1999). In addition, university policy limited the type and frequency of contact with the students. This limitation made it likely that response rates would be low. Consequently, 240 students were randomly selected from the frame and asked to participate in the study to ensure that at least 60 students responded. Email reminder notices were sent bi-weekly and random drawings for two $100 gift certificates to an online bookstore were offered as incentives in an effort to increase response rates. While 70 students submitted both online instruments, two did not report their course and had to be dropped from some analyses. The remaining 68

respondents constitute a 28.3% response rate. T-tests indicated that the sample showed no significant differences between early and late respondents on the MSLQ scores, computer technology experience scores, and satisfaction with perceived knowledge gained scores.

It was expected that examining research question five through the inferential statistic of multiple linear regression would offer a first exploratory look at how course structure and a learner's ability to self-regulate learning combine to explain how satisfied learners are with their perceived learning in Web based courses. Prior to conducting the regression analysis, the relationships between the individual variables were explored in order to answer research questions 1-4.

Results

The first four research questions explored the relationships between the independent variables of course structure score, MSLQ score, computer technology experience score and the dependent variable of satisfaction with perceived knowledge gained in a Web course. Overall, the participants had high levels of computer technology experience (Mean = 5.66, S.D. = .966; Min = 3, Max. = 7; Scale = 1-7) and moderate abilities to self-regulate their learning in the Web courses included in the study (Mean = 4.22, S.D. = 0.78; Min. = 1.93, Max. = 6.32; Scale = 1-7), while course structure scores were low for all courses (Mean = 58.77, S.D. = 2.38; Min.= 52, Max.= 77.33; Scale = 40 - 120). Low course structure scores indicate low levels of interaction and low levels of flexibility for the individual students. However overall, the students were moderately satisfied with both the structure of the courses (Mean = 5.05, S.D. = 1.5) and the interactions in their courses (Mean = 4.7, S.D. = 1.45). The students were also moderately satisfied with their perceived learning in these courses (Mean = 5.09; S.D. = 1.29). A review of the correlation matrix (see Table 1) provides the results for research questions 1-4.

Table 1. *Correlation Matrix of All Variables*

		Satisfaction with Knowledge Gained in Course	Computer Technology Experience	Course Structure Score	MSLQ
Satisfaction with Knowledge Gained in Course	Pearson Correlation	1			
	Sig. (2-tailed)				
	N	70			
Computer Technology Experience	Pearson Correlation	.089	1		
	Sig. (2-tailed)	.464			
	N	70	70		
Course Structure Score	Pearson Correlation	-.044	.144	1	
	Sig. (2-tailed)	.723	.240		
	N	68	68	68	
MSLQ	Pearson Correlation	.361(**)	.393(**)	-.200	1
	Sig. (2-tailed)	.002	.001	.101	
	N	70	70	68	70

(Note: ** Correlation is significant at the 0.01 level (2-tailed).

The results for research question one (What is the relationship of course structure with learner's satisfaction with perceived knowledge gained in Web-based courses?) indicate no statistically significant relationship (r = .044, p = .723). Because previous research indicated that there is a relationship between course structure and satisfaction with perceived learning (Stein, et al., 2005), a significant relationship was expected. However, the model of learning in Web courses proposed in this study suggested that it is the combination of the ability to self-regulate learning and the course structure provided that determines the level of satisfaction with learning in a Web course. Therefore the relationship between self-regulated learning and satisfaction with perceived learning was examined next.

Research question two (What is the relationship of self-regulated learning with learner's satisfaction with perceived knowledge gained in Web-based courses?) results indicated a moderate relationship between scores on the MSLQ and satisfaction with perceived knowledge gained scores (r = .361, p = .002). The model suggests that it is the combination of course structure and ability to self-regulate learning that determines the level of satisfaction with learning, therefore, since no relationship was found between course structure and overall satisfaction with learning, it is possible that moderate ability to self-regulate learning may negate the effect of course structure. That is, these students may not have needed the additional support provided by course structure at a significant level.

Research question three (What is the relationship between a learner's experience with computer technology and learner's satisfaction with perceived knowledge gained in a Web-based course?) examined the potential direct relationship between computer technology experience and satisfaction with perceived knowledge gained in a Web-based course. The proposed model of learning in Web courses, suggests that rather than a direct relationship, computer technology experience moderates self-regulation and effects overall satisfaction with perceived learning through the self-regulation variable, rather than directly impacting satisfaction with learning. No statistically significant relationship between computer technology experience and satisfaction with perceived knowledge gained was found (r= .089, p = .464).

Research question four (What is the relationship between self-regulated learning and computer technology experience?) was posed in order to explore the potential relationship between computer technology experience and self-regulation for learning. A moderate relationship was found between computer technology experience and self-regulation as measured by the MSLQ (r = .393, p = .001), indicating that computer technology experience may moderate self-regulated learning.

A regression analysis was planned in order to answer research question five (Which independent variables explain and predict the greatest amount of variance in the level of a learner's satisfaction with perceived knowledge gained in a Web-based course?). However, a review of the correlation matrix indicated there was only one statistically significant relationship between an independent variable and the dependent variable. Therefore, this set of independent variables was not sufficient to obtain a regression model in this study, and the regression analysis was not conducted.

Conclusions and Implications

In the past, distance education researchers suggested that adult learners would want distance courses to offer flexibility so that the content and tasks centered on the individual learner's immediate learning needs (Moore, 1993; Moore & Kearsley, 1996; 2005). In this study, there was virtually no flexibility in any of the Web courses; however, the students reported that they had moderate to high satisfaction with their learning and that they were moderately satisfied with the structure in these courses. These same students had moderate abilities to self-regulate their learning, and there was a significant relationship found between self-regulated learning and satisfaction with perceived learning. Consequently, it is likely that it was the ability to self-regulate in the course, rather than the desire to make the course more pertinent to immediate needs that affected satisfaction with perceived learning for these students.

Second, computer technology experience appears to moderate self-regulated learning. The literature on self-regulation indicates that confidence in the ability to perform computer and Internet tasks in general increases the learner's confidence in their ability to perform these tasks in Web courses (Joo, et al., 2000; Lim, 2001).   Thus, increasing the computer and Internet skills of learners increases their ability to self-regulate in Web courses which affects their satisfaction with perceived learning in Web courses.

Third, course structure was not related to satisfaction with perceived knowledge gained. It may be that this is true only when the learners have high enough abilities to self-regulate their learning in low structure situations, or it may be that course structure is not a significant variable in determining satisfaction with learning in Web courses. In this study, satisfaction with learning was not affected by the course structure; however the learners did have moderate abilities to self-regulate learning in these courses.

Finally, the proposed pathway in the conceptual model was not supported by the data in the study. Course structure did not reach a significant level in the model, and therefore the role of course structure in the model was revised so that rather than functioning as an independent variable, course structure functions as a mediating variable. This changed the fundamental understanding of the role of course structure within the conceptual model. Mediating variables transmit the effects of another variable. In this case, the findings of the study suggest that course structure may transmit the effects self-regulation for learning, resulting in a moderate to high level of satisfaction with perceived knowledge gained in Web courses.   Thus, the *path* of the conceptual model has not changed however our understanding of the *role* of course structure within the model has changed from that of an independent variable

with a direct effect on satisfaction with learning to one of a mediating variable that transmits the effect of self-regulation on satisfaction with perceived learning.

Several limitations of this study must be noted. First, this study was conducted in a specific setting and while implications can be made, further testing of the model in other settings is required. Second, the independent variables were chosen to explain satisfaction with perceived knowledge gained in a Web-based course based on constructs from Moore's proposed theory of transactional distance (1991, 1993), Guolla's work on learning satisfaction, and Zimmerman's socio-cognitive theory of self-regulated learning (1989, 2002). It is possible that other variables would reflect different results. Third, all measures used for the independent variables were subjective in nature. More objective measures for all variables need to be developed. Future studies should investigate other factors that may be related to satisfaction with perceived knowledge gained, utilize objective measures, should consider multiple measures of learning outcomes, and should explore the model in other settings.

For HRD practitioners, this study suggests that the ability to self-regulate may be significant in trainees' satisfaction with their perceived learning in Web courses. While satisfaction with training programs is not necessarily a good indication of the application of learning on the job (Swanson, 1997), the students in this study were not asked to evaluate satisfaction with the program – but specifically with their learning. It is learning that we hope transfers to job performance and therefore, as practitioners, we must ensure that our trainees have the self-regulatory skills required before asking them to learn in Web based training programs.

The findings of this study indicate that the courses provided low levels of structure, flexibility, and interaction for the learners. In addition, these courses provided little modeling of the self-regulating behaviors required to learn the course material. Based on these findings it appears that Web teachers and trainers require further professional development on how to provide adequate structure, flexibility and interactions in their Web courses for those students who may lack the level of self-regulation required to learn the course material. In addition, Web instructors need to develop the ability to teach and model self-regulatory behaviors. Institutions and organizations offering Web courses need to provide development for their Web instructors on presenting and modeling these self-regulatory skills. The professional development offered to these Web instructors should also include information to help instructors gain a better understanding of the developmental processes their students experience as they become more self-regulating in their courses, and how, as instructors, they can support these processes.

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