ISSN (Print) : 0974-6846
ISSN (Online) : 0974-5645
Indian Journal of Science and Technology, *Vol 8(S1),103-109, January 2015* 10.17485/ijst/2015/v8iS1/57729

Effects of Environmental and Human Constructs on e–learning Effectiveness in Online University Settinings

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Abstract

The purpose of the research was to understand effects of environmental and human constructs on the success of e-learning in an online university in Korea. The participants of the study completed an online course entitled "Foundations of Online Learning" during 2013-14 winder semester. The participants were asked to respond to the questionnaires on the course content quality, instruction configuration quality, LMS quality, self-regulated learning ability, and instructor-learner/learner-learner/learner-content interactions. Among a total of 196 participants, valid data from 177 participants were used for the analyses. The results included effects of some independent variables on academic achievements and class satisfaction. Based on the findings, suggestions were made.

Keywords: Academic Achievement, Class Satisfaction, Effectiveness of Education, Environmental Constructs, Human Constructs, Online University

1. Introduction.

Since their introduction in 2001, with the development of information and communication technology, Korean online universities (or cyber universities) have continued to grow. As of 2013, 100,455 students were enrolled in the country's 21 online universities (Cyber University information System, 2014).

Cyber universities facilitate learning at any time or place without the limitations of a physical classroom[14]. Learners at cyber universities are characteristically autonomous and capable of managing their learning independently[9]. Thus, learners' self-regulated learning (SRL) strategies play a significant role in successful learning[28].

Online universities also promote active learning through interaction between instructors, learners, and content (Moore and Kearsley)[23] using online communication tools that transcending time and space constraints[2].

Yoo[27] suggests that six factors determine e-learning performance and effectiveness

1. Learners' characteristics (e.g., readiness, motivation, self-directed learning ability)
2. Learning content and resource quality
3. Interaction quality
4. Operating strategy quality
5. The Cyber Learning System Environment (i. e., hardware, software, and network infrastructure)
6. Administrative and Institutional Support.

Accordingly, understanding the importance of factors such as learning content/resource quality, interaction, and learner characteristics is critical in an e-learning environment. While both external (environmental) and

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internal (human) variables should be considered in online learning, prior research did not focus on these. Therefore, to analyze the effectiveness of online learning, variables for instructional and learner-related environments were included as major constructs in this research.

Kim[16] asserted that positive class satisfaction did not necessarily guarantee effective instruction. This implies that learner-evaluated class satisfaction and instructor-assessed academic performance should both be synthetically considered in measuring the effectiveness of education. Consequently, academic achievement and class satisfaction were used as the instruction result.

In this study, learning environments encompassed the quality of course content, instruction configuration, and the Learning Management System (LMS). Regarding internal variables, learners' SRL ability, instructor-learner/learner-learner/learner-content interactions were used for analyses.

In conducting the present study, seven independent variables were set: three related to environmental factors (quality of course content, instruction configuration, and the LMS), and four related to human factors (SRL ability, instructor-learner interaction, learner-learner interaction, and learner-content interaction). Dependent variables comprised academic achievement and class satisfaction.

With these variables, the first research question involves determining which of the seven independent variables affect on academic achievement, while the second question examines which of the seven independent variables affect class satisfaction?

2. Theoretical Backgrounds

2.1 Environmental Factors in e-learning

In Jung, Choi and Choi[10], major factors that affected class satisfaction were the quality of course content and instruction configuration. Similarly, Cho[4] found that students' were uninterested in incoherent course content, and that they seldom participated in learning activities. This indicates that simply utilizing state-of-the-art digital technology does not necessarily result in successful e-learning. In other words, course content and instruction configuration should be pertinent in order to motivate online learners. Chae[3] analyzed the effect of education by measuring academic achievement. In the study, course content, the LMS interface and technical support were critical constructs for academic performance.

In a survey of web-based learning participants, Freeman found that frequent web server failures and slow LMS processing speeds were key factors inhibiting online learning[7]. Kim, Yang, Um, and Kim[15] did not find a significant relationship between learning satisfaction and technical factors such as e-learning system quality and ease of use. This could imply that highly advanced e-learning technologies do not greatly enhance learner satisfaction.

In sum, the quality of course content, instruction configuration, and LMSs are major factors that researchers have addressed in online learning.

2.2 Human Factors in e-learning

Among variables such as SRL ability, attitude, time management and other learner-related variables in e-learning, SRL ability was most influential in academic achievement and class satisfaction[8]. Lee[18] also found a high correlation between SRL ability and academic performance although SRL ability could not independently explain all grades. In contrast, Yoo[27] and Freeman[7] contended that SRL ability was unrelated to task performance, and that sub-elements of SRL ability negatively affected on learning outcomes.

Regarding interaction in e-learning, Moore and Kearsley divided online interaction into three types: learner-learner, learner-instructor, and learner-content[23]. Jung and Lim[11] found that the degree of learner-instructor interaction and learners' active participation affected class satisfaction in online learning. Moreover, learner-instructor interactions were more effective than learner-learner interactions[20]. Shin, Park, Kim, and Kye[24] conducted a meta analysis and confirmed that learner-instructor and leaner-learner interactions contributed significantly to improved learning outcomes.

Contemporary research examining successful e-learning models has generally focused on identifying independent variables to explain academic achievement and class satisfaction including external of environmental factors (e.g., course content, instruction configuration, LMSs) and procedural or human-related factors related to interactions and intrinsic attributes (e.g., SRL ability). Therefore, we deemed it essential to examine the effects of academic achievement and class satisfaction on both

environmental and human factors to synthetically understand the structure of successful online learning.

3. Methodology

3.1 Participants

Study participants completed a course examining the foundations of online learning while attending an online university located in Seoul, Korea during the 2013-14 winter semester. As a required subject, the learners' backgrounds varied significantly. A total of 196 participants completed online surveys at the semester's close, 177 valid responses were received and used to address the study's research questions. The participants' demographics are provided in Table 1.

Table 1. Demographics of the participants

Index		N	%
Gender	Male	63	35.59
	Female	114	64.41
Grade	Freshman	37	20.91
	Sophomore	14	7.91
	Junior	61	34.46
	Senior	65	36.72
Total		**117**	**100**

3.2 Research Instruments

Regarding environmental factors, 13 questions were formed from three constructs. First, items measuring course content quality were developed based on Kettinger and Lee[13] and Lee, Strong, Khan, and Wang[21] inventories on content quality. These questions included statements such as "The course content was varied," "The course content met your needs," "The course content was informative and suggested problem solving methods," "The course content was interesting," "The course content was rich," and "The course content provided diverse learning strategies." Second, instruction configuration quality was modeled after Kettinger and Lee[13] and Lee, Strong, Khan, and Wang[21]: "There were no errors in the instruction configuration," "The instruction configuration was clear," "The instruction configuration was consistent," and "The instruction configuration was easy to understand." Third, questions regarding LMS quality were developed based on Ku, Lee, Kim, and Seo[17] system quality inventory; these questions included "Data processing of the LMS was fast," "The LMS was stable," and "The LMS was easy to use."

In terms of human factor, 34 questions were developed to measure the four constructs. First was related to SRL ability: "When studying for a test, I try to combine the information from the class and textbook," "When completing homework, I try to remember what the instructor said in class so I can answer the questions correctly," "It is easy for me to decide what the main ideas are in what I read," "When I study I put important ideas into my own words," "When studying, I copy my notes over to help me remember material," "I use what I have learned from old homework assignments and the textbook to do new assignments," "When I read material for this class, I say the words over and over to myself to help me remember," "I outline the chapters in my book to help me study," "When reading I try to connect the things I am reading about with what I already know," "I ask myself questions to make sure I know the material I have been studying," "I work on practice exercises and answer end of chapter questions even when I don't have to," "Even when study materials are dull and uninteresting, I keep working until I finish," "Before I begin studying I think about the things I will need to do to learn," "when the instructor is talking, I hardly think of other things and listen to what is being said," and "When I'm reading I stop once in a while and go over what I have read."

In regard to interactions, items were modeled after An[1] research. The learner-learner interaction construct comprised five items: "I actively communicated with other students online," "I completed various group activities with other students," "I asked questions and answered other students' questions," "I exchanged information with other students while learning," and "I actively communicated with other students using e-mails." The instructor-learner factor comprised seven items. These items included: "The instructor provided feedbacks," "The instructor actively communicated with students online," "The instructor understood student's learning needs and responded to them," "The instructor facilitated active interactions among students," "The instructor offered activities based on students' proficiencies," "The instructor conducted various interactions," and "The instructor continuously inspired and motivated students." The final set of questions concerned learner-content interaction. These items included: "The content was consistently engaging," "The interaction interface

was consistent," "The interactive content was available when students needed access," "The content was easily accessible by students," "This course was structured to be easily accessible and interactive," "I could easily check my learning progress and receive feedback concerning it," and "Various materials were offered based on students' proficiencies."

The dependent variables used to estimate learning effectiveness were twofold with the first variable being academic achievement, which was measured according to course grades. Course grades were calculated based on written examinations (40%), assignments (30%), class participation (10%), attendance (10%). Students who scored above 70% passed the course; others failed.

Class satisfaction was the second dependent variable, and its inventory was based on Wang[26] research. It included statements such as "I learned a lot from this course," "I do not regret taking this course," "I feel that I matured during this course," "My learning ability and skills have improved," "Overall, I am satisfied with the course," "The knowledge and experiences obtained from this course will benefit my work," "I felt a sense of accomplishment following this course," and "I would recommend this course to other students."

3.3 Research Methods

Participants completed a twelve-week online course entitled "Foundations of Online Learning" during 2013-14 winter semester. Following the course, an online survey questionnaire was distributed to participants, and the responses were analyzed using SPSS 18.0. In parallel, a qualitative approach was utilized to support the statistical analyses. A cyber university management officer and an instructor with ten and five years yearth of experience respectively participated in the study as interviewees. After the quantitative results were collected, both interviewees partook in the analyses and provided feedback.

4. Result

4.1 Reliability and Multicollinearity

To examine the reliability of the survey questionnaire, internal consistency Cronbach's αvalue was measured revealing an acceptable number of .70. Tolerance and Variance Inflation Factor (VIF) analysis was conducted to verify multicollinearity. The results are shown in Table 2 and no multicollinearity was found.

Table 2. Results of multicollinearity test

Construct	Tolerance	VIF
Course content quality	.30	3.32
Instruction configuration quality	.37	3.07
LMS quality	.36	2.80
SRL ability	.58	1.73
Learner-learner interaction	.85	1.18
Learner-instructor interaction	.44	2.28
Learner-content interaction	.22	4.57

4.2 Academic Achievement

In order to obtain results easily usable in practice, we determined the validity limits of the equations for the purpose of prediction

A regression equation was created to address the first research question, which is provided in Table 3.

Table 3. Regression equation for the first research question

Academic achievement $(y) = b_0+b_1 x_1+b_2 x_2+b_3 x_3+b_4 x_4+b_5 x_5+b_6 x_6+b_7 x_7+e$

b_0: intercept	b_1~b_7: estimated slope of a regression of y on x_1~x_7
x_1: course content quality	x_2: instruction configuration quality
x_3: LMS quality	x_4: SRL ability
x_5: learner-learner interaction	x_6: learner-instructor interaction
x_7: learner-content interaction	e: error

After conducting a multiple regression analysis, some significant results were found. The F-value of the test statistic was 2.79 with a significance level of .009. R^2 (which represents the model's explanatory power) showed a value of .10. Regarding independent variables, SRL ability and LMS quality were significant at a level of .05. Specifically, the standardized coefficients for the SRL ability and LMS were .31 and .28, respectively.

Table 4. Result for the first research question

Variables	Unstandardized coefficient		Standardized coefficient B	t	p
	B	S.E.			
(Intercept)	76.32	6.46		11.81	.000
Course content quality	-.12	.35	-.047	-.36	.723
Instruction configuration quality	-.43	.53	-.10	-.80	.423
LMS quality	1.49	.64	.28	2.31	.022*
SRL ability	.44	.14	.31	3.27	.001**
Learner-learner interaction	-.19	.24	-.06	-.81	.420
Learner-instructor interaction	-.37	.25	-.16	-1.49	.138
Learner-content interaction	-.38	.39	-.15	-.98	.329
R^2 = .10 / F = 2.79**					

*p<.05, **p<.01

4.3 Class Satisfaction

A second multiple regression analysis was conducted for the class satisfaction tests. The F value of the results was 52.96 (p<.001), and the R^2 was .69. In terms of independent variables, course content and instruction configuration quality were significant. The standardized coefficient for course content and instruction configuration was .55 (p<.001) and .30 (p<.001), respectively. The overall results are provided in Table 5.

Table 5. Result for the second research question

Variables	Unstandardized coefficient		Standardized coefficient B	t	p
	B	S.E.			
(Intercept)	9.89	4.95		2.00	.047
The quality of course content	1.86	.27	.55	6.98	.000***
The quality of instruction configuration	1.63	.41	.30	4.01	.000***
The quality of the LMS	.78	.49	.12	1.59	.114
SRL ability	.04	.10	.02	.41	.681
Learner-learner interaction	-.22	.18	-.06	-1.21	.230
Learner-instructor interaction	.22	.19	.07	1.12	.264
Learner-content interaction	-.40	.30	-.12	-1.33	.184
R^2 = .69 / F = 52.96***					

***p<.001

5. Conclusion and Suggestions

This study examined the effects of environmental (i. e., course content, instruction configuration, and LMS quality) and human factors (i. e., learner's SRL ability and interactions) in relation to e-learning success. A total of 177 questionnaires from participants attending an online university were analyzed to answer the research questions.

The academic achievement and class satisfaction test results are discussed below.

First, the results from the multiple regression analysis to understand the independent variables' effects on academic achievement revealed that LMS quality and SRL ability were positively significant. In addition, SRL ability that had a higher standardized coefficient of the two variables was more influential. The results implied that SRL ability had a greater effect on academic achievement than learning environments and interactions. This result differed from earlier studies (Yoo[27]; Chae[3]; Lee and Yoo[20]; Shin, Park, Kim, and Kye[24]; Suh[25]; Lim and Lee[22]) that emphasized the importance of interactions in e-learning.

Class satisfaction was mainly affected by course content and instruction configuration quality. These independent variables explained 68.7% of class satisfaction. Between the two variables, course content quality was most influential, a result supported by previous research such as Jung, Choi, and Choi[10]. Therefore, participant satisfaction was primarily dependent on how well course content was organized.

Since data used in the analyses were from the subjective perspectives of participants' points of views, they can only provide a generalization of the results. Nevertheless, this study had a unique strength in that both external (environmental) and human (internal) factors were jointly considered in determining the effectiveness of e-learning in an online university setting. Based on these findings, the following suggestions were made.

First, further research is required to explain e-learning success in a more systematic way. Although numerous variables were considered in this study, more sophisticated ones should be selected. For example, Lee[19] maintains that SRL ability alone cannot not cover all learner-related variables, and that other variables such as online learning strategies might be more accurate predictors of academic performance. As such, optimal instructional models that consider and use essential variables that lead to successful e-learning should be developed.

Second, an examination of how high class satisfaction leads to positive academic achievement must occur so that both factors can be correlated to enhance learning effectiveness. A set of educational activities would be deemed successful when both learner-evaluated class satisfaction and instructor-assessed academic achievement were positively estimated in tandem. Hence, critical variables that link class satisfaction and academic performance should be systematically investigated to achieve effective instruction.

Finally, an improved e-learning instructional paradigm for online universities is needed. Seven different variables were tested in this research to understand learning effectiveness-some significant and others not. Although no model can identify all variables that contribute to perfect e-learning success, identifying the fittest variables is imperative in pursuing effective and efficient online learning, which can subsequently facilitate enhancing the overall quality of Online Universities.

6. References

1. An BK. Development of evaluation criteria for interactions in e-Learning for public schools [Doctor Disseration]. Department of Education Graduate School Keimyung University; 2009.
2. Barron AE, Lyskawa C. Software tools for online course management and delivery. In: Khan B, editor. Web-based Instruction. Englewood Cliffs, NJ: Educational Technology Publications; 2001. p. 303–10.
3. Chae KM. A study of Web-based Instruction Effectiveness in Firms [Master Thesis]. Incheon, Korea: Graduate School of Management University of Incheon; 2003.
4. Cho ES. Evaluation of Student Responses in virtual classroom: Case study in Satellite lectures of Cyber Univer. J of Mokwon University. 1999
5. Statistics of Cyber University. Cyber University Information System. 2014. Available from: http://www.cuinfo.net/home/eudc/statistics.sub. action?gnb=55
6. Driscoll MM. Developing synchronous web-based training for adults in the workplace. In Khan B, editor. Web-based Instruction. Englewood Cliffs, NJ: Educational Technology Publications; 2001. p. 173–83.
7. Freeman M. Flexibility in access, interaction and assessment: The case for web-based teaching programs. Aust J Educ Tech. 1997; 13(1):23–39.
8. Hwang JY, Choi MS. Learning achievement and educational satisfaction according to learners' background variables and learning strategies in online teacher training. Korean Assoc for Educ Inform and Media. 2006; 12(2):255–74.
9. Joo YJ. Kim NY. Cho HK.Relationship between self-efficacy, online task value and self-regulated learning, and satisfaction and achievement in cyber education. Korean Assoc for Educ Inform and Media. 2008; 14(3):115–35.
10. Jung IS, Choi SW, Choi SH. Educational effectiveness analysis using online network: focus on open education of samsung. Korean National Open University Institute of Distance Education. 1997
11. Jung JS, Lim KY. Effect analysis of factors related to the learner participation, achievement, and satisfaction in the

web-based online discussion. J of Educ Technol. 2000; 16(2):107–35.
12. Kang MH, Kim SE. Investigating the effects of self regulated learning strategy assisting online project based learning. J of Educ Technol. 2002; 18(1):3–22.
13. Kettinger JW, Lee CC. Pragmatic perspectives on the measurement of information systems service quality. MIS Quarterly. 1997; 21(2):223–40.
14. Khan BH. Web-based training: an instruction. In Khan B, editor. Web-based instruction. Englewood Cliffs, NJ: Educational Technology Publications; 2001. p. 5–12.
15. Kim JS, Yang HD, Um HM, Kim JK. Consensus of corperate e-learning system stakeholders regarding the satisfaction of end-users. Asia Pacific J of Inform Syst. 2005; 15(4):27–60.
16. Kim MR. Evaluation in social education. Seoul: Wonmisa; 1999.
17. Ku JC, Lee SC, Kim NH, Seo YH. Factors affecting user acceptance in mobile banking: An empirical study using extended TAM and trust. Asia Pacific J of Inform Syst. 2006; 16(2):159–81.
18. Lee IS. Relationship between e-learning strategies and learning achievement. J of Educ Technol. 2005; 18(2):51–68.
19. Lee IS. Self-regulation, self-efficacy and e-learning strategies during e-learning and academic achievement. J of Educ Technol. 2003; 19(3):41–68.
20. Lee JS, Yoo JM. Effect of CMC-environment and interaction-types on the achievment and satisfaction in the teaching and learning of science. J of the Korean Earth Sci Soc. 2003; 24(7):625–34.
21. Lee YW, Strong DM, Khan BH, Wang RY. AIMQ: a methodology for information quality assessment. Inform & Manag. 2002; 40:133–46.
22. Lim YW, Lee OH. A study on relations among the learning participation, learning satisfaction and academic achievement of cyber learners. The Korea Assoc of Yeolin Educ. 2008; 16(2):177–200.
23. Moore MG, Kearsley G. Distance education: a systems view. Belmont, CA: Wadsworth Publishing Company; 1996.
24. Shin JH, Park IW, Kim DI, Kye BK. Factors affecting academic achievement in e-learning. Korea Educ and Res Inform Serv. 2005. KR2005-35.
25. Suh HJ. A study of the factors related learning outcome in the web-based lifelong learning program [Doctor Disseration]. The Graduate School of Sookmyung Women's University; 2001.
26. Wang YS. Assessment of learner satisfaction with asynchronous electronic learning systems. Inform & Manag. 2003; 41(1):75.
27. Yoo PJ. Learner-related factors which have effects on learner participation, learning achievement, and learner satisfaction of online graduate course. Korean Assoc for Educ Inform and Media. 2003; 9(4):229–67.
28. Zimmerman BH, Martinez-Pons M. Student differences in self-regulated learning: relating, grade, sex, and giftedness to self-efficacy and strategy usse. J Educ Psychol. 1990; 82(1):51–9.