The Role of Technology Self-efficacy in Electronic Learning Satisfaction: EFL Online English Class*

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Kim, Sun-Young. 2009. The Role of Technology Self-efficacy in Electronic Learning Satisfaction: EFL Online English Class. *The Linguistic Association of Korea Journal. 17*(3). 79-99. This study proposes the conceptual model that can explain the mechanism in which a technology self-efficacy affects students' satisfaction with online English learning. The set of hypotheses drawn from the Technology Acceptance Model (TAM) and the literature are tested to examine the role of technology self-efficacy in students' satisfaction. Survey data collected from the students taking online English courses were analyzed using the factor analysis and structural equation modeling techniques. The test results for the proposed hypotheses supported the mechanism in which a technology-specific self-efficacy influenced the students' satisfaction level with online learning. In particular, the TAM factor provided the mediating channel through which a technological competence affected educational outcome by interacting with a student's technology adoption process. This study argues that teachers should take technology proficiency in electronic English classes as an essential part of teaching practices.

Key Words: online education, information technology, computer self-efficacy, student satisfaction, technology acceptance model

1. Introduction

Online learning in English education has been widely accepted as the term to describe technology-based learning in all its forms. As Rosenberg (2001)

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pointed out, online learning in this paper is defined as "delivering course contents to the end-user via an Internet technology that creates the connections between a teacher and students." As demands for online learning have rapidly grown over time, the majority of educational institutions in Korea, especially colleges and universities, recognize the importance of online learning as a major growth strategy, delivering as many as course content over the Internet. Accordingly, the Internet is incorporated into educational settings, replacing the traditional classroom space and time. In particular, the flexibility of time and place for learning might be the most important feature of online education.[1)]

Many Korean educational institutions have offered a wide range of degree and certificate programs through the online learning systems. As of 2008, among 3.5 million students in higher education institutions, about 80 thousands students were enrolled in 15 cyber universities. Recently, traditional universities have also increased online course offerings to turn into "hybrid model institutions." For instance, the Korea Open Course Ware provides the services of sharing online course contents across majors with 38 universities in Korea. In line with the paradigm shift toward online course offerings, many institutions in the field of English education have attempted to broaden the learning space by providing a variety of courses in online formats. Though a debate still flourishes on whether online interaction can enhance students' English learning, higher demands for online English class serve as a means to increase online course offerings.

Many studies, examining the role of a technology self-efficacy in online learning, argued that online educational services provide students with a third place to interact, reflect on, and collaborate, leading to a high level of educational satisfaction. However, little attention has been paid to the mechanism in which a technological self-efficacy is defined as "a technology-specific competence that an individual student perceives on her/his capabilities to perform a course of actions in online learning environment" (Bandura, 1997; Compeau & Higgins, 1995), which affects students' satisfaction with online learning. The literature criticizes the assumption that most students

1) A range of terms, such as "e-learning" (Rosenberg, 2001), "distance learning" (Sherry, 1995; Leidner & Jarvenpa, 1995; Garrison, 2000), and "flexible learning" (Collis & Moonen, 2001), describe a similarly conceived online education.

have the ability to use the information and communication technologies appropriate to an educational setting (Jones, Packham, Miller, & Jones, 2004). Specifically, the role of Technology Acceptance Model (TAM, here after) as a mediator has been ignored in the literature (Hong, Ridzuan, & Kuek, 2003; Xie, Debacker, & Ferguson, 2006). A technology self-efficacy can affect students' decisions to adopt technology through the interaction with two TAM variables, the easy-of-use and usefulness perceived by them.

The students' beliefs on their efficacy influence their technology choices, aspirations, and how much effort they mobilize in a given endeavor (Bandura, 1997; Eastin & LaRose, 2000). In this respect, a technology self-efficacy could be viewed as a key mechanism leading to students' educational satisfaction through their decisions to use appropriate technologies required to take online courses. For example, individuals who perceive themselves as highly self-efficacious are likely to initiate the sufficient effort to maintain control over online learning, which in turn produces successful learning outcomes, and vice versa.

This study proposes the conceptual model that can explain the mechanism in which a technology self-efficacy affects educational satisfaction with online learning through the mediating TAM variables in the context of English education. Three Hypotheses drawn on the TAM variables and the literature were developed to test the implications of a model, or the impact a technology self-efficacy may have on educational satisfaction through the technology adoption process. Two TAM variables, the perceived easy-of-use and usefulness of online learning, were incorporated into the model as the mediators linking a technology competence to students' satisfaction with online learning. The factor analysis and structural equation modeling techniques were used to examine the empirical relationships existing between the educational satisfaction and other derived factors.

This study takes an approach different from other studies conducted in this field. First, the mediating role of the TAM variables is examined using the surveys collected from the students, which is compared with other studies done under the qualitative tradition. Second, this study first develops the conceptual model based on the theory and literature and then empirically tests it through the set of hypotheses.

The paper is organized as follows. I briefly review related studies in Section

II and proposes an educational satisfaction model in Section III. Section IV reports the results for the hypothesis tests with the concluding remarks in Section V.

2. Literature Review

This section reviews the existing researches on a technology self-efficacy and TAM theory, which formed the theoretical background of this research. Then, the hypotheses drawn on the literature were developed.

2.1 Role of Technology Self-Efficacy and TAM Variables

Recent studies on the technology-assisted learning in English education have focused mainly on how to improve user acceptance through the application of the Technology Acceptance Model (TAM) (Chau & Hu, 2001; Gefen, Karahanna, & Straub, 2003; Lederer, Maupin, Sena, & Zhuang, 2000). Based on the theory of reasoned action, TAM suggests that students' acceptance of technology is driven by their beliefs about the consequences of that usage. In particular, TAM predicts that students embrace a technology only when online learning system is easy to use and useful to their online learning (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989). Thus, students are willing to adopt educational technology when their perceptions on "the easy-of-use" and "usefulness of technology" are positive.

The perceived easy-of-use as a first TAM factor represents the level of difficulty they expect to have in integrating the technology into their routines. On the other hand, the perceived usefulness as a second TAM factor measures students' perceptions on whether the use of educational technology will enhance their performance in completing an academic job. TAM suggests the student should perceive both ease-of-use and usefulness before s/he adopts a technology, which will eventually influence her/his decision to adopt technology.

Venkatesh & Davis (1996) and Venkatesh, Morris, Davis, & Davis (2003) empirically showed that the perceived easy-of-use as a critical antecedent to

technology acceptance played an important role not only in the process of technology adoption, but in raising the level of satisfaction from online learning as well. On the contrary, many other studies showed that the results were not immediate, casting doubt on applying the TAM theory to teaching practices. Similarly, Venkatesh & Davis (2000) found that it was not clear what role the perceived easy-of-use played in the student's decision-making process. In a similar context, Szajna (1996) and Venkatesh (1999) also demonstrated that students' perceptions on the easy use of technology was not related to the technology adoption decisions.

On the other hand, some studies demonstrated that the impact of the easy-of-use on a student's satisfaction was not be immediate since the technology adoption process was more related to learner-specific personal traits. Specifically, Keil, Beranek, & Konsynski (1995), and Morris & Dillon (1997) indicated that students' personal traits such as attitude toward online learning was likely to contribute to their educational satisfaction through the interaction with classroom technology.

The role of the second TAM factor, the perceived usefulness by students, has been demonstrated in numerous studies, showing that the perceived usefulness were found to be significant. Specifically, it appeared to influence the technology adoption process and thus the degree of satisfaction they experienced from online English learning. Karahanna, Straub, & Chervany (1999) demonstrated that the adoption decision made by students widely differed according to the usefulness of technology they perceived. In a similar studies, Karahanna & Straub (1999) found that, in order to produce successful outcomes, the technology use must not only be useful, but be appropriate to their own learning purposes as well. This point was also illustrated by Venkatesh & Davis (2000). Their study suggested that the students' beliefs about usefulness were influenced by the relevance of the technology to one's purpose.

These studies above, though addressing the importance of TAM variables in online learning, failed to distinguish between a technology self-efficacy and the use of technology. In particular, it is not clear how students' satisfaction is related to a technology competence and two TAM variables. The role of a technology self-efficacy in relation to TAM variables was not examined in the literature. It was not clear whether educational satisfaction is influenced by a

technological competence, by two TAM variables, or by the interaction between them.

The other strand of research on online education directly examined whether students' satisfaction from online learning is affected by their technological competence (i.e., judgment of capabilities to use online learning systems) (Agarwal, Sambamurthy, & Stair, 2000; Marakas, Yi, & Johnson, 1998). Online learning self-efficacy is distinguished from general self-efficacy in that it refers to task-specific or situation-specific form of efficacy. Even for students with general self-efficacy, there may be a lack of task-specific self-efficacy (i.e., using computers, the Internet, and other web application tools).

Agarwal, Sambamurthy, & Stair (2000) found that technology self-efficacy affected the satisfaction level by interacting with the perceived use of technology toward new systems. In a similar study, Marakas et al. (1998) supported this argument by finding that students who had the high level of technology self-efficacy were more likely to reveal higher perceptions both on the usefulness and ease of use. However, these studies, although addressing the mediating role played by the TAM factors, are limited in that their relationships to educational satisfaction were not addressed.

As Hong, Lai, & Holton (2003) address, information technology skills seem to provide an important aspect for students' improvement in web-based courses. A higher level of computer competence is linked to greater enjoyment with web-based learning (Mitchell, Chen, & Macredie, 2005). Changchit (2007) and Liu et al. (2009) investigated which technological tools were most effective in conducting online courses at the college level and found that "message board" and "chat room" were the most useful tools. The use of these classroom technology was found to have a positive influence on students' achievement and their satisfaction from web-based courses. In this respect, the familiarity with technology is important skills required to take an online course. Once students become familiar with the technology, they are more likely to participate in online education, ensuring the quality of learning experiences provided and developed (White, 2005).

As reviewed in this section, the research on technology self-efficacy has not addressed the mediating role played by TAM factors while TAM literature fails to distinguish between the use of technology and self-efficacy. As an attempt to

understand the effect of technology self-efficacy on educational satisfaction with online English learning, this study develops the model that includes the TAM variables as the factors mediating educational satisfaction from online learning.

2.2 Hypotheses Development

The relationships among a student's self-efficacy, TAM variable (i.e., perceived usefulness and easy-of-use of online education), and educational satisfaction have not been widely explored in the field of English education. Furthermore, the mediating role played by TAM variables in online learning has not been examined in the literature. To examine the role of technology self-efficiency in online education, I developed the satisfaction model drawn both from the e-learning literature and the TAM theory. In particular, the structural model tested how a technology self-efficacy influences a student's learning outcome, measured by his/her satisfaction for online learning, through the mediating TAM channels. The three hypotheses were proposed here to understand a mechanism through a technology self-efficiency affecting students' learning outcome.

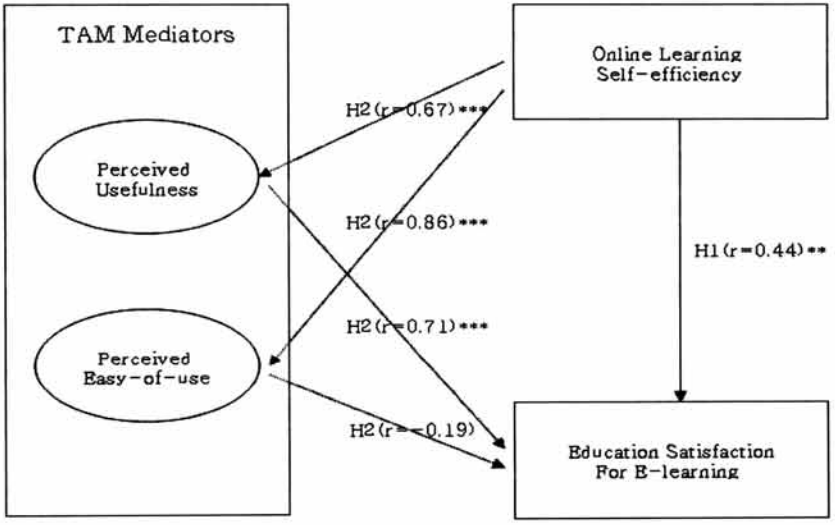
Figure 1 presents the conceptual model that explains the inter-relations among the factors. In Hypothesis 1, it is expected that a technology self-efficacy influences the satisfaction level from online learning. As documented in the literature, it plays an important role in determining the extent to which students participating in online English courses are satisfied with these experiences. In the model, two variables, or technological competence and satisfaction, are correlated each other with a correlation coefficient of 0.44, supporting the possible relationship existing between them.

In Hypotheses 2 and 3, it is expected that students' perceptions on the easy-of-use and usefulness of online technology have a significant and positive effect on learning outcome. The students' evaluations on the use of technology can mediate their satisfaction level since it influences their technology adoption processes. As expected, the usefulness measure is highly correlated with a satisfaction variable ($r = 0.71$), but the relationship between the perceived easy-of-use and satisfaction variables was not significant ($r = -.019$). The Hypotheses tested are as follows.

H1: *A technology self-efficacy has a significant and positive effect on students' satisfaction for online education.*

H2: *A technology self-efficacy has a significant and positive effect on online educational satisfaction through the interaction with perceived the easy-of-use of online learning.*

H3: *A technology self-efficacy has a significant and positive effect on online educational satisfaction through the interaction with the perceived usefulness of online learning.*



Note: "***" and "**" denote the statistical significance of the correlation coefficient (r) at the 1* and 5% levels, respectively. The degree of relationships among the variables included in the model was estimated using the Pearson r (product-moment) correlation method.

Figure 1. A Conceptual Mapping of the Interrelationships among the Factors

3. Research Methodologies

3.1 Survey

This study developed a questionnaire, as shown in the appendix, to measure the students' perceptions on online learning on a 5-point Likert scale in four

specific areas: two TAM variables, a technology self-efficacy, and educational satisfaction. This self-reporting survey was distributed to Korean students who were registered to online universities and had previous or current experiences of taking English online courses. The survey was administrated via a web-based survey method during March and April, 2008. Among 211 surveys returned, 190 valid observations with complete responses were used in this study. An average satisfaction score with online learning was 3.9 (SD = 0.87) out of 5, indicating that the participants, on average, reported a higher level of satisfaction from online English learning.

Key sample characteristics such as gender, age, and educational experience, are reported in Table 1. Unlike students in traditional universities, the participants attending online universities showed a wide range of differences in terms of age and educational background. Specifically, more than 50% of the students were aged over 30, suggesting that pursuing academic careers might not be their main purposes of attending online universities. The students' education backgrounds also differed widely. The significant portion of the participants already had the college or undergraduate degrees, as shown in Table 1.

Table 1: Profiles of Participants

Sample characteristics		N	%
Gender	Male	102	53.7
	Female	88	46.3
Age	18-22	16	8.4
	23-29	68	35.8
	30-39	64	33.7
	40-49	31	16.3
	Above 50 years old	11	5.8
Previous Education	Secondary (high school)	96	50.5
	College	48	25.2
	University	36	18.9
	Graduate	10	2.5

To measure students' satisfaction with online learning, three items were used: "overall satisfaction with online learning," "willingness to recommend online education to others," and 'intension to continue online education' with responses ranging from 'least likely = 1' to 'most likely = 5.' Two TAM variables (i.e., perceived usefulness and easy-of-use of online education) measured the extent to which the students decided to adopt technology. These variables were measured using a total of 9 exploratory instruments on a 5-point scale ranging from 'strongly disagree = 1' to 'strongly agree = 5.' To measure "online learning self-efficacy," students were asked to identify technical skills and knowledge required for successfully performing online course works on a continuum ranging from 'very poor = 1' to 'very good =5.'

3.2 Factor Analysis

The factor analysis with a Varimax rotation procedure was applied to identify underlying dimensions of perceived usefulness and easy-of-use of online education with the reliability test that tested the internal consistency for extracted constructs. An exploratory factor analysis for the perceived usefulness and easy-of-use of online education yielded two factors based on 1 eigenvalue cut-off. The sums of squared loadings from both components showed the cumulative value of 77% in explaining the total variance. Further scale refinement was accomplished by examining item-to-total correlation to improve the reliability. Table 2 summarizes the factor analysis outcomes for two TAM variables.

Table 2. Results of Factor Analysis for Perceived Usefulness and Easy-of-use

Items	Factor loadings	Eigen-value	Extracted variance	Factor name	Corrected item-total correlation	α
Enhancing effectiveness	0.88	4.14	45.99	Perceived usefulness	0.72	0.90
Increasing productivity	0.87				0.85	
Improving ability	0.84				0.84	

Accomplishing quickly	0.82				0.79	
Overall useful	0.81				0.81	
Easy to become a skilful user	0.88	2.88	32.10	Perceived easy-of-use	0.81	0.88
Clear and easy interaction	0.85				0.78	
Overall easy-of-use	0.85				0.75	
Total			76.102			

Note: The Principal Component Analysis was used as an extraction method and Varimax with Kaiser Normalization as rotation method.

As shown in Table 2, 8 out of 9 items were retained for analysis, which represented the two TAM factors; "perceived usefulness" measured by 5 items with internal consistency of $\alpha = 0.90$ and "perceived easy-of-use" measured by 3 items with internal consistency of $\alpha = 0.88$. In addition, the Kaiser-Meyer-Olkin (KMO) overall measure of sampling adequacy (MSA) yielded 0.920 within the acceptable level. Such reliability measures provided a strong support for using these multiple items. On the other hand, the internal consistency measures for the dependent variable ($\alpha = 0.91$ with 3 items), or "online education satisfaction," and for "technology self-efficiency" ($\alpha = 0.92$ with 4 items) all indicated that items included in the survey were reliable measures of respective variables.

The Analysis of Moment Structures (AMOS: Arbuckle, 2006) was used for an empirical testing of the structural model, and numerical values for its components were estimated using the Maximum Likelihood Estimation method. Bootstrapping (Efron, 1987; Stine, 1989) method was employed to diagnose the presence of distribution problems in the data and to gauge their effects on the parameter estimates. In this case, 200 bootstrap replications were obtained. Confirmatory Factor Analysis (CFA) was applied to test the validity of the scales in measuring specific constructs of the measurement model according to Fornell and Larker (1981)'s guideline.

The degree of freedom with large standard error variances (Bollen & Joreskog, 1985) was evaluated to diagnose possible identification problems. An

identification problem was remedied in accordance with Hayduk (1987)'s guidelines. Bollen's (1989, p. 275) criteria was applied to evaluate the overall model goodness-of-fit. The following goodness-of-fit measures were executed: Chi-square statistic (CMIN), degrees of freedom (DF), goodness of fit index (GFI), adjusted goodness of fit index (AGFI), root mean square residual (RMR), normed fit index (NFI), and root mean square of approximation (RMSEA). GFI and AGFI can vary from 0 to 1 where values above 0.90 are good and value of 0.80 are moderate (Bentler & Bonett, 1980).

4. Empirical Results

The result rejected Hypothesis 1 (i.e., the direct impact of a technology self-efficacy on students' satisfaction with online learning), indicating that there exists a significant and positive causal relationship between them with the estimated coefficient of 0.43 ($p < 0.05$). The result shows that even in English online class, technological competence plays an important role in explaining the degree of satisfaction students experience from online learning. This finding, though not explaining specific channel through which a technological self-efficacy affects students' satisfaction, provides the evidence supporting the importance of online self-efficacy in English education.

When it comes to Hypothesis 2, a technology self-efficacy has a significant and positive impact on the perceived easy-of-use with the estimated value of 0.87 ($p < 0.001$), but the causal relationship between the perceived easy-of-use and students' satisfaction is found to be insignificant (estimated value = -0.19 with $p > 0.1$). The acception of Hypothesis 2 pointed out that although a technological competence affected the use of technology, a technical skill itself did not lead to the higher level of satisfaction from online learning. This finding is consistent with Venkatesh & Davis (2000) and Szajna (1996) in that the easy-of-use perceived by students does not play a role in their decision-making process and thus satisfaction.

Hypothesis 3 tested whether a technology self-efficacy had a significant and positive effect on online educational satisfaction through the mediating TAM factor (the usefulness of online learning). The test rejected this hypothesis,

supporting that a technology-specific self-efficacy had a significant interaction with the perceived usefulness. Thus, the result reinforces the importance of this TAM variable in understanding the degree of satisfaction students experience from online learning.

Table 3. Outputs of Structural Equation Model (SEM) Estimates.

Path diagram				Proposed model	Bootstrapping #
				Estimate (S.E.)	Estimate (bias)
H1:	Online learning self-efficacy	→	Satisfaction	0.43(0.17)**	0.59(0.021)
H2:	Online Learning self-efficacy	→	Perceived Easy-of-use	0.87(0.039)***	0.83-0.0032)
	Online learning self-efficacy	→	Satisfaction	0.45(0.16)**	0.49(0.021)
H3	Perceived Usefulness	→	Satisfaction	0.79(0.071)***	0.74(-0.01)
	Perceived Easy-of-use	→	Satisfaction	-0.19(0.15)	0.21(-0.01)

Note: "***" and "**" denote the statistical significance of the estimated coefficient at the 1% and 5% levels, respectively. Fitness measures for respective tests are as follows: Chi-square = 231.33, df = 39, RMR = 0.051, RMSEA = 0.078, GFI = 0.91, Adjusted GFI = 0.87, and NFI=0.96.

In short, the test results for the proposed model were partially accepted in this study. As suggested by the TAM literature, the hypotheses tested provide the specific mechanism in which a technology-specific self-efficacy influences the students' satisfaction with online learning. In particular, the perceived usefulness provides the mediating channel through which a technology self-efficacy affects educational outcome by interacting with a student's technology adoption process. However, the easy-of-use variable, or one of the mediating factors in the TAM literature, is not closely linked to a student's decision to adopt an

online technology. It suggests that the simple and easy use of technology itself did not necessarily interact with a computer competence that led to positive learning outcomes. In this respect, the mediating role played by the usefulness perceived by students found to be significant in electronic learning environments while the perceived easy-of-use variable does not provide a conclusive evidence supporting the TAM literature.

5. Discussion and Implications

This study highlighting the role of self-efficacy in student satisfaction clearly shows that as long as students have the skills to communicate in web-based learning environments, they will be more likely to enjoy online class. The results of this study illuminated the impact a technology-specific self-efficacy could influence the perceived usefulness and perceived easy-of-use of online English learning and thus online education satisfaction. When the students believe that they are able to take online English courses successfully, they evaluate online technology more positively and are likely to promote the degree of online education satisfaction. This result supports our postulation that task-specific (i.e., computers, the Internet, other online education tools) self-efficacy can play a significant role especially when an English learner needs to make a choice under uncertainty.

The fact that self-efficacy is a strong predictor of student satisfaction and the perceptions on usefulness of online education provides important pedagogical implications applicable to online English classes. First, institutions and practitioners should create the opportunities for students to develop appropriate computer and internet skills and knowledge needed for online education by devoting a significant portion of resources available to online courses to instructing necessary skills. More importantly, the instructor should make sure that students have basic computer skills and information technology knowledge demanded by online English courses. In this way, students will not be discouraged with online environments they may encounter. Rather than assume that every student possesses basic computer skills required, teachers need to incorporate the use of technology as a part of instructional practices. At the

beginning of the semester, if necessary, students with a low level of technology proficiency should be provided with a training program or an informative orientation to assure that they gain the web application skills and knowledge required for the online course.

Second, English teachers who are interested to offer online courses should begin by building the self-efficacy of prospective students in favor of online education. Given that self-efficacy has a strong positive impact on online education satisfaction, it is desirable that students have control over online learning systems. In this respect, institutions and instructors should pay exceptional attention to the variables affecting student enjoyment with online education. In other words, web-based learning environments should be facilitated through the activities that increase students' level of computer usage skills and information technology knowledge.

The significant role of students' abilities and competence in online education has been examined in an attempt to understand the characteristics of online students. While the research on self-efficacy has been introduced and utilized in other areas such as information systems and social sciences, it is the first attempt to harness online learning self-efficacy (e.g., computer, the Internet, online education systems, applications and tools) in the field of English education.

Further research is needed to confirm the validity of the model. These efforts will be beneficial to the improvement of the model and the continued development of research and practice in online English education. The results should not be taken as a conclusive evidence in that there are many factors that may influence student satisfaction in online learning environments. In this respect, additional survey items or variables, such as economic motives, social motives, and institutional measures might be included in the analysis to extend our understanding of online education satisfaction.

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APPENDIX

Perceived Usefulness (PU) and Perceived Easy-of-use (PEOU)	Mean	S.D.
PU1 Using online learning system enables me to accomplish programs more quickly.	3.69	1.01
PU2 Using online learning system improves my ability to accomplish academic tasks.	3.70	.96
PU3 Using online learning system increases my productivity in accomplishing academic tasks.	3.79	1.04
PU4 Using online learning system enhances my effectiveness in accomplishing academic tasks	3.71	1.06
PU5 I find online learning system useful in my study completion.	3.77	1.01
PEOU1 I find it easy to use the online learning system for what I want it to do	3.82	1.01
PEOU2 My interaction with the online learning system is clear and understandable	3.96	.92
PEOU3 It is easy for me to become skillful at using the online learning system	3.96	.93
PEOU4 I find the online learning system easy to use	3.89	.97
Online Education Satisfaction (OES)		
OES1 If asked, I would likely recommend the online learning system as an ideal learning platform	3.61	1.03
OES2 For future advanced degrees (programs/certificates), I would probably use the online learning system	3.73	1.05
OES3 Overall, I am satisfied with the online learning system	3.80	.97
Technology Self-efficacy (TSE)		
TSE1 I have skills necessary to use the online learning system	3.70	.96
TSE2 I have Internet connection fast enough to use the online learning system	3.93	1.03
TSE3 I have the knowledge necessary to use the online learning system	3.88	.99
TSE4 Overall, I am ready to use the online learning system	3.91	.92

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