

February – 2019

Structural Relationships of Factors Which Impact on Learner Achievement in Online Learning Environment



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Abstract

The purpose of this study is to identify relationships of learners' achievement goal orientation, self-regulation, test-anxiety, self-efficacy, participation, satisfaction, and achievement in online learning environments in Korea. A total of 1,832 student responses from a Korean cyber university were used to find structural relationships of factors. Causal relationships among various variables are provided as results of this study. Achievement goal orientation –approach, self-regulated learning, test-anxiety, and self-efficacy, were positively related to participation; however, achievement goal orientation-avoidance was negatively related to participation. Test-anxiety was directly related to learning achievement and it was found that participation affected learning satisfaction and learning achievement. It was also revealed that learning satisfaction was related to learning achievement. Results of this study suggest that a comprehensive management of learners' psychological variables, such as achievement goal orientation, self-regulation, test-anxiety, self-efficacy for designing, and managing online learning environments is important to online learning organizations, instructors, and administrators for better learner support.

Keywords: online learning, achievement goal orientation, self-regulation, test-anxiety, self-efficacy, participation, satisfaction, achievement, structural relationships

Introduction

With the rapid growth of MOOCs and smartphone technology, many people have developed an increased interest in online learning and choose it for their professional development or degree acquisition. MOOCs have changed the framework of formal education in many ways; learners are able to search and select courses that they want to attend, and they have flexibility of time and type of course delivery (Kaplan & Haenlein, 2016). However, this autonomy comes with a heavy responsibility to learners. Learners in online courses, not only in MOOCs, are expected to have self-regulation skill since they are expected to engage in a learning process comparable to one in a traditional education setting (Puzziferro, 2008).

Mobile technology is another important factor that recently expanded online learning venues. Nowadays, a learners' daily life is prominently attached to mobile technology, creating a culture that manages almost everything through mobile devices. Mobile technology enables learning on-the-go as well as active learning through the exchange of learning materials based on various contexts (Jones, Scanlon, & Clough, 2013; Shin & Kang, 2016).

Given the different dynamics of learning in an online environment, many researchers explored diverse factors which impact on learning outcomes in this specific environment and investigate the relationships between various factors. Relationships between human-related variables and design variables (Piccoli, Ahmad, & Ives, 2001); environment, individuals, and learning outcomes (Lim, Kang, & Park, 2016); and interaction-related factors and learning outcomes (Kang & Im, 2013) have been examined in the online learning environment.

More specifically, learners' achievement goal orientation has been suggested as one of the important factors that predict learning achievement (Lee, 2003), and has shown a positive relationship with learning flow (Park & Han, 2013). Self-regulated learning has been suggested as one of the predictive factors to learning satisfaction and learning achievement (Joo, Chung, Seol, & Yi, 2012). Test-anxiety was studied as one of the critical factors that impact learning achievement, but the results were not consistent (Bak & Im, 2010; Sung, Chao, & Tseng, 2016). Also, studies that explore relationships among test-anxiety and other factors in the online learning environment are very limited. Self-efficacy has an important role in deciding how much effort learners will put into learning, so it is suggested to have a positive relationship with learning achievement (Zimmerman, Bandura, & Martinez-Pons, 1992; Womble, 2007; Cho, 2010; Lim, Kang, and Park, 2016). In sum, the relationships between these factors and learning outcomes, such as participation, learning satisfaction, and learning achievement, were individually analyzed in previous studies. Thus, there is a lack of studies that explore comprehensive relationships of these factors with learning outcomes in online learning settings.

The purpose of this study is to identify determinants of learners' outcomes in online learning environments. Among various factors surrounding online learning, individual factors such as achievement goal orientation, self-regulated learning, test-anxiety, and self-efficacy were specifically selected for this study. Learning outcomes in this study represented learning satisfaction and learning achievement.

Background

Online Learning in Korea

With the increased demands for flexible learning environments in Korea, coupled with the quality advancements in technology, online learning has increased. Usage of online learning in Korea has been experiencing exponential growth annually, from 53.3% in 2012 to 58.2% in 2015 (National IT Industry Promotion Agency, 2016). Mobile learning has more rapidly expanded due to the one-person one-smartphone culture in Korea; between the years 2011 and 2013, the number of people who had experienced mobile learning nearly doubled from 18.4% to 32.9%. (National IT Industry Promotion Agency, 2015)

A recent study tested a theoretical model of successful mobile learning (Shin & Kang, 2016). This study found online university learners have started accepting mobile technology and this acceptance was directly and indirectly related to learning achievement.

With the growth of online learners, there are lots of efforts to figure out key factors for the success of online learning. Lim, Kang, and Park (2016) explored relationships of online learning environments, learner characteristics, and learning outcomes. These researchers found that qualities of online learning content and system are significant determinants of learners' motivation and self-efficacy. Also, learners' intrinsic and extrinsic motivation showed direct influence to their satisfaction but not to achievement in this study.

Individual Variables Which Impact on Learning Outcomes

Achievement goal orientation. Achievement goal orientation can be defined as a personal intent that affects the individual learner's decision of why and how to approach and participate in specific learning activities (Pintrich, 2000). Individual learners approach, participate, and respond to learning activities differently, and based on their achievement goal orientation (Ames, 1992). Achievement goal orientation focuses on how individual learners think about their motivation and intent to learn tasks apart from presence and absence of external learning motivation. Therefore, achievement goal orientation has been previously used as a framework that explains a learner's achievement motivation (McGregor & Elliot, 2002).

Many of achievement goal orientation studies focused on examining the relationship with self-regulation strategies and achievement. Lee (2003) found learning achievement goal orientation was the most important factor that predicts the use of self-regulation strategy and learning outcome for undergraduate students. An experimental study showed goal orientation and motivation had significant correlations with learning flow in an online learning environment (Park & Han, 2013) and Sen (2016) discovered performance approach goals and self-regulated learning skills were positively related to chemistry achievement.

Self-regulated learning. Prior research has found that self-regulated learning and learners' outcomes showed positive relationships (Cellar et al., 2011; Yukselturk & Bulut, 2007; Sen, 2016). Positive relationship between self-regulated learning and achievement was found with college students in Korea

(Lee & Shin, 2013). Joo, Lee, and Hong (2011) revealed the positive effect of self-regulated learning to achievement within 317 cyber university students. It was also found that self-regulated learning positively predicted both satisfaction and achievement in an online learning environment (Joo, Chung, Seol, & Yi, 2012), while Kang and Lim (2013) found that self-regulated learning directly affected achievement at Cyber University.

Test-anxiety. Test-anxiety refers to a response of anxiety when a person faces test situations (Mandler & Sarason, 1952; Zeidner, 1998). Morris, Davis, and Hutchings (1981) conceptualized test anxiety consisting of two dimensions: cognitive dimension and affective dimension. Cognitive dimension of test-anxiety is called as worry, and affective dimension of test-anxiety is called as emotionality. Cognitive dimension of test anxiety refers to negative expectancy on doing well in certain test and affective dimension of test anxiety is about being nervous or terrified toward test. Previous studies show inconsistent results on the correlation between test-anxiety and learning outcomes (Chapell et al., 2005; Bak & Im, 2010; Eum & Rice, 2011; Sung et al., 20016).

A meta-analysis study found negative relationship between test-anxiety and achievement (Bak & Im, 2010), whereas Sung et al. (2016) examined the relationship between test-anxiety and achievement and found positive correlation between them.

Self-efficacy. Self-efficacy refers to a personal judgment of one's own capability to perform activities that are necessary to succeed in certain tasks (Bandura, 1997). Self-efficacy possesses the critical role to determine that a person will put how much effort, and how long the efforts will last for the task (Zimmerman, 2000). Self-efficacy has been found to have positive relationships with learning outcomes in many studies (Zimmerman et al., 1992; Womble, 2007; Cho, 2010; Lim, Kang, & Park, 2016). A meta-analysis study using publications in Korea between 2001 and 2014 revealed the mean effect size of self-efficacy to achievement as .66 (Ku, Yang, & Choi 2014).

Learning Outcomes

Most important and commonly measured variables as learning outcomes are learners' satisfaction and achievement. Prior research suggested that both cognitive (achievement) and affective (satisfaction) dimensions of learning outcomes should be considered (Paechter, Maier, & Macher, 2010; Lim, Kang, & Park, 2016). In addition, satisfaction is known as one of the important factors for online course completion and achievement (Levy, 2007; Puzziferro, 2008; Wang, Shannon, & Ross, 2013). It is possible to conclude that online learning success can be determined by how satisfied learners are with their online learning experience and level of achievement as a result.

Based on the review of related research, this study focuses on identifying determinants of learner satisfaction and achievement in an online learning environment. Among various factors surrounding online learning, individual factors including achievement goal orientation, self-regulated learning, test-anxiety, and self-efficacy were specifically selected in this study. The research hypotheses with these given variables are like below:

1. Learner's achievement goal orientation is related to satisfaction and achievement.
2. Learner's self-regulated learning skill is related to satisfaction and achievement.
3. Learner's test-anxiety is related to satisfaction and achievement.
4. Learner's self-efficacy is related to satisfaction and achievement.

Methods

Participants

Participants of this study were undergraduate students in a cyber university in Korea. Originally, a survey was sent to 2,224 students, however, 392 invalid responses (empty or identical responses) were excluded from the analysis. Thus, 1,832 questionnaires were used in addressing the study's research questions. Demographic information of survey participants is shown in Table 1.

Table 1

Participant Demographics

Gender		Age		Grade	
Category	Number	Category	Number	Category	Number
Male	855	Under 19	8	1	690
Female	977	20~29	457	2	99
		30~39	504	3	769
		40~49	597	4	274
		Over 50	266		
Total	1,832	Total	1,832	Total	1,832

Materials

A questionnaire was developed for this study based on previous studies regarding achievement goal orientation, self-regulated learning, test-anxiety, self-efficacy, participation, learning satisfaction, and learning achievement. In this study, achievement goal orientation was measured by two dimensions including approach and avoidance. Three experts in educational measurement and educational technology reviewed this questionnaire for ensuring face validity.

To measure learner's achievement goal orientation, 16 items regarding achievement goal orientation approach, and 10 items regarding achievement goal orientation avoidance were adopted from a survey by Bak and Lee (2005) with a Cronbach's α of .88 and .86 respectively. Fifteen items were adopted from a research of Pintrich and De Groot (1990) to measure learner's self-regulated learning and the Cronbach's α for these items was .90. Regarding test-anxiety 10 items were adopted from a questionnaire designed by Spielberger et al. (1980) with a Cronbach's α of .95. For checking self-efficacy of learners, nine items were adopted from Lee (2006) and Flowers (2011), with a Cronbach's α of .95. Each item consisted of a 5-point Likert scale from 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, to 5 = strongly agree. Number of survey items and Cronbach's α for each variable are shown in Table 2.

Table 2

Number of Survey Items

Category	Number of items	Cronbach's α
Achievement goal orientation_ approach	16	.88
Achievement goal orientation_ avoidance	10	.86
Self-regulated learning	15	.90
Test-anxiety	20	.95
Self-efficacy	9	.95
Participation	16	.91
Learning satisfaction	3	.90
Learning achievement	6	.94

Data Collection

A total of 1,832 survey responses were collected for 10 days using the university's online learning platform. Structural equation modeling was used to investigate the research model hypotheses, and the data was analyzed using AMOS 18.0.

Results

Measurement Model

Convergent validity. Before analyzing convergent validity, an exploratory factor analysis was done and valid factors were extracted. A convergent validity test (Fornell & Larcker, 1981) was conducted in three elements: item reliability, construct's composite reliability, and the average variance extracted (AVE). Item reliability test was conducted to confirm convergent validity of items with factor loading of each item. The factor loadings for the items were ranged between .697~.934, which were significant and met the convergent reliability. Composite reliability met the required value of $\geq .7$ (.764 ~ .963), AVE met

the required value of $\geq .5$ (.503 ~ .868). The fit indices were obtained as follows: $\chi^2 / df = 5.923$; TLI = .964; CFI = .976; RMSEA = .052.

Discriminant validity. A construct's discriminant validity test was performed. The square root of the AVE should exceeds the correlation coefficient between constructs to obtain the validity (Segars & Grover, 1998). Table 3 shows the results of the validity test and confirms the research instrument's validity.

Table 3

Correlation Matrices and Discriminant Validity Among Variables

Variable**	AVE	AGO-AP	AGO-AV	SRL	TA	SE	PA	LS	LA
AGO-AP	.61	.84*							
AGO-AV	.50	-.03	.78*						
SRL	.76	.55	-.31	.71*					
TA	.71	.07	.43	-.11	.87*				
SE	.50	.44	-.06	.55	-.11	.71*			
PA	.69	.51	-.34	.75	-.16	.55	.83*		
LS	.75	.39	-.27	.57	-.05	.36	.58	.87*	
LA	.87	.43	-.25	.37	-.03	.37	.60	.93	

*Square root of the AVE (Average Variance Extracted) ** AGO_AP : Achievement Goal Orientation related to AApproach, AGO_AV : Achievement Goal Orientation related to AVoidance, SRL : Self-Regulated Learning, TA : Test Anxiety, SE : Self Efficacy, PA : Participation, LS : Learning Satisfaction, LA : Learning Achievement.

Structural model. Indices for the structural model indicated that the model was adequate. The following results were obtained: $\chi^2 = 758.443$ ($p < .001$); $\chi^2 / df = 6.116$; TLI = .963; CFI = .973; RMSEA = .053.

Figure 1 shows causal relationships among variables. Detailed results are as follows: AGO_AP was not related to PA, but AGO_AV related to PA. SRL, TA, and SE were related to PA. TA was related to LA. PA was related to LS and LA. LS was related to LA.

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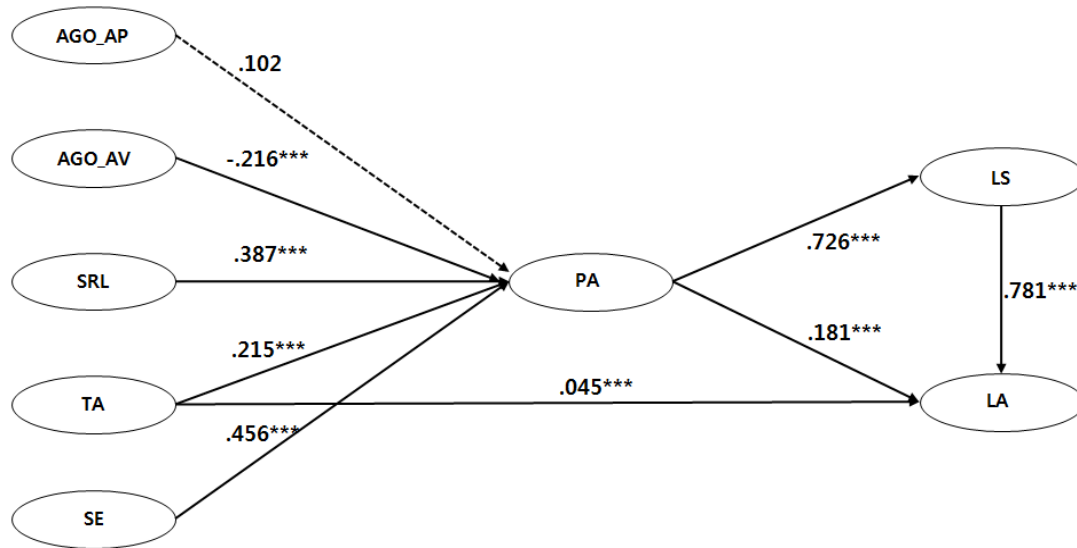


Figure 1. Structural relationships between variables. AGO_AP : Achievement Goal Orientation related to Approach, AGO_AV : Achievement Goal Orientation related to Avoidance, SRL : Self-Regulated Learning, TA : Test Anxiety, SE : Self Efficacy, PA : Participation, LS : Learning Satisfaction, LA : Learning Achievement.

Indirect and total effects for the research model are provided in Table 4. First, self-efficacy was the most powerful determinant for participation, with a total effect of .46. This was followed by self-regulated learning, test-anxiety, with a total effect of .39 and .25 respectively. Second, participation was the most important determinant for learning satisfaction, with a total effect of .73. This was followed by self-efficacy, self-regulated learning, test-anxiety, with a total effect of .33, .28, and .18 respectively. Third, learning satisfaction was shown as the most influential determinant for learning achievement, with a total effect of .78. This was followed by participation, self-efficacy, self-regulated learning, and test-anxiety, with a total effect of .75, .34, .29, and .23 respectively.

Table 4

Direct, Indirect, and Total Effects for the Research Model (A-> B)

B A	PA			LS			LA		
	Direct	Indirect	Total	Direct	Indirect	Total	Direct	Indirect	Total
AGO_AP	.10		.10		.07	.07		.08	.08
AGO_AV	-.21*		-.21*		-.16*	-.16*		-.16*	-.16*
SRL	.39*		.39*		.28*	.28*		.29*	.29*
TA	.25*		.25*		.18*	.18*	.05*	.18*	.23*
SE	.46*		.46*		.33*	.33*		.34*	.34*
PA				.73*		.73*	.18*	.57*	.75*
LS							.78*		.78*

* $p < .05$ AGO_AP : Achievement Goal Orientation related to APproach, AGO_AV : Achievement Goal Orientation related to AVoidance, SRL : Self-Regulated Learning, TA : Test Anxiety, SE : Self Efficacy, PA : Participation, LS : Learning Satisfaction, LA : Learning Achievement.

Discussion and Conclusion

In this study, structural relationships among learners' characteristics, participation, satisfaction, and achievement in the context of online learning environment were explored. As a result of this study, a model that achievement goal orientation, self-regulation, test-anxiety, self-efficacy have impact on learners' participation, and participation turned out valid. Specifically, this model showed that participation has a mediated effect among exogenous variables and achievement.

Summary of results of this study is like below. First, achievement goal avoidance was negatively related to participation, satisfaction, and achievement. Second, test-anxiety was positively related to participation, satisfaction, and achievement. Third, participation had a mediated effect between three of exogenous variables (self-regulated learning, test-anxiety, self-efficacy) and satisfaction and learning achievement. Fourth, participation had the biggest impact on satisfaction, as well as biggest impact on learning achievement mediated by satisfaction. One of interesting findings from this study is that test-anxiety showed positive relationships with participation, satisfaction, and achievement, which is different with main stream of previous studies. Most of text-anxiety research found negative relationship between test-anxiety and achievement. However, few studies found positive relationship between test-anxiety and achievement (Sung et al., 2016; Hardy & Hutchinson, 2007). These researchers suggested that test-anxiety increased performance motivation and improved achievement as a result based on the motivational enhancement model.

Here are two plausible reasons for this interesting result. First, the participants of this study were adult learners mostly had a full time job pursuing a bachelor's degree from the Cyber University. It means they had a clear goal to achieve and high responsibilities for their learning. Thus, for these learners, test-anxiety made them more motivated to study hard and led to better achievement. Second, the unique test environment in the Cyber University may decrease the cognitive interference effect. The test environment in online learning could be more relaxing and less stressful.

Results of this study showed that learners' psychological variables as exogenous variables had strong impact on participation and learning achievement. This study examined the structural model that explained learners' achievement goal orientation, self-regulation, test-anxiety, self-efficacy had positive effects on learning outcomes (satisfaction, achievement) mediated by participation and it would be valuable for further research. Based on the results of study, it could be suggested that a comprehensive management of learners' psychological variables such as achievement goal orientation, self-regulation, test-anxiety, self-efficacy for designing and managing online learning environment is important to online learning organizations, instructors, and administrators for better support to learners.

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