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Investigation of the Relationship between Learning Process and Learning Outcomes in E-Learning Environments

Halil YURDUGÜL[1]

Nihal MENZİ ÇETİN[2]

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Abstract

Problem Statement: Learners can access and participate in online learning environments regardless of time and geographical barriers. This brings up the umbrella concept of learner autonomy that contains self-directed learning, self-regulated learning and the studying process. Motivation and learning strategies are also part of this umbrella concept. Taking into consideration learning processes and outcomes together, Biggs' *3P* model of learning is used as the theoretical framework. The first *P* was defined as learning presage and included learning inputs such as learner variables, prior knowledge, learner readiness, personality, etc. The second *P* was considered the learning process, which covers learner motivation and learning strategies. The last *P* was suggested as learning outcomes (product) which consist of the results of formal and informal assessment, perceived learning, self-concept, satisfaction, etc.

Purpose of Study: In this study, we especially considered the learning process and the learning outcomes and investigated the effects of learning process on learning outcomes. In addition, we took into consideration the two dimensions of learning outcomes as *a)* perceptions of learning, and *b)* performances of learning, respectively. Also, we investigated the relationship between learners' perceptions of learning and performance of learning.

Methods: Relational scanning model was used based on the 3P model. Within the Computer Networks and Communication Course, 68 students participated in the study. Study Process Questionnaire, Online Learning

[1] Corresponding author: Assoc. Prof. Dr. Hacettepe University, Department of Computer Education and Instructional Technology, Ankara. yurdugul@hacettepe.edu.tr

[2] Hacettepe University, Res. Asst. Department of Computer Education and Instructional Technology, Ankara, nmenzi@hacettepe.edu.tr

Perception Scale and performance test were used to identify student learning processes and outcomes. Associations between these psycho-educational constructs were examined through Structural Equation Model (SEM).

Findings and Results: According to SEM analysis, learners' approaches to learning have a significant effect on their perception of learning. Conversely, the effects of surface approaches on learners' perception of learning was not statistically significant ($p>.05$). Whereas deep strategy approaches have significant effects on performance of learning, the relationship between deep motivation and performance of learning was not significant. Performance of learning was negatively affected by surface approaches ($p<.05$). Interestingly, there was no significant relationship between perceived and actual learning performance.

Conclusions and Recommendations: Results showed autonomous learners (those with deep strategy and motivation) have better perceived learning outcomes. However, having deep motivation and high perception of learning is not necessarily correlated with high performance. This asserts that performance in an online learning environment independent of learner's motivation and perception about learning. One possible reason is that assessment of perception of learning is norm- referenced, while performance of learning is criterion referenced.

Keywords: E-learning, learning management system, perception of learning, performance of learning, learning outcomes.

The use of web technologies in distance education is currently increasing. In this setting, learners generally use online learning activities which are structured in accordance with instructional design bases. The quality of online interactions and learning activities is examined in the context of instructional design, while learners' approaches to these interactions and activities are considered as learner characteristics. Learner characteristics focus on two points: learner motivation and learning strategies. These two components are also named as approaches to learning. Because online learning began in higher education, and andragogical learning is more prominent than pedagogical learning for higher education, learner motivation and strategies are crucial in the higher education context. Effective learning in online learning environments is facilitated when the learner participates responsibly and motivationally in the learning process. Andragogical learning is the essential concept of self-directed learning, self-regulated learning and autonomous learning (Knowles, 1979). According to these learning approaches, an efficient learning process depends on a learner's self-knowledge, self-motivation and utilization of learning strategies.

In higher education, learner autonomy is one of the key concepts that make learners responsible for their own learning process, and autonomy is an umbrella concept covering the concepts of self-directed learning, self-regulated learning, and the studying process (Tanyeli & Kuter, 2013). The common components of these psycho-learning constructs, taken as part of the learning process, are the motivation

and learning strategies of learners. Mutlu and Eröz-Tuğa (2013) defined learner autonomy as acquiring learning strategies and the methods of using these strategies that lead learners to taking control of their own learning. Taking into consideration the learning processes and the outcomes, Biggs' *3P* model of learning is used as the theoretical framework. The first *P* was defined as learning *presage* and includes learning inputs such as learner variables, prior knowledge, learner readiness, personality, etc. The second *P* was considered as the learning *process* which covers learner motivation, learner behavior, and learning strategies. Finally, the last *P* was suggested as learning outcomes (*product*) which consist of the results of formal and informal assessment, perceived learning, self-concept, satisfaction, etc.

Approaches to learning are psycho-educational constructs that consist of a learner's motivation and strategies (Biggs, 1982; Enwistle & McCune, 2004). This construct is examined in two dimension; deep learning and surface learning. Deep and surface learners and their learning outcomes in the online environment are the main objectives of this study. Learning outcomes mean perception of learning and performance of learning.

Deep and surface learning/learner

Although learners engage with the same content in the same class, they learn in different ways. In an educational context, these different ways are referred to as *approaches to learning* (Biggs, 1994; as cited in Lee, 2013). According to Diseth and Martinsen (2003: 195), "Approaches to learning refers to individual differences in intentions and motives when facing a learning situation, and the utilization of corresponding strategies." Individual differences arise from different personalities and motivations (Enwistle & McCune, 2004). Based on descriptions, approaches to learning consist of learner motivation and learning strategies (Biggs, 1982; Enwistle & McCune, 2004). These variables are also components of learner autonomy (Moore, 1972). According to Struyven, Dochy, Janssens and Gielen (2006), approaches to learning are not characteristics of learners, but are choices determined by learners based on context.

Marton and Säljö (1976) firstly distinguished between deep and surface approaches; they defined the deep approach as being intrinsically interested in the topic and making an effort to understand the content (as cited in Baeten, Struyven & Dochy, 2013). In the surface approach, on the other hand, learners are extrinsically motivated to avoid failure, and they tend to work with a lot of information in a given period of time and mechanically store it (Baeten, Struyven & Dochy, 2013; Enwistle & McCune, 2004).

When definitions of deep and surface approaches are examined, they are associated with Ausubel's rote and meaningful learning. According to Ausubel, learners learn in different ways; therefore, they have different achievement scores under the same conditions. These different perspectives refer to rote and meaningful learning. Ausubel (1968) distinguished between rote and meaningful learning as follows;

> Meaningfully and rotely learned materials are learned and retained in qualitatively different ways because potentially meaningful learning tasks are, by definition, relatable and anchorable to relevant established ideas in cognitive structure. They can be related to existing ideas in ways making possible the understanding of various kinds of significant (derivative, correlative, superordinate, combinatorial) relationships… Rotely-learned materials, on the other hand, are discrete and relatively isolated entities that are relatable to cognitive structure only in an arbitrary, verbatim fashion, not permitting the establishment of the above-mentioned relationships (p.107-108).

According to definitions, rote learning is related to the surface approach and meaningful learning is related to the deep approach. However, characteristics of the deep approach demonstrate more elaborated than meaningful learning. In the literature, some of the characteristics of deep learners are listed as follows (Klinger, 2006):

- willing to understand learning material
- interact with content intensively and critically
- become actively interested in the course content
- integrate ideas and establish cause-and-effect relationship
- associate ideas with prior knowledge and experiences
- be aware of own learning and improvement
- creating new information from information that was collected, using hypotheses and quotes

On the other hand, surface learners memorize the information in order to pass exams and achieve higher grades; they do not try to understand relationships between concepts or think about how to apply information in different ways (Laird, Seifert, Pascarella, Mayhew & Blaich, 2014).

Internet-based information and communication technologies provide flexible and motivating learning environments based on interaction and collaboration, and this type of environment fosters deep and meaningful learning (Garrison & Kanuka, 2004). In parallel with the developments in information and communication technologies, online learning environments are becoming increasingly common. Köksal and Çöğmen (2013) stated that lifelong learning requires an individual to participate in his/her own learning, and a growing interest in lifelong learning in higher education and supportive learning environments are became a necessity. In online learning environments, self-directed and self-regulated learners who take responsibility for their own learning and determine their learning goals and necessities are required (Bracey, 2010). In such an environment, a learner's success depends not only on taking responsibility for his/her own learning but also

following an appropriate strategy. Learners following the deep strategy can most benefit from the online learning environment.

In online learning, learners' approaches to learning are influenced by some individual and environmental factors. According to Struyven et al. (2006), one of the factors that influences student approaches to learning is the learning environment itself. Student-activated learning environments and alternative assessment methods can deepen student approaches to learning. The study also concluded that student approaches to learning are dynamic concepts which are changeable based on learners' educational experiences. Individual factors include learner motivation, prior knowledge, learner interest in the topic and prior skills; whereas, content, teaching and presentation method, presentation time and learning environment are environmental factors (Platow, Mavor & Grace, 2013). Depending on these factors, learners adopt deep or surface approaches to learning. For further insight into this issue, it is useful to review the literature. Kyndt, Dochy, Struyven & Cascallar (2011) investigated the effect of motivation on student approaches to learning; in an authentic learning context, students were asked to undertake different assignments and their perception of workload was measured. According to the results, under high workload conditions, autonomously motivated learners primarily adopted a deep approach to learning. Beccaria, Kek, Huijser, Rose & Kimmins (2014) investigated the impact of group work on student approaches to learning in higher education with regard to Biggs' 3P model. Their study focused on the presage and process components of the model and examined the relationships between students' individual characteristics, group work and approaches to learning. Researchers found that individual characteristics (age) and metacognitive awareness within the group work were the predictors of adoption of deep approaches to learning. Paechter, Maier & Macher (2010) investigated students' expected e-learning course characteristics and course experiences as they related to their perceived learning achievement and course satisfaction. Researchers found that students' perceived learning outcomes are affected by their achievement goals because they make more effort to learn. As course outcomes, students' e-learning experiences are influenced by instructor support and expertise. The structure of course and learning materials, stimulation of learner motivation and facilitation of collaborative learning are other factors that affect students' perceived learning outcomes. Gijbels, Van de Watering, Dochy and Van den Bossche (2005) examined the relationship between students' approaches to learning and learning outcomes based on problem-based learning. In their study, Biggs, Kember and Leung's (2001) Study Process Questionnaire, final exam results of the course were used to determining learning outcomes. The results of a correlational analysis showed no relationship between students' approaches to learning and problem-based learning outcomes.

In reviewing the literature, it is clearly necessary to investigate the effects of study processes on learning outcomes in e-learning environments in higher education. Learning outcomes refers to a set of observable and demonstrable statements about what the learner knows and understands at the end of the learning experience or course (Yueng & Ong, 2012). Therefore, in addition to students' self-

reported experiences, it would be helpful to examine performance of learning in order to understand e-learning course success. This study took place in an online learning environment, and learning is discussed as perceived learning and actual learning. Perception of learning is reflected in the learner's self-reported quality and quantity of learning. According to Fritzsche (1977), perception of learning shapes the learner's challenge and attitude towards learning content and environment. The term 'challenge' is related to the learner's intrinsic or extrinsic motivation. The deep approach to learning is controlled by intrinsic motivation (Biggs, 1993, 1994; as cited in Lee, 2013). Consequently, perception of learning is related to motivation; motivation is associated with approaches to learning.

In this study, relations between the process (approaches to learning) and product (perception of learning and academic achievement) dimensions of the 3P model are investigated. The correlations are shown in Figure 1. In the study, the following hypotheses were tested:

H1: There is an effect of *using deep strategy* on the learner's *perception of learning*.

H2: There is an effect of *using surface strategy* on the learner's *perception of learning*

H3: There is an effect of *using deep strategy* on the learner's *performance of learning*.

H4: There is an effect of *using surface strategy* on the learner's *performance of learning*.

H5: There is an effect of *using deep motivation* on the learner's *perception of learning*.

H6: There is an effect of *using surface motivation* on the learner's *perception of learning*.

H7: There is an effect of *using deep motivation* on the learner's *performance of learning*.

H8: There is an effect of *using surface motivation* on the learner's *performance of learning*.

H9: There is a relationship between *the perception of learning* and the *performance of learning*.

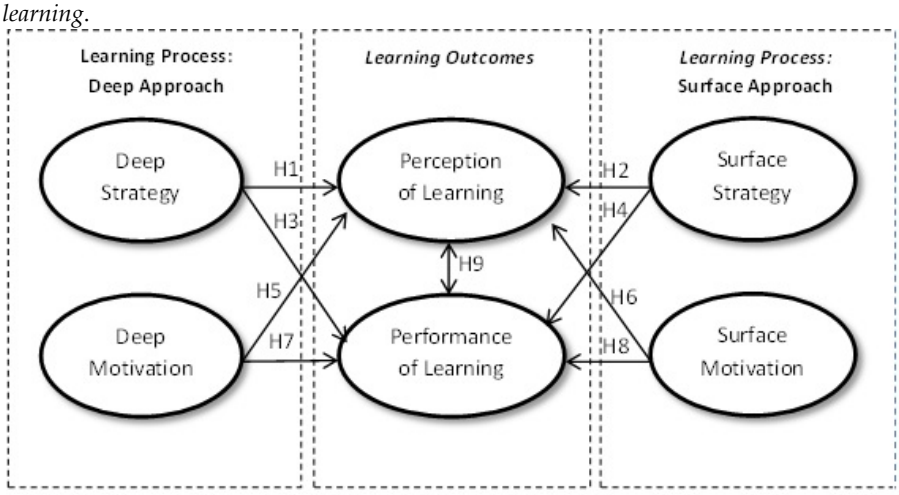

Figure 1: Pattern and hypothesis of the study

Method

Research design

In this study we examined interrelationships among psycho-educational constructs appearing in Biggs' 3P model. Correlational research study is carried out in an e-learning course. In order to investigate relations between process and product aspects of the learning environment, structural equation modeling was used.

Research Sample

A total of 68 the participants in this research were undergraduate students in a CNC course. All participants had previous experience with online courses. Because of this, we were not concerned with the mediated and/or moderated effects of learner experiences on learning process (Haverila, 2012). The course was on a learning management system (LMS) developed to allow the three types of interactions (learner-content, learner-instructor, and learner-learner) defined by Moore (1989; as cited in Sims, 2003).

Research Instruments

To measure the students' *learning outcomes,* two measurement tools were used separately at the end of the course. The first was administered to the participants to measure the students' *perception of learning*. This questionnaire (Online Learning Perception Scale- OLPS) was developed by researchers for this study and includes 6 items on a Likert–type scale. The items in this scale are given in Table 1.

Table 1.
The Items on OLPS

Through this online learning environment, I have experienced meaningful learning about course content.
Through this online learning environment, I have better learned concepts in course content.
This online learning environment reduced my learning quality.
This online learning environment encouraged me in the course.
It was enjoyable learning in this online learning environment.
This online learning environment increased my interest in course topics.

The data set obtained from OLPS was analyzed with confirmatory and exploratory factor analysis. According to the results in Figure 2, uni-dimensionality of the scale scores are demonstrated. Thus, factorial validity of OLPS was assured and we could sum item scores on OLPS.

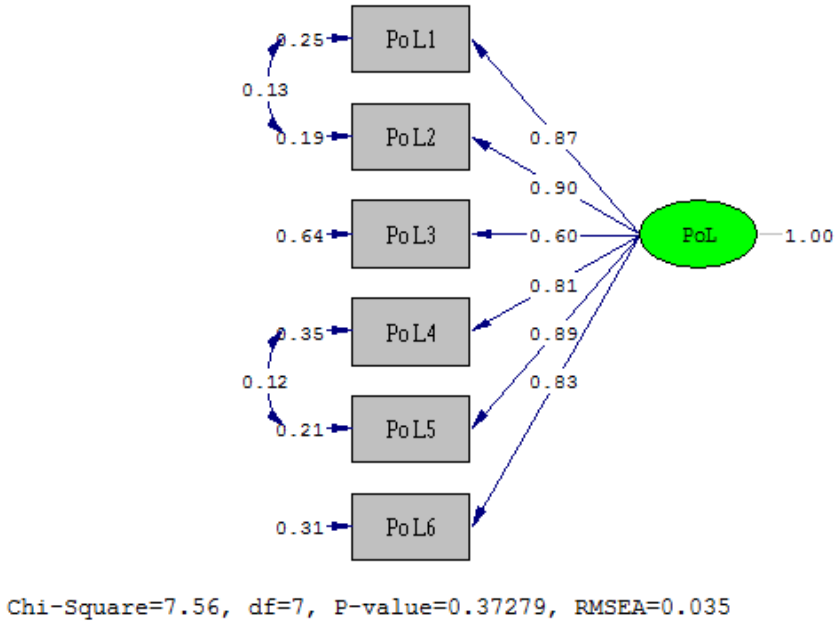

Figure 2: Factorial structure of OLPS (PoL: Perception of Learning)

To determine students' academic achievement, a 20-item multiple choice achievement test was designed on a blueprint of this course for content validity and administered to obtain the students' *performance of learning* in terms of summative assessment. The test was prepared for the content of the CNC course and in this test every right answer was coded as 1, the wrong answers were coded as 0, and the total of right answers demonstrated a student's academic achievement score. The coefficient alpha was found at .76 demonstrating internal consistency of the achievement scores.

In this study, to determine the students' approaches to learning in the *learning process,* we used the Study Process Questionnaire (SPQ) developed by Biggs (1987; as cited in Biggs, Kember, and Leung, 2001) and revised by Biggs, Kember, and Leung (2001). This R-SPQ-2F scale was adopted into Turkish by Batı, Tetik, and Gürpınar (2010). The scale consists of 20 items and 2 sub-dimensions; 10-items on this scale measure the deep approach (da) to learning and the other 10-items measure the surface approach (sa) to learning. In the reliability analysis, for each sub-dimension Cronbach-alpha values were calculated. For the deep approach, Cronbach's Alpha was 0.77, and for the surface approach, this value was calculated as 0.80. Also, the deep and surface approaches were themselves separated into deep strategy (ds) and deep motivation (dm); surface strategy (ss) and surface motivation (sm).

Procedure

Initially students had six weeks of online learning experience in a LMS. Throughout the course all students actively participated in the online learning environment. At the end of this period, students had SPQ, OLPS and an achievement test.

Data Analysis

After the online learning process, we examined learners' approaches to learning, perception of and performance of learning and interrelations among these variables (Figure 1). Each of these variables is a psycho-educational construct; we used a structural equation model to examine the relationships. The Structural Equation Model was based on covariance and therefore sensitive for sample size (Tabachnick & Fidell, 2007). In this study our sample was limited to 68 students. This number may cause initial hesitation, but in our structural model, data-model fit indices are satisfied. This is explained by MacCallum, Widaman, Zhang and Hong (1999), that although sample size is small, in the case where quality measurement (communality values) is high, the sample is qualified to represent the population[3].

Results

Descriptive statistics of learners' *perception of* and *performance of learning* in an online learning environment are shown in Table 2.

Table 2.
Descriptive Statistics of Learners' Perception of and Performance of Learning

	N	*Means*	*Sd*	*Min*	*Expected Rank Value*	*Max*
Perception of Learning	68	27.2	8.77	6	24	42
Performance of Learning	68	8.07	3.47	1	9	17

Table 2 presents descriptive statistics for the *perception of learning* scale and the multiple choice achievement test. According to this, students had higher average scores than expected when ranking value for *perception of learning*. Students' scores of *performance of learning* are an approximate rate of the expected rank value. These values were obtained from different scales and could not be directly compared. Because of this, expected rank values were compared, instead of means of scores. In consideration of this, while the mean of *perception of learning* exceeded the rank value, the mean value of *performance of learning* could not exceed the rank value. Accordingly, we can assume that in online learning environments students' perceived learning scores higher than their actual learning scores. Descriptive

[3] In this study process we ensure learners' active involvement. Throughout the process we share the purpose and findings of the study with students, and questionnaires have been answered reliably.

statistics about students' preferences of approaches to learning in each sub-scale of SPQ are presented in Table 3.

Table 3.
Descriptive Statistics of Students' Scores in Each Sub-Scale of the SPQ

Sub Scales	***Mean***	***Std. Deviation***
Dm	15.32	2.84
Ds	16.66	2.95
Sm	12.75	3.40
Ss	15.00	2.80

Table 3 shows learners' scores in the study process approaching each sub-scale of the SPQ. In SPQ, because each sub-scale consists of an equal number of items, we compared scores of sub-scales directly. According to this, the maximum mean score of participants is ds (16.66), and the second is dm (15.32). According to this, learners mostly follow a deep approach to learning.

Effects of approaches to learning on perception of learning

Learning outcomes in the e-learning process are affected by learner motivation, learning strategies and the way the learner performs learning activities. In this study, as seen in Figure 1, learners' navigation-interaction behaviors in an e-learning system (e-learning experiences) are excluded from study and psycho-educational variables (approaches to learning, perception of and performance of learning) are included in a causative model. This model is analyzed based structural equation model principles and has produced some structural parameters. As demonstrated in Figure 1, we analyzed the *direct effects* of each sub-dimension of approaches to learning on learning outcomes instead of total effects. In this way, ds, dm, ss and sm are turned into unrelated variables (Kline, 2011: 166), and so structural parameters (also hypothesis in Figure 1) indicate each of the sub-dimensions' direct effects on learning outcomes. Goodness of fit indices of model-variable are CFI=0.90, GFI=0.92, NNFI=0.92, and RMSEA=0.06. According to these values, data-model fit is satisfied. The structural parameters obtained by estimating the models were given schematically in Figure 3 and numerically in Table 4.

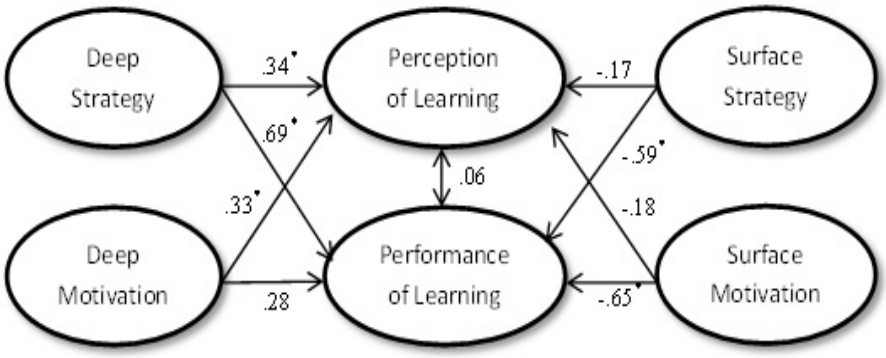

Figure 3: Relationships between approaches to learning and learning outcomes

As shown in Figure 3, deep motivation and deep strategy have a positive and significant effect on learners' perception of learning (H1 and H5 were confirmed). On the other hand, sub-dimensions of surface motivation and surface strategy have negative but not significant effect on perception of learning (H2 and H6 not confirmed). Accordingly, perception of learning is directly affected by the deep approach and is independent of the surface approach. Correlations are also shown in Table 4.

Effects of approaches to learning on performance of learning

The effect of deep strategy on performance of learning is significant; deep motivation, on the other hand, has no significant effect. A remarkable finding is that learners' performance of learning is negatively affected by the surface approach sub-dimensions. According to this, it is said that in an online learning management system, having surface motivation and strategy lead to ineffective performance. Effects of approaches to learning sub-dimensions on learners' performance of learning are shown in Table 4.

Table 4.
Correlations Between Learning Processes and Outcomes

		Learning Outcomes			
		Perceptions of Learning		***Performances of Learning***	
Learning Processes	Sub-scales	□	T values	□	T values
	Ds	0.34* (*H1*)	2.42	0.69* (*H3*)	2.13
	Dm	0.33* (*H5*)	2.17	0.28 (*H7*)	1.41
	Ss	-0.17 (*H2*)	-0.98	-0.59* (*H4*)	-2.22
	Sm	-0.18 (*H6*)	-1.29	-0.65* (*H8*)	-2.76
	Correlation	0.06 (*H9*)			

(*) is significant at $p \leq 0.05$ and □□ is standardized structural regression parameters

As shown in Table 4, deep strategy has a positive effect on performance of learning (H3 was confirmed). The effect of deep motivation on performance is not significant (H7 was not confirmed). Correlations between sub-dimensions of the surface approach (surface strategy and surface motivation) and performance of learning are negatively significant (H4 and H8 confirmed negatively). The last finding, surprisingly, was that there is no correlation between learners' perception of learning and performance of learning (r=0.06). Therefore, H9 was not confirmed.

In this study, learners taking the CNC course had an online learning experience in an LMS. After the learning period, there was a significant effect noted from the deep approach (both deep strategy and deep motivation) on perceived learning. In addition, learners' perception of learning is independent for the surface approach.

Discussion and Conclusion

In online learning environments deep learners have higher perceived learning outcomes than surface learners. Rote learners who have a fear of failure and focus only on passing exams have low perceptions of learning, while deep learners have more positive perceptions about the learning environment and perceived achievement than surface learners (Geçer, 2012; Parpala, Lindblom-Ylänne, Komulainen, Litmanen & Hirsto, 2010). The surface approach to learning has negative effects on learner performance of learning. Meanwhile, the abovementioned rote learners have failed in online learning environments. Lazarević and Trebješanin (2013) found significant positive correlation between the deep approach and academic achievement of prospective teachers.

The last finding of this study, perception of learning, demonstrated no significant effect on performance of learning. One probable reason for this finding is that perception of learning is norm referenced, while performance of learning is criterion referenced. While learners interact and discuss with each other (discussion environments in LMS), their perception about what they learned may change. In addition, in a well-structured learning environment, the quality of interactions (learner-learner or learner-teacher) may affect learners' perception of learning. Sims (2003) stated interrelationships between learner–learner, learner–content, learner–teacher and learner–interface interaction allow learners to feel comfortable and involved, make students more active and in control of the environment and process. On the other hand, in online courses, learners tend to compare their learning with peers and they shape a relative learning perception.

In this study it is found that autonomous learners have higher perception of learning; learning performance was independent of learner motivation. Learning strategies are a crucial element for achieving online learning goals for autonomous learners. Another finding is that performance of learning and perception of learning are independent from each other. In an online learning environment, with learner-learner interaction (Moore, 1972) cause perception of learning is norm referenced. As

learners' roles change in distance learning, their perceptions about learning change. In an online setting, perception of learning is affected by a well-constructed environment, interaction among learners and teacher and quality of discussions (Sun, Tsai, Finger, Chen & Yeh, 2008). According to Paechter, Maier and Macher (2010), in an e-learning environment learners' perceived learning outcomes (perception of learning and satisfaction) are influenced by many factors: course structure, facilitation of collaborative learning and the stimulation of learning motivation. In this study learners who have deep motivation but do not follow deep strategy have not produced high-performance learning. One possible reason is that some of the course objectives were not meet to learners' achievement goals.

In this study, online CNC allowed interactions among students and teacher and facilitated discussions at any time. We can assume that these interactions and discussions increase learner interest in online courses and positively affect learners' perception of learning. Similarly, the positive correlation between learning perception and deep motivation is related to motivated learners' efforts to achieve course objects.

Deep motivation reflects a learner's interest in the learning material and it affects learning positively. Contrary to the literature, deep motivation and academic performance are not correlated in this study. This shows that intrinsic motivation does not increase achievement in any way. According to Martens, Gulikers ve Bastiaens (2004), deeply motivated learners in an online learning environment tend to be interested in different content, while students with high intrinsic motivation have more curiosity, so that does not mean that they achieve better grades every time. Zainal et al. (2012) point out that deep and intrinsic motivation affect learners' perceived learning but do not estimate academic success.

In conclusion, academic performance is not determined only by approaches to learning. Following a deep strategy has a significant effect on performance of learning; however, deep motivation and perception of learning do not predict high performance every time. Because perception of learning is based on a learner's self-reported learning level, it is different from performance of learning which is assessed by achievement tests. In addition, a learner may have a good experience in an online LMS and his/her perception may be positive. However, in a limited period of time, making satisfying academic performance was influenced by many other factors. According to Lee (2013), we hope that following a deep approach will lead to high academic performance, but other factors should be taken into account. Teaching and evaluation techniques, structure of course and learning material, and learner's workload in a unit may be counted among these factors. Future research is necessary to reveal other factors that affect learning outcomes in an online learning setting.

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Çevrimiçi Öğrenme Ortamlarında Öğrenme Süreçleri ve Öğrenme Çıktıları Arasındaki İlişkinin İncelenmesi

Atıf:

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Özet

Problem durumu: Geleneksel öğrenme ortamlarından çevrimiçi ortamlara geçişte öğrenen profili de değişime uğramıştır. Zaman ve mekan kısıtlaması olmaması çevrimiçi öğrenme ortamlarında bireyi bağımsız hale getirerek öğrenen özerkliği kavramını gündeme getirmiştir. Bireyin kendi öğrenmesinin sorumluluğunu almaya yönelik becerisi şeklinde tanımlanan özerklik, öz-düzenlemeli öğrenme, öz-güdümlü

öğrenme ve üstbiliş çalışma süreçlerini içine alan bir şemsiye kavramdır. Birer psiko-eğitsel yapı olan motivasyon ve öğrenme stratejileri de bu şemsiye kavramın altında yer almaktadır. Biggs ve Moore'un önerdiği öğrenmede 3P modeli, öğrenme süreçleri ve çıktıları için uygun bir kuramsal çerçeve sunmaktadır. Modele göre ilk *P* (presage),öğrenme sürecinin öğrenen ile ilgili değişkenlerini, öğrenenin ön bilgilerini, kişilik özelliklerini ve hazır bulunuşluğunu ifade etmektedir. İkinci *P* (process), öğrenme sürecinde bireyin motivasyonu, davranışları ve öğrenme stratejilerini içermektedir. Diğer bir deyişle süreç değişkeni belirli bir öğrencinin girdi unsurlarını ele alış biçimini göstermektedir. Son *P* (product) ise öğrenme çıktılarının niteliği ve niceliği ile ilgilidir. Öğrenme ürünlerinin formal ve informal değerlendirmesi, algılanan öğrenme ve tatmin düzeyi bu sürecin öğeleridir. Bu çalışmada modelin süreç ve çıktı değişkenleri üzerinde durularak öğrenme süreçlerinin öğrenme çıktıları üzerindeki etkisi incelenmiştir. Öğrenme çıktıları ise a)algılanan öğrenme düzeyi ve b) gerçekleşen öğrenme düzeyi olarak iki farklı formda ele alınmış, aynı zamanda bu iki öğrenme çıktısı arasındaki ilişki incelenmiştir.

Araştırmanın amacı: Bu çalışmada 3P modelinin süreç ve çıktı değişkenleri üzerinde durularak öğrenme süreçlerinin öğrenme çıktıları üzerindeki etkisi incelenmiştir. Öğrenme çıktıları a)öğrenme algısı ve b)öğrenme performansı olmak üzere iki boyutta ele alınmış, öğrenme algısı ile öğrenme performansı arasındaki ilişki incelenmiştir.

Araştırmanın Yöntemi: Çalışmada 3P modeli temelinde ilişkisel araştırma deseni kullanılmıştır. Bilgisayar Ağları ve İletişim dersine devam eden lisans düzeyinde 68 öğrenci çevrimiçi öğrenme ortamında Öğrenme Yönetim Sistemi aracılığıyla öğrenme yaşantısı geçirmişlerdir. Çalışmada öğrencilerin öğrenme çıktılarını belirlemek amacıyla iki farklı ölçme aracı kullanılmıştır: a) Algılanan öğrenme düzeyi, 6 maddeden oluşan Çevrimiçi Öğrenme Algısı Ölçeği ile belirlenmiştir. Ölçekte yer alan 6 maddenin öz değeri 1'den büyük tek faktör altında toplandığı görülmüştür. Araştırmacılar tarafından geliştirilen ölçeğin Cronbach Alfa değeri .93 olarak bulunmuştur. b) Gerçekleşen öğrenme düzeyini ortaya koymak amacıyla 20 maddelik akademik başarı testi uygulanmıştır. Uzman görüşleri ve dersin kazanımlarına dayalı olarak kapsam geçerliği sağlanan bu testin iç tutarlık katsayısı .76 olarak bulunmuştur. Araştırmada kullanılan üçüncü ölçme aracı olarak öğrenenlerin öğrenme yaklaşımlarını (derin ve yüzeysel) Öğrenme Yaklaşımları Ölçeği kullanılmıştır. Belirtilen psiko-eğitsel yapılar arasındaki ilişkiler Yapısal Eşitlik Modellemesi (YEM) ile incelenmiştir.

Araştırmanın Bulguları: YEM analizine göre öğrenenlerin öğrenme yaklaşımları öğrenme algısı üzerinde anlamlı bir etkiye sahiptir. Diğer yandan yüzeysel yaklaşımın öğrenme algısı üzerinde anlamlı bir etkisi görülmemiştir ($p>.05$). Derin strateji yaklaşımı öğrenme performansını olumlu yönde etkilerken derin motivasyon ve öğrenme performansı arasında anlamlı bir ilişki ortaya çıkmamıştır. Öğrenme performansı yüzeysel yaklaşımlardan olumsuz yönde etkilenmektedir ($p<.05$). Beklenmeyen bir şekilde algılanan öğrenme ile öğrenme performansı arasında anlamlı bir ilişki ortaya çıkmamıştır.

Araştırmanın Sonuçları ve Önerileri: Sonuçlar özerk öğrenenlerin (derin strateji ve motivasyona sahip) algılanan öğrenme çıktılarının daha yüksek olduğunu göstermektedir. Çevrimiçi öğrenme sürecinin sonunda öğrencilerin algılanan

öğrenme düzeyleri üzerinde derin yaklaşımın (derin strateji ve derin motivasyon) anlamlı bir etkisi görülmüştür. Buna ek olarak; öğrenme algısı yüzeysel yaklaşım düzeylerinden etkilenmemektedir. Burada ortaya çıkan sonuca göre; mekanik öğrenmeyen ve not kaygısı taşımayan öğrencilerin öğrenme algıları yüzeysel öğrenenlere göre daha yüksek bulunmuştur. Öğrencilerin öğrenme algıları yanı sıra öğrenme performansları üzerinde yüzeysel yaklaşımın (surface strategy and surface motivation) negatif ve anlamlı bir etkisi bulunmuştur. Bir diğer ifade ile öğrenmeden daha çok not kaygısı olan öğrencilerin başarıları daha düşük çıkmıştır.

Akademik başarı ile derin strateji arasında pozitif yönde ve anlamlı bir ilişki olduğu görülürken derin motivasyon alt boyutunda anlamlı bir ilişki gözlenmemiştir. Bu bulguya göre derin yaklaşımın her iki alt boyutunun bağımsız hareket ettiği söylenebilir. Son olarak algılanan ve gerçekleşen öğrenme düzeyleri arasında anlamlı bir ilişki ortaya çıkmamıştır. Çevrimiçi öğrenme yaşantısı sonucunda edinilen öğrenme algısı öğrencinin akademik başarısına yansımamıştır. Bu durum norma dayalı bir ölçüm olan algılanan öğrenme düzeyinin öğrencilerin kişisel beyanlarına dayanması ve öğrencinin çevrimiçi ortamda (discussion environments in LMS) iletişime girdikçe diğer öğrencilerden daha iyi öğrendiğini düşünmesi ve kendi öğrenmesini diğerleriyle kıyaslamasından kaynaklanıyor olabilir. Özetle tercih edilen öğrenme yaklaşımı ve öğrenme algısının akademik başarıyı tam anlamıyla etkilemediği ortaya çıkmıştır. Derin strateji yaklaşımını izlemenin başarı üzerinde anlamlı bir etkisi vardır ancak derin motivasyona sahip ve öğrenme algısı yüksek olan bireylerin her zaman yüksek performans sergilemediğini söyleyebiliriz. Gelecek çalışmalarda, çevrimiçi öğrenme ortamlarında öğrenme çıktılarını etkileyen bir takım çevresel değişkenlerin tespit edilerek incelenmesi süreçteki değişkenlerin açığa çıkması bakımından faydalı olacaktır. Çevrimiçi öğrenme ortamlarında kullanılan öğretim ve değerlendirme yöntemi, ders içeriği ve yapısı, işyükü (workload), ortamın teknik özellikleri vb. bu değişkenlerden bazıları olabilir.

Anahtar Sözcükler: E-öğrenme, öğrenme yönetim sistemi, öğrenme algısı, öğrenme performansı, öğrenme çıktıları.