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Online Distance Learning in Higher Education: E-Learning Readiness as a Predictor of Academic Achievement

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Abstract

The purpose of this study was to examine the relationship between e-learning readiness and academic achievement in an online course in higher-level education. The survey method was employed when collecting the study data, and the data-collection instrument used was the E-Learning Readiness Scale. The scale comprises 33 items and six sub-dimensions, including (1) computer self-efficacy, (2) internet self-efficacy, (3) online self-efficacy, (4) self-directed learning, (5) learner control, (6) motivation toward e-learning. The study participants comprised 153 freshmen who were taking an online English as a Foreign Language course. A relational model is proposed in this study to measure the predicted levels of readiness on academic achievement in online learning. Reliability analysis, Pearson correlation, linear regression analysis, and structural equation modelling were used to analyze and model the study data. Results indicated that self-directed learning is the strongest predictor of academic achievement, while motivation toward e-learning was found to be another predictor of academic achievement. Internet/online/computer self-efficacy and learner control were not found to be among significant predictors of academic achievement. It is concluded that, especially with the spread of Covid-19 worldwide, education is currently switching from face-to-face to online learning in an immediate and unexpected way; therefore e-learning readiness has to be carefully taken into consideration within this new educational paradigm.

Keywords: E-learning readiness, self-directed learning, self-efficacy, academic achievement, online learning readiness, motivation, English as a Foreign Language.

Introduction

Distance learning in higher education is a key and constantly evolving concept the aim of which provides e-learning practices to students at university level. At higher education levels, distance learning involves many different application types. Some institutions adopt a wholly online instruction approach, while others provide a blended learning type, using supportive systems and implementing tools such as Moodle, Blackboard, Atutor, and CanvasLMS among others. Since the mainstream adoption of online distance learning practices and applications at a higher education level, societies are increasingly replacing their traditional educational paradigms (Santosh & Panda, 2016).

Implementing effective e-learning is important for achieving institutional goals of both teaching and learning in higher education. Existing literature and research on e-learning has mainly be conducted with an in-depth focus on certain e-learning dimensions such as technology, faculty, support, pedagogy, readiness, management, ethics, evaluation, planning, and institution (Al-Fraihat, Joy & Sinclair, 2017). Among these e-learning sub-dimensions, e-learning readiness is one of the most important and studied. Learner readiness was first proposed for the Australian vocational education system, and three characteristics of e-readiness were specified: (1) students' preferences of delivery as opposed to face-to-face classroom instruction, (2) student confidence in using the internet and computer-mediated communication, and (3) the ability to engage in autonomous learning (Warner, Christie & Choy, 1998).

Determining student readiness levels regarding e-learning practices is a key factor among the successful practices of e-learning. For the decision makers, e-learning programmers, and researchers, knowing the readiness levels of the students and its direct and indirect effects can provide a planning guide for better learning and better student achievement. It is not only the success of e-learning applications administered by educational institutions that are important; the effects of e-learning readiness on learners' own learning progress, outcomes, and academic achievement are also other key factors in maintaining the main goals of education and learning online.

Literature Review and Theoretical Framework

E-learning Readiness

E-learning readiness is regarded as a kind of skill (Lopes, 2007) or ability (Kaur & Abas 2004) for increasing the quality of learning and for taking advantage of the benefits of e-learning. Tang and Lim (2013) describe the main features of readiness in online learning environments as online learning choices, and these can be compared with readiness concerning face-to face learning instructions, technological tool usage confidence and ability to learn individually.

Low readiness levels among students cause failure in e-learning environments. Accordingly, recent literature reports on the relationship between e-learning readiness and achievement (Kruger-Ross & Waters, 2013; Kırmızı, 2015; Çiğdem & Öztürk, 2016). Forcing learners to e-learn when they are not ready might cause them to develop a negative e-learning experience, and can increase their prejudice toward upcoming e-learning activities (Guglielmino & Guglielmino, 2003). Drop-out risk is reported as another key factor in e-learning readiness (Muse, 2003). Guglielmino and Guglielmino (2003) identify learners who are ready for e-learning and discuss an instrument for determining learner readiness to support their success in e-learning environments. The current study investigates participants who are experiencing e-learning for compulsory courses; accordingly, it will be important to see whether the results of this research are in line with existing studies in the literature.

Since there are many reasons for failure in e-learning, many of which have already been identified, when students are not ready to learn a course online, this causes a failure. To prepare learners for e-learning and make them ready to consume related e-learning content successfully, specific classroom mechanisms have to be implemented to enhance self-directed learning among e-learners (Piskurich, 2003). At higher education levels, the roles of learner and instructor are related to one another for the development of a better university e-learning practice (Siemens & Yurkiw, 2003). Before commencing any e-learning activity, it is critical for the e-learning readiness levels of learners be better understood in regard to the provided learning activity (Yurdugül & Alsancak-Sırakaya, 2013). With the increasingly substantial usage of e-learning in higher education, it is important that e-learning practitioners provide guidance and help for online learners with the awareness of these learners' preparation/readiness levels, and the awareness of whether they are ready to experience the online education program concerned.

The E-readiness Scales

In the last two decades researchers have been developing instruments to determine the e-learning readiness (Evans, 2000; McVay, 2000; Smith, Murphy & Mahoney, 2003; Pillay, Irving & Tones, 2007; Hung, Chou, Chen & Own, 2010; Yurdugül & Demir, 2017). Internet/computer/online self-efficacy (Compeau & Higgins, 1995a; Eastin & Larose, 2000; McVay 2000; Roper 2007), learner control (Shyu & Brown, 1992), self-directed learning (Garrison, 1997; McVay 2000) and motivation toward e-learning (Ryan & Deci, 2000) dimensions were added to the e-readiness research by Hung et al. (2010).

Computer Self-Efficacy

Computer self-efficacy is defined as an individual's belief of their ability to use a computer and their judgments about the application of computer-related skills to broader tasks (Compeau & Higgins 1995b). Computer self-efficacy is a significant predictor of students' satisfaction with web-based distance education (Lim, 2001). It was found that computer self-efficacy was a reason for college students choosing web-based online courses, because computer self-efficacy was related to their final exam results (Wang & Newlin, 2002). These students' perceived ability to transfer computer and ICT usage skills has a positive relationship with computer self-efficacy, while anxiety has a negative relationship with computer self-efficacy (Vuorela & Nummenmaa, 2004). It is indicated that self-efficacy has a predictive role in learner performance and success levels (Wang & Newlin, 2002; Lynch & Dembo, 2004; Bell & Akroyd, 2006).

Internet Self-Efficacy

Internet self-efficacy is defined as the trust of an Internet user while using the Internet. Internet self-efficacy differs from computer self-efficacy in that it may require a series of behaviors for establishing, maintaining, and using the Internet (Hung et al., 2010). Internet and computer self-efficacy are among those e-readiness sub-dimensions that are relatively infrequently addressed, among other sub-dimensions in the literature (Kuo, Walker, Belland & Schroder, 2013). Positive contributions of Internet and computer self-efficacy in e-learning environments are reported in previous research (Eastin & LaRose, 2000; Wang & Newlin, 2002; Chu & Chu, 2010).

Originating with Bandura's original Social Cognitive Theory (Bandura, 1977), self-efficacy provides a set of practices for the route to academic achievement in e-learning environments. It is known that higher Internet self-efficacy leads to better achievement levels in web-based learning settings (Tsai & Tsai, 2003).

Online Self-Efficacy

Online learning provides regular communication between teacher and student without the need for face-to-face interviews. In online learning environments, it is important to communicate with others using the system, and individuals' online self-efficacy should be considered as attempts to overcome the limitations of online learning. Effective communication improves the chances of successfully learning in e-learning environments, (Gülbahar, 2009) and helps students engage in classroom discussions more successfully (Roper, 2007). For this reason, online self-efficacy can be considered as a dimension of online learning readiness. Online self-efficacy is an important sub-dimension of e-readiness for overcoming the challenges of online learning.

Self-directed Learning

Self-directed learning is defined in association with certain terms, such as the learner's own goals, their learning strategies, their decision making, their outcome evaluation, and the clarification of learning needs, all of which underpin autonomous learning as controlled by the learner's own monitoring (Knowles, 1975; Paris & Paris; 2001). In online learning, the self-directed learning process is in accordance with the original self-directed learning paradigm (Lin & Hsieh, 2001). Self-regulated learning is a constructive process for learners, one in which learners regulate their own learning by monitoring and setting their own learning goals (Pintrich, 2004). A skillful self-directed learner is expected to diagnose their own learning needs, formulate learning goals, and find adequate learning

resources (Jossberger, Brand-Gruwel, Boshuizen & Van de Wiel, 2010). Self-directed learners learn independently and have more freedom in pursuing their learning goals compared with learners who are supposed to self-regulate their own learning by initiating an appropriate learning task. Therefore, in self-regulated learning, tasks are usually set by the instructor (Robertson, 2011). While self-regulated learners are supposed to self-regulate, they may not do so because self-regulated learning is the micro level concept that concerns processes within task execution (Saks & Leijen, 2014). Jossberger et al. (2010) indicate that providing students with opportunities for self-directed practice can help to improve their self-regulation.

Recent research on the positive relationship between self-directed learning and academic achievement in e-learning environments has yielded more relevant findings (Yukselturk & Bulut, 2007; Lee, Shen & Tsai, 2008; Wang, Shannon & Ross, 2013; Cigdem & Ozturk, 2016). In online learning environments, the learning process is characterized by the autonomy of the learner, and self-regulation plays an important role in taking advantage of learning environments. To test this hypothesis, the relationship between self-regulated learning and academic achievement, and technology-based learning is investigated by the researchers; thereby according with findings of the literature it is revealed that self-regulated is a predictor of academic achievement (Greene & Azevedo, 2009; Cho & Shen, 2013). Duncan and McKeachie (2005) developed a measurement instrument for self-regulated learning and suggest that students can improve their learning when they are provided with effective learning environments.

Learner Control

Web-based learning environments provide learners the opportunity to choose the information they access, with their information being sorted so to facilitate flexible and individualized learning opportunities (Lin & Hsieh, 2001); this compares with traditional learning environments, wherein system is structured with acquired and comprehended information. Shyu and Brown (1992) define learner control as the process whereby learners come to have control over their learning by self-guiding their own learning experiences. The Elaboration Theory of Instruction proposes seven major strategy components such as an elaborative sequence, learning prerequisite sequences, summary, synthesis, analogies, cognitive strategies and learner control. The theory suggests that when the highly motivated learners are given the appropriate level of authority and responsibility for providing their own learning, their learning occurs in a more attractive and efficient way (Reigeluth, 1983). In online learning environments, learners are given the opportunity to have their own preferences and can access to educational content according to their needs, regardless of a specific educational sequence. Online learning environments allow learners to control their own learning by choosing the most appropriate learning process and steps for their best learning (Brown, Howardson & Fisher, 2016; Alqurashi, 2016; Fisher, Howardson, Wasserman & Orvis, 2017; Jung, Kim, Yoon, Park & Oakley, 2019). It is expected that learners with better learner control will be able to better determine their own learning process and obtain a better learning performance as an outcome (Hung et al., 2010).

Motivation

There are many definitions of motivation in the field of education, and motivation has been put forward according to many theoretical approaches. In general, motivation is defined as a state of empowerment that causes learners to engage in certain activities which have physiological, cognitive, and affective dimensions that occur within. Motivation, as the structure of an online education program is largely self-directed, as it is in the traditional education process, and also comprises an important

part of the learning process in distance education. Motivation is regarded as one of the requirements of successful online learning (Lim, 2004). As learning is a more individual and independent activity within the online learning process, motivation is therefore essential for effective online learning in relation to success, dropout rate, and qualified learning (Grolnick & Ryan, 1987).

According to the famous study by Deci and Ryan (1985), motivation toward e-learning plays an important role in e-learning readiness when measuring academic achievement and satisfaction. Motivation is found to be a required component of online learning (Lim, 2004), and positive relationships have been found between motivation and academic success (Saade, He & Kira, 2007). Baeten et al. (2016) states that motivated students yield better outcomes in online learning environments.

Toward a Proposed E-readiness and Academic Achievement Model for the Current Study

E-learning readiness is associated with satisfaction and motivation (Yılmaz, 2017), as well as with academic achievement (Kırmızı, 2015). In time, practices of teaching and learning, in regard to the aims of higher academic achievement outcomes in traditional face-to-face learning environments, such as classroom teaching, can be expected to be similar to those employed through e-learning environments. Learner readiness levels and determining the effects of these levels on academic achievement can be assumed to involve similar processes in regard to both teaching and learning. Additionally, the institution wherein the current study was held, provide additional online courses applied for some of the basic freshman year courses, such as History, Literacy, and English as a Foreign Language (EFL), which are required courses in the curriculum for all of the students enrolled in-campus face-to-face learning. Taking into consideration the leveraging cost-effectiveness of e-learning in higher education, the applications of e-learning practices for concurrently learnt courses may be adopted en masse by such institutions in the future. To overcome the barriers of face-to-face in-campus learning, some curriculum courses are already being taught online by higher education institutions.

Since the research on e-learning readiness provides a substantially relevant literature to the current study, only a few number of studies in the literature address the relationship between academic achievement/success and relationship between predictive role of e-learning readiness and its sub-dimensions (Keramati, Afshari-Mofrad & Kamrani, 2011; Cigdem & Öztürk, 2016).

Common compulsory courses (CCCs) such as History, Literacy, and EFL which are good examples of such courses for all university students from different fields of study are being scheduled as required online courses in weekly teaching programs.

E-readiness levels of students are also crucial at this point, as they are for all types of e-learning when the courses concerned are compulsory. Students will not have any other preferences for online compulsory courses when these compulsory courses are required online courses. This study attempts to hypothesize a relational model of e-learning readiness to predict the effects on learner academic achievement in terms of internet/computer/online self-efficacy, self-directed learning, motivation toward e-learning and learner control. Moreover, this study addresses the readiness–achievement relationship of a required online course, which means that the possible results of this study will be more important in understanding the e-readiness levels of the students in higher education. The research questions of the study are as follows:

1. Is e-learning readiness a predictor of academic achievement?
2. How correlated are e-learning readiness sub-dimensions (computer self-efficacy, Internet self-efficacy, online self-efficacy, self-directed learning, learner control, motivation) and academic achievement?

Consequently, and in accordance with the current study's background analysis as seen in the literature review, a relational model is hypothesized. The structural relations model is proposed with the complementary hypothesis given below (Figure 1).
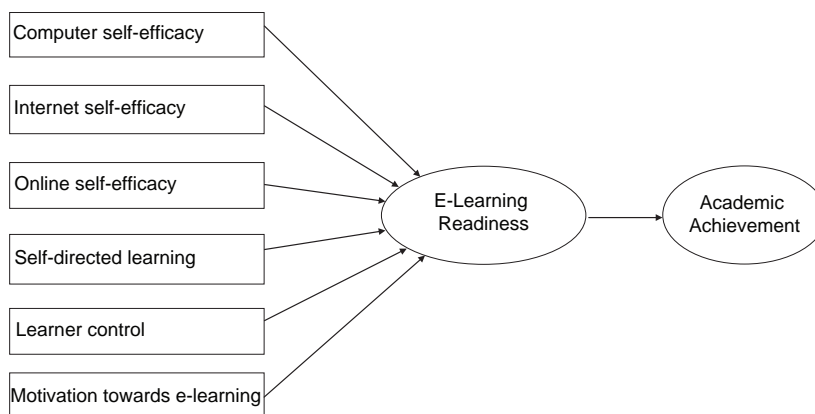

Figure 1: Hypothesized Model of Relations between E-learning Readiness and Academic Achievement.

Hypothesis 1: E-learning readiness is significantly associated with academic achievement.
Hypothesis 2: Sub-dimensions ("Computer self-efficacy", "Internet self-efficacy", "Online self-efficacy", "Self-directed learning", "Learner control", "Motivation toward e-learning") of e-learning readiness are the predictors of academic achievement.
Hypothesis 2a: Computer self-efficacy has a positive influence on academic achievement.
Hypothesis 2b: Internet self-efficacy has a positive influence on academic achievement.
Hypothesis 2c: Online self-efficacy has a positive influence on academic achievement.
Hypothesis 2d: Self-directed learning has a positive influence on academic achievement.
Hypothesis 2e: Learner control has a positive influence on academic achievement.
Hypothesis 2f: Motivation toward e-learning has a positive influence on academic achievement.

Method

Research Context

Most public and private universities are switching from campus education to online distance education platforms for CCCs in their own curriculums. CCCs are the basic courses that are mostly taught in the first year of the university. These basic courses are compulsory for those students in the curriculum. An EFL course was a compulsory five-credit course, and was provided online by the university as one of the basic introductory courses in the freshman curriculum. EFL courses with 3–5 credits each semester are among the basic CCCs of the freshman. A basic EFL course in the fall freshman curriculum, one that was entirely carried out on an online distance education platform, was selected for the current study.

CCCs are taught online via the university's distance education platform. The course instructors are the lecturers and academicians of the university. The instructor carries out a blended or totally online teaching process by using the platform. The midterms and finals are applied in a paper-based classical exam setting. By administrating distance education for CCCs, the university aims to use a less burdening but wholly equal and independent type of education for all their students. Figure 2 displays a screenshot from the distance learning platform's EFL course. After enrollment, students can join the lessons taught synchronously, and watch them repeatedly and asynchronously when

they want from the saved library of recorded video lectures, ask questions, and follow up their activity. Students can also take quizzes from the test bank for their own self-evaluation and immediately view their own reports. Surveys are held to monitor and get feedback, the students so to improve the system's functioning in case of any technical problems.
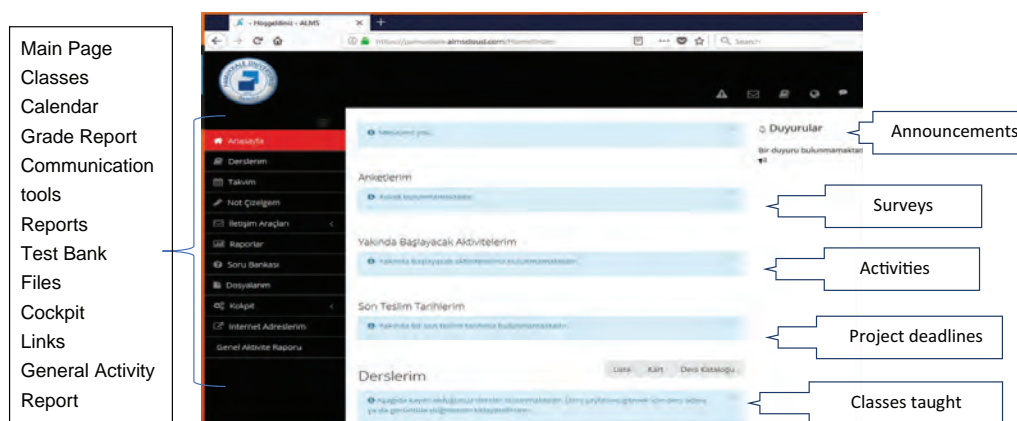

Figure 2: A Screenshot of the Online Distance Learning Student Portal.

Participants

A total of 155 students from a public university participated in this study. Two sets of responses were excluded from the study due to missing data, and so a total of 153 subjects were ultimately enrolled in the study; accordingly, the study subjects comprised 79 female (51.63%) and 74 male (49.37%) freshmen who were enrolled in an English as a Foreign Language class. All the freshmen were from the university's Communication, Business, Engineering and Education school. Overall, 55.2% of the students (n=84) reported that they did not have an online course participation experience, while 44.8% of the students (n=69) reported that they had at least one online course experience (Table 1).

Table 1: Demographics

	N	%
Gender		
Female	79	51.63
Male	74	49.37
Prior E-Learning/online course participation		
None	84	55.2
At Least One	69	44.8
School		
Communication	54	35.29
Business	42	27.45
Education	34	22.22
Engineering	23	15.03
Total	153	100

Instruments

The E-learning readiness (ELR) scale, and an additional personal information and demographics form, were used to collect the study data. The personal information form collected student demographics such as data on their gender, attended department/schools, and prior e-learning/online course participation experiences.

ELR scale (Yurdugül & Demir, 2017) is a 33-item scale with six sub-dimensions. The sub-dimensions of the instrument are computer self-efficacy (five items), Internet self-efficacy (four items), online self-efficacy (five items), self-directed learning (eight items), learner control (four items), and motivation toward e-learning (seven items). The freshmen who attended the EFL course for the 2019–2020 fall semester answered questions of the e-learning readiness scale voluntarily.

Data Collection Procedure

The EFL course was taught online to freshmen by instructors during the 2019–2020 fall semester. The course lasted 15 weeks during the fall semester of the 2019 academic calendar. The attendance levels of students were recorded by the online monitoring system in terms of hours attended for each course. A purposely designed learning management system (LMS) for the online distance CCCs developed by the university's distance education center was used as the teaching platform, regardless of the LMS system was used for the traditional on-campus courses. During the semester, students attended their classes for the EFL course, and completed midterm and final exams. Concerning the study data, academic achievement is calculated using the results of midterm and final exams of the EFL course. Each student's average midterm and final grades (maximum grade is 100) were tracked from the system and were recorded as "academic achievement" data for the study.

At the end of the semester after 15 weeks, the data collection instruments were administered online. The students answered the questions of the personal information form and ELR scale, respectively.

Data Analysis

The data analysis started with skewness and kurtosis analysis in order to find the normal distribution of the data. Based on the results, the whole data did not show a normal distribution. Measures of the sampling adequacy and sphericity tests were then undertaken. The results of the KMO (Kaiser-Meyer-Olkin) coefficient and the Bartlett's test of sphericity showed that the data are suitable for SEM. The KMO value was calculated as 0.712, and KMO values between 0.7–0.8 are considered to be good. The sphericity test (p = 0.000) was significant at the p < 0.05 level. According to these results, the data were found out to be adequate for SEM to test the hypothesized constructs. KMO values can range from 0–1, and KMO values above 0.5 are considered acceptable. Furthermore, KMO values between 0.5–0.7 are moderate, values between 0.7–0.8 are good, values between 0.8–0.9 are very good, and values of KMO above 0.9 indicate excellent relational patterns among or between the items (Hutcheson & Sofroniou, 1999).

To calculate the relationships between the hypothesized variables, the correlation coefficients are calculated, and the regression analysis is applied. Starting with the calculation of the reliability of the scale and its various subscales, descriptive statistics analysis was conducted to determine average scores, mean scores, and total averages. To confirm the correlation and regression results, SEM is applied with incremental, absolute, and parsimony fit indices. The estimates, model fit, chi-square, Root Mean Square Error of Approximation (RMSEA), Standardized Root Mean Squared Residuals (SRMR), Goodness of Fit (GFI), Adjusted Goodness of Fit (AGFI), Normed Fit (NFI), Non-normed

Fit (NNFI), and Comparative Fit (CFI) index values were then calculated and assessed in accordance with the acceptance criteria to test the proposed model fit for e-readiness.

Results

The ELR scale was found to have a Cronbach's Alpha value of 0.81, indicating a good level of reliability. Internal reliability coefficients were calculated as 0.79–0.86 (Table 2).

Table 2: Reliability Analysis of the Subscales of the ELR

Sub-dimensions	Cronbach's alpha	Number of items
E-learning Readiness Scale	0.81	33
Computer self-efficacy	0.79	5
Internet self-efficacy	0.86	4
Online self-efficacy	0.82	5
Self-directed learning	0.83	8
Learner control	0.78	4
Motivation toward e-learning	0.79	7

Descriptive statistics for the ELR sub-dimensions are given in Table 3. Responses to the ELR are given according to a sliding scale from 1 = "Never", to 7="Always". As can be seen in Table 3, the total average ELR score is 153.68 (Mean = 4.66). On examination of the sub-dimension averages, it can be seen that the students reported the highest readiness level of motivation toward e-learning (Mean = 5.08). Additionally, online self-efficacy and self-directed learning have both equivalent, and the second-highest mean, values (Mean = 4.84). Following these, it was found that internet self-efficacy (Mean = 4.77), computer self-efficacy (Mean = 4.20) and learner control (Mean=3.78) sub-dimensions have above average and relatively high readiness scores.

Table 3: Descriptive Statistics

Scale	Number of items	Min. score	Max. score	$\overline{X}$	SD	$\overline{X}/k$
ELR	33	33	231	153.68	1.12	4.66
Computer self-efficacy	5	5	35	21	1.36	4.20
Internet self-efficacy	4	4	28	19.08	1.16	4.77
Online self-efficacy	5	5	35	24.2	1.21	4.84
Self-directed learning	8	8	56	38.72	1.11	4.84
Learner control	4	4	28	15.12	1.27	3.78
Motivation toward e-learning	7	7	49	35.56	1.19	5.08

Correlation for Academic Achievement (AA)

Table 4 displays the relationships between AA (average of the midterm and final grades of the EFL course) and ELR, based on the Pearson correlation coefficient calculations. The relationship between academic achievement and ELR were all found to be positive. As can be seen in Table 4, there are strong (r > 0.50) correlations between self-directed learning (r = 0.824, p = 0.000) and motivation toward e-learning (r = 0.508, p = 0.000). Moderate (r is between 0.30 and 0.49) correlation is calculated for learner control (r = 0.375, p = 0.000). The correlations are small (r < 0.29) for online self-efficacy (r = 0.225, p = 0.005), Internet self-efficacy (r = 0.170, p < 0.05) and for the computer self- efficacy (r = 0.095, p > 0.05). The correlation between computer self-efficacy and ELR was not found to be statistically significant.

Table 4: Pearson Correlations Between Academic Achievement and E-Learning Readiness

		AA	ELR1	ELR2	ELR3	ELR4	ELR5	ELR6
AA	r	1						
	p							
ELR1	r	0.824**	1					
	p	0.000						
ELR2	r	0.508**	0.492**	1				
	p	0.000	0.000					
ELR3	r	0.375**	0.468**	0.154	1			
	p	0.000	0.000	0.057				
ELR4	r	0.225**	0.283**	0.319**	0.391**	1		
	p	0.005	0.000	0.000	0.000			
ELR5	r	0.170*	0.247**	0.289**	0.289**	0.472**	1	
	p	0.036	0.002	0.000	0.000	0.000		
ELR6	r	0.095	0.112	0.320**	0.085	0.579**	0.498**	1
	p	0.241	0.169	0.000	0.295	0.000	0.000	

**Correlation is significant at the 0.001 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).
ELR1: Self-directed learning, ELR2: Motivation toward e-learning, ELR3: Learner control, ELR4: Online self-efficacy, ELR5: Internet self-efficacy, ELR6: Computer self-efficacy, AA: Academic Achievement

The directions of the Pearson correlation coefficient relationships of the sub-dimensions of ELR were all positive on AA (Table 5). That means AA is in positive relationship with computer-internet-online self-efficacy, self-directed learning, learner control, and motivation toward e-learning. When students' ELR is high, this makes greater contributions to higher academic achievement levels, and self-directed learning seems to be the variable that most affects AA. To be able to see the linear model of the variables together and interpret the total effects regression analysis, SEM were then conducted using the study data.

Table 5: Pearson Correlations of AA and ELR Variables

Variable	Sub-dimensions / Factors	Pearson correlations	N
Academic Achievement	Computer self-efficacy	0.095	153
	Internet self-efficacy	0.170*	153
	Online self-efficacy	0.225**	153
	Self-directed learning	0.824**	153
	Learner control	0.375**	153
	Motivation toward e-learning	0.508**	153

**Correlation is significant at the 0.001 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

Regression Analysis for Academic Achievement

Linear regression analysis is administered to predict the effects of ELR on AA in the online EFL course. The relationship between self-directed learning and AA was found to be strong ($\beta = 0.820$, $p = 0.000$) and positive. The analysis showed motivation toward e-learning as indicating the second biggest relationship between ELR and AA ($\beta = 0.157$, $p = 0.006$) among other variables. Self-directed learning ($p < 0.001$) and motivation toward e-learning were found to be the only significant ($p < 0.05$) variables on AA.

Table 6: Regression Analysis for E-Learning Readiness in Predicting Academic Achievement

Variables	B	SE	b	t	p
Constant	0.249	0.235		1.057	0.292
Computer self-efficacy	0.000	0.054	0.000	0.002	0.988
Internet self-efficacy	-0.61	0.058	-0.059	-1.058	0.292
Online self-efficacy	-0.20	0.062	-0.020	-3.20	0.750
Self-directed learning	0.820	0.064	0.758	12.841	0.000
Learner control	0.020	0.053	0.022	0.384	0.701
Motivation toward e-learning	0.157	0.056	0.155	2.790	0.006

Regression analysis revealed that self-directed learning was the strongest predictor of academic achievement in online learning. Motivation toward e-learning was the second predictor of e-learning readiness. Computer self-efficacy, Internet self-efficacy, online self-efficacy and learner control were not the significant predictors of e-learning readiness. In this study, the most important variable among other ELR variables—such as, computer-internet-online self-efficacy, learner control, and motivation toward e-learning—was the self-directed learning. Confirming the research hypothesis, standardized regression coefficients indicated that e-learning readiness was a predictor of academic achievement ($\beta = 0.67$, $p < 0.001$).

Hypothesized Model Testing

Incremental, absolute, and parsimony fit indices were calculated and interpreted for the model fit. The results demonstrated contradictory constructs in this study in that the most appropriate indices were selected for the model fit. Since the sample size is smaller (n = 153), the chi-square was calculated as 255.334 (p = 0.000), which indicates a poor model of fit (Hu & Bentler, 1999). However, the results were found to be statistically significant (p < 0.001). It is possible for the chi-square to be affected by both the size of the correlations and the latent variables. The total variance explained in the model was 65.79%, thereby revealing a good variance of explanation rate. Remaining overall fit and R^2 measurements of the proposed model to test the direct and indirect effects of ELR variables on AA were not found to satisfy the acceptable or perfect-fit criteria. The indices and their acceptance criteria are given in Table 7.

Table 7: Perfect and Acceptable Fit Criteria for SEM

Fit Index	Perfect Fit Criteria	Acceptable Fit Criteria	Reference Resource
x^2/ SD	$0 \leq x^2/SD \leq 2$	$2 \leq x^2/SD \leq 3$	Hu and Bentler (1999)
GFI	$0.95 \leq GFI \leq 1.00$	$0.90 \leq GFI \leq 0.95$	Marsch, Balla and Mcdonald (1988), Jöreskog and Sörbom (1993), Schermelleh-Engel and Moosbrugger (2003).
AGFI	$0.90 \leq AGFI \leq 1.00$	$0.85 \leq AGFI \leq 0.90$	
CFI	$0.95 \leq CFI \leq 1.00$	$0.90 \leq CFI \leq 0.95$	Bentler (1980), Bentler and Bonnett, (1980), Marsch, Hau, Artelt, Baumertv and Peschar, (2006).
NFI	$0.95 \leq NFI \leq 1.00$	$0.90 \leq NFI \leq 0.95$	
NNFI	$0.97 \leq NNFI \leq 1.00$	$0.95 \leq NNFI \leq 0.97$	
RMSEA	$0.00 \leq RMSEA \leq 0.05$	$0.05 \leq RMSEA \leq 0.08$	Browne and Cudeck (1993), Byrne and Campbell (1999), Hu and Bentler (1999), Schermelleh-Engel and Moosbrugger (2003).
SRMR	$0.00 \leq SRMR \leq 0.05$	$0.05 \leq SRMR \leq 0.10$	

The hypothesized model did not provide an acceptable model of fit (Hu & Bentler, 1999) based on the fit indices criteria. The calculated indices were not acceptable, including the RMSEA and SRMR values and the values were not within the acceptable range. Comparatively, the proposed model generated by AMOS 23 is displayed in Figure 3, indicating the direct effects of ELR on students' academic achievement.
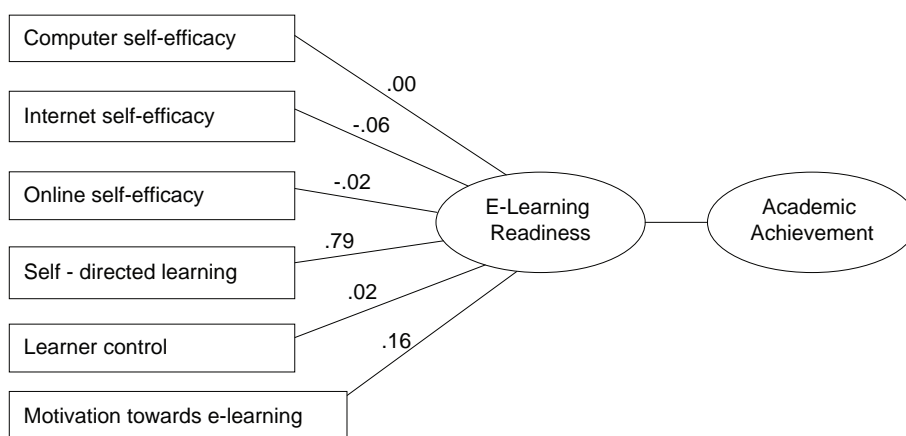

Figure 3: The Hypothesized Model for E-learning Readiness and Academic Achievement Generated by SEM

As expected, there were direct effects of self-directed learning and motivation toward e-learning on AA, as can be seen in the hypothesized model depicted in Figure 3 ($\beta = 0.79$, $p < 0.001$; $\beta = 0.16$, $p < 0.001$). Learner control was found to have a positive but weak direct effect on AA ($\beta = 0.02$, $p < 0.001$), whereas Internet self-efficacy and online self-efficacy were found to have negative direct effects on AA ($\beta = -0.06$, $p < 0.001$; $\beta = -0.02$, $p < 0.001$). Computer self-efficacy effect was calculated as neutral providing a result of zero direct effect on AA ($\beta = 0.00$, $p < 0.001$).

Discussion and Conclusion

This study aims to contribute to literature on role of e-learning readiness in predicting academic achievement. To determine the predictive roles of Internet self-efficacy, computer self-efficacy, online self-efficacy, learner control, self-directed learning, and motivation toward e-learning on academic achievement in e-learning, relational analysis and SEM were used to analyze the study data.

The results of the study revealed that self-directed learning is the most important predictor of academic achievement in online EFL courses. Self-directed learning predicted online academic achievement to a statistically significant degree according to the study's regression analysis, and this prediction effect was also confirmed with structural equation modelling. The hypothesized model confirmed the strong relationship between self-directed learning of e-learning readiness and academic achievement. SEM also confirmed that motivation toward e-learning was second most predictor of academic achievement. Consequently, the model proposed in this study emphasizes the importance of e-readiness to increase academic achievement in e-learning. For students' positive academic achievement in e-learning, it is important that they have high levels of e-readiness for e-learning in terms of the various e-readiness sub-dimensions.

The results of the effects of self-directed learning on academic achievement are supported by the existing literature and closely accord with previous research (Pintrich, 2004; Lee et al., 2008; Wang et al., 2013; Kırmızı, 2015; Çiğdem & Öztürk, 2016). As was confirmed through the hypothesized model that is proposed in the current study, self-directed learning emphasizes the effect of e-learning readiness on students' academic achievement when taking online courses. It is evident from this result that better self-directed learning processes contribute to better learning outcomes and academic achievement among students learning in online learning environments. These results confirm that self-directed learning processes in online learning are in accordance with the original self-directed learning paradigm (Lin & Hsieh, 2001). Therefore, it is recommended that e-learning practitioners support students in establishing the relationship between students' own learning objectives and learning needs in e-learning. Additionally, giving students the responsibility to choose and implement the appropriate learning strategy can also increase their academic achievement.

Self-efficacy, as a sub-dimension of e-learning readiness, was not predictive on academic achievement in terms of Internet, computer, and online self-efficacy. In student-centered learning, students are expected to have competencies such as controlling learning, defining learning needs, determining learning strategies, and interest in and attitudes toward their own learning. This concept, expressed as readiness for learning, constitutes an important dimension of online learning environments. However, due to the online learning context involved in distance education, other student readiness structures gain importance in e-learning environments, such as computer, Internet, and online-communication self-efficacy. Today, social networks play an important role in student communication, and it can be said that social networks are more advanced in terms of interaction, increasing student motivation in e-learning, and enriching online communication. Therefore, the effect of social network usage in e-learning can be tested to measure the online communication self-efficacy sub-dimension of e-readiness.

Based on the descriptive data collected for this study (Table 3), learners indicated the highest mean on motivation toward e-learning (Mean = 5.08). This result pointed to a strong motivational readiness toward learning EFL online, and it is supported by Hung et al. (2010), Tang and Lim (2013), and Çiğdem and Öztürk's (2016). According to the descriptive statistical analysis, this relationship between motivation and e-learning readiness resulted as a predictive e-readiness factor on academic achievement. Therefore, it is important that educators are unable to provide activities, content, and tools to motivate students when learning online, and also to facilitate their adaptation to the system for more sustainable motivation during online learning.

The overall readiness scores of the learners who participated in the current study were of a high value (Mean = 4.66) and above average (Mean > 3.5). Learners' lowest readiness level was found in regard to learner control. A reason for this finding may be due to the small number of the students who were experiencing e-learning for the first time; accordingly, students were about to experience an unforeseen and tacit type of EFL learning process through e-learning, and so were unable to control their own learning. Furthermore, EFL course was of a common and compulsory type, and was taught online only without a face-to-face or blended-learning alternative.

The correlations between e-learning readiness and academic achievement were positive among the e-learning readiness sub-dimensions. A very strong correlation was found for self-directed learning and academic achievement, and the correlation between motivation toward e-learning and academic achievement was also found to be strong. A moderate correlation was reported for the learner control sub-dimension while the correlations between the sub-dimensions of self-efficacy—including online, Internet, and computer, dimensions—were all found to be small. The correlation for computer self-efficacy was not statistically significant. These results imply that learners who can make appropriate arrangements of their own learning and choose learning materials and activities they like on online training courses, can generate better learning outcomes. Additionally, learners' self-directed learning was more important than their self-efficacy, learner control, and motivation affecting the outcome of online learning effectiveness regarding their academic achievement. According to this result, students with a relatively high self-directed learning capability performed better in learning English online. In light of this information, online learning and education designers are recommended to focus on improving students' self-directed learning skills. The support of the instructors will be needed in determining the learning needs of the students' and their basic tasks required to reach them to their learning goals. Accordingly, in addition to helping learners acquire technical skills utilized in online courses, educators or e-learning practitioners should note the great influence of self-directed learning in facilitating learners to develop positive online learning experiences.

In this study, data instrumentation comprised a single measurement tool and the data analyses were carried out using a quantitative research design. Future studies in the field might add to the literature by collecting more detailed data, and could analyze these data using a mixed-method research design. This study was carried out to investigate the online distance learning practices appertaining to a required EFL course, one was carried out wholly online, results may vary in other types of distance education settings. Future research might also address different types of practices in higher education and use larger sample sizes. Similar research could also be carried out for different courses using participants from different student groups. Results of different studies might also be compared for improved generalization of their findings. Additionally, satisfaction, memory performance, cognitive task analysis, and meta-cognitive strategies in e-learning could also be investigated along with e-readiness.

While this research article was being written, the Covid-19 pandemic commenced. In many affected countries, universities ended normal education suddenly and quickly switched to using distance education. However, this transition brought with it a wide range of challenges in regard

to enabling rapid activation of both infrastructure and distance education within a limited period. Many universities started online distance education directly, without conducting readiness research to determine the readiness of their students or their instructors. All face-to-face classes in higher education—and indeed in all steps of education, including elementary and secondary education—are now undertaken on online platforms; this not only unexpectedly resulted in common compulsory courses being conducted online, but also the totality of higher education teaching. Therefore, the e-readiness of both faculty and students regarding distance education is controversial, and so much so that quick and rigorous e-readiness research is recommended in order to help practitioners concerned to better maintain e-learning practices.

References

Al-Fraihat, D., Joy, M., & Sinclair, J. (2017). Identifying success factors for e-learning in higher education. In *International conference on e-learning* (pp. 247–255). Academic Conferences International Limited.

Alqurashi, E. (2016). Self-efficacy in online learning environments: A literature review. *Contemporary Issues in Education Research (CIER), 9*(1), 45–52. https://doi.org/10.19030/cier.v9i1.9549

Baeten, M., Dochy, F., Struyven, K., Parmentier, E., & Vanderbruggen, A. (2016). Student-centred learning environments: an investigation into student teachers' instructional preferences and approaches to learning. *Learning Environments Research*, *19*(1), 43–62. https://doi.org/10.1007/s10984-015-9190-5

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological review*, *84*(2), 191.

Bell, P. D., & Akroyd, D. (2006). Can factors related to self-regulated learning predict learning achievement in undergraduate asynchronous Web-based courses. *International Journal of Instructional Technology and Distance Learning*, 3(10), 5–16.

Bentler, P. M. (1980). Multivariate analysis with latent variables: Casual modeling. *Annual Review of Psychology, 31*, 419–456.

Bentler, P. M. & Bonett, D.G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin, 88*, 588–606.

Brown, K. G., Howardson, G., & Fisher, S. L. (2016). Learner control and e-learning: Taking stock and moving forward. *Annual Review of Organizational Psychology and Organizational Behavior,* 3, 267–291.

Browne, M. W., & Cudeck, R. (1993). Alternative Ways of assesing Model Fit. K.A. Bollen & J. S. Long (Eds.), *Testing structural Equation Models* (pp.136–162). Sage.

Cho, M. H., & Shen, D. (2013). Self-regulation in online learning. *Distance education*, *34*(3), 290–301. https://doi.org/10.1080/01587919.2013.835770

Chu, R. J., & Chu, A. Z. (2010). Multi-level analysis of peer support, Internet self-efficacy and e-learning outcomes–The contextual effects of collectivism and group potency. *Computers & Education*, *55*(1), 145–154. https://doi.org/10.1016/j.compedu.2009.12.011

Cigdem, H., & Ozturk, M. (2016). Critical components of online learning readiness and their relationships with learner achievement. *Turkish Online Journal of Distance Education, 17*(2).

Compeau, D. R., & Higgins, C. A. (1995a). Application of social cognitive theory to training for computer skills. *Information systems research*, *6*(2), 118–143.

Compeau, D. R., & Higgins, C. A. (1995b). Computer Self-efficacy: Development of a measure and initial Test. *MIS Quarterly*, *19*, 189–211.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic Motivation and Self-Determination in Human Behavior*. Berlin: Springer Science & Business Media. https://doi.org/10.1007/978-1-4899-2271-7

Duncan, T. G., & McKeachie, W. J. (2005). The making of the motivated strategies for learning questionnaire. *Educational psychologist*, *40*(2), 117–128.

Eastin, M. S., & LaRose, R. (2000). Internet self-efficacy and the psychology of the digital divide. *Journal of computer-mediated communication, 6*(1), JCMC611.

Evans, T. (2000). 12 Flexible delivery and flexible learning. *Flexible learning, human resource and organizational development: Putting theory to work*, 211.

Fisher, S., Howardson, G., Wasserman, M. E., & Orvis, K. (2017). How do learners interact with e-learning? Examining patterns of learner control behaviors. *AIS Transactions on Human-Computer Interaction, 9*(2), 75–98.

Garrison, D. R. (1997). Self-directed learning: Toward a comprehensive model. *Adult education quarterly*, *48*(1), 18–33.

Greene, J. A., & Azevedo, R. (2009). A macro-level analysis of SRL processes and their relations to the acquisition of a sophisticated mental model of a complex system. *Contemporary Educational Psychology*, *34*(1), 18–29.

Grolnick, W. S., & Ryan, R. M. (1987). Autonomy in children's learning: An experimental and individual difference investigation. *Journal of Personality and Social Psychology, 52*(5), 890–898. https://doi.org/10.1037/0022-3514.52.5.890

Guglielmino, L. M., & Guglielmino, P. J. (2003). Identifying learners who are ready for e-learning and supporting their success. *Preparing learners for e-learning* (pp. 18–33).

Gulbahar, Y. (2009*). E-learning*. Pegem A Publication, Ankara.

Hu, L., & Bentler, P. M. (1999). Cut-off criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modelling, 6*(1), 1–55. https://doi.org/10.1080/10705519909540118

Hung, M. L., Chou, C., Chen, C. H., & Own, Z. Y. (2010). Learner readiness for online learning: Scale development and student perceptions. *Computers & Education,* 55(3), 1080–1090. https://doi.org/10.1016/j.compedu.2010.05.004

Hutcheson G., & Sofroniou N. (1999). *The multivariate social scientist: Introductory statistics using generalized linear models.* Sage.

Jöreskog, K. G., & Sörbom, D. (1993). *Lisrel 8: User's guide*. Chicago: Scientific Software.

Jossberger, H., Brand-Gruwel, S., Boshuizen, H., & Van de Wiel, M. (2010). The challenge of self-directed and self-regulated learning in vocational education: A theoretical analysis and synthesis of requirements. *Journal of vocational education and training, 62*(4), 415–440.

Jung, E., Kim, D., Yoon, M., Park, S., & Oakley, B. (2019). The influence of instructional design on learner control, sense of achievement, and perceived effectiveness in a supersize MOOC course. *Computers & Education, 128*, 377–388. https://doi.org/10.1016/j.compedu.2018.10.001

Kaur, K. & Abas, Z. W. (2004). An assessment of e-learning readiness at the open university Malaysia. *International conference on computers in Education, ICCE 2004*, Melbourne, Australia.

Keramati, A., Afshari-Mofrad, M., & Kamrani, A. (2011). The role of readiness factors in E-learning outcomes: An empirical study. *Computers & Education*, *57*(3), 1919–1929. https://doi.org/10.1016/j.compedu.2011.04.005

Kirmizi, Ö. (2015). The influence of learner readiness on student satisfaction and academic achievement in an online program at higher education. *Turkish Online Journal of Educational Technology-TOJET*, *14*(1), 133–142.

Knowles, M. S. (1975). *Self-directed learning: A guide for learners and teachers*.

Kruger-Ross, M. J. & Waters, R. D. (2013). Predicting online learning success: Applying the situational theory of publics to the virtual classroom. *Computers & Education, 53*, 761–774. https://doi.org/10.1016/j.compedu.2012.09.015

Kuo, Y. C., Walker, A. E., Belland, B. R., & Schroder, K. E. (2013). A predictive study of student satisfaction in online education programs. *The International Review of Research in Open and Distributed Learning*, *14*(1), 16–39. https://doi.org/10.19173/irrodl.v14i1.1338

Lee, T. H., Shen, P. D., & Tsai, C. W. (2008). Applying web-enabled problem-based learning and self-regulated learning to add value to computing education in Taiwan's vocational schools. *Journal of Educational Technology & Society*, *11*(3), 13–25.

Lin, B., & Hsieh, C. T. (2001). Web-based teaching and learner control: a research review. *Computers & Education, 37*(4), 377–386.

Lim, C. K. (2001) .Computer self-efficacy, academic self-concept, and other predictor of satisfaction and future participation of adult distance learners. *The American Journal of Distance Education, 15*(2), 41–51.

Lim, D. H. (2004). Cross cultural differences in online learning motivation. *Educational Media International*, 41(2), 163–175.

Lopes, C. T. (2007). Evaluating e-learning readiness in a health sciences education institution. *Proceedings of IADIS International Conference of E-Learning*, Porto, Portugal.

Lynch, R., & Dembo, M. (2004). The relationship between self-regulation and online learning in a blended learning context. *The International Review of Research in Open and Distributed Learning, 5*(2).

McVay, M. (2000). *How to be a successful distance learning student: Learning on the Internet*. Pearson Custom Publication.

Muse, H. E. (2003). The web-based community college student: An examination of factors that lead to success and risk. *The Internet and Higher Education, 6*, 241–261.

Paris, S. G., & Paris, A. H. (2001). Classroom applications of research on self-regulated learning. *Educational psychologist*, *36*(2), 89–101.

Pillay, H., Irving, K., & Tones, M. (2007). Validation of the diagnostic tool for assessing tertiary students' readiness for online learning. *High Education Research & Development*, *26*(2), 217–234.

Pintrich, P. R. (2004). A conceptual framework for assessing motivation and self-regulated learning in college students. *Educational psychology review*, *16*(4), 385–407. https://doi.org/10.1007/s10648-004-0006-x

Piskurich, G. M. (2003). *Preparing learners for e-learning*. John Wiley & Sons.

Reigeluth, C., & Stein, R. (1983). *Elaboration theory. Instructional-design theories and models: An overview of their current status* (1983), 335–381.

Robertson, J. (2011). The educational affordances of blogs for self-directed learning. *Computers & Education, 57*(2), 1628–1644.

Roper, A. R. (2007). How students develop online learning skills. *Educause Quarterly*, *30*(1), 62.

Ryan, R. M. & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, *55*(1), 68.

Saadé, R. G., He, X., & Kira, D. (2007). Exploring dimensions to online learning. *Computers in Human Behavior*, *23*(4), 1721–1739.

Saks, K., & Leijen, Ä. (2014). Distinguishing self-directed and self-regulated learning and measuring them in the e-learning context. *Procedia-Social and Behavioral Sciences, 112*, 190–198.

Santosh, S., & Panda, S. (2016). Sharing of knowledge among faculty in a mega open university. *Open Praxis, 8*(3), 247–264. http://dx.doi.org/10.5944/openpraxis.8.3.317

Schermelleh-Engel, K. & Moosbrugger, H. (2003). Evaluating the fit of structural equation models: Tests of significance and descriptive goodness of fit measures. *Methods of Psychological Research Online*, *8*(2), 23–74.

Shyu, H. Y., & Brown, S. W. (1992). Learner control versus program control in interactive videodisc instruction: What are the effects in procedural learning. *International Journal of Instructional Media*, *19*(2), 85–95.

Siemens, G., & Yurkiw, S. (2003). The roles of the learner and the instructor in e-learning. In G.M. Piskurich (ed.), *Preparing learners for e-learning* (pp. 123–138). John Wiley & Sons.

Smith, P. J., Murphy, K. L., & Mahoney, S. E. (2003). Towards identifying factors underlying readiness for online learning: an exploratory study. *Distance Education, 24*(1), 57–67.

Tang, S. F. & Lim, C. L. (2013). Undergraduate students' readiness in e-learning: a study at the business school in a Malaysian private university. *International Journal of Management & Information Technology, 4*(2). 198–204.

Tsai, M. J., & Tsai, C. C. (2003). Information searching strategies in web-based science learning: The role of Internet self-efficacy. *Innovations in education and teaching international*, *40*(1), 43–50.

Vuorela, M., & Nummenmaa, L. (2004). How undergraduate students meet a new learning environment? *Computers in Human Behavior, 20*(6), 763–777.

Wang, A. Y., & Newlin, M. H. (2002). Predictors of web-student performance: The role of self-efficacy and reasons for taking an on-line class. *Computers in human behavior, 18*(2), 151–163.

Wang, C. H., Shannon, D. M., & Ross, M. E. (2013). Students' characteristics, self-regulated learning, technology self-efficacy, and course outcomes in online learning. *Distance Education*, *34*(3), 302–323.

Warner, D. Christie, G., & Choy, S. (1998). *Readiness of VET clients for flexible delivery including online learning*. Brisbane: Australian National Training Authority.

Yilmaz, R. (2017). Exploring the role of e-learning readiness on student satisfaction and motivation in flipped classroom. *Computers in Human Behavior, 70*, 251–260.

Yukselturk, E., & Bulut, S. (2007). Predictors for student success in an online course. *Journal of Educational Technology & Society*, *10*(2), 71–83.

Yurdugül, H., & Alsancak-Sırakaya, D. (2013). Çevrimiçi öğrenme hazır bulunuşluluk ölçeği: Geçerlik ve güvenirlik çalışması. *Eğitim ve Bilim, 38*(169).

Yurdugül, H., & Demir, Ö. (2017). Öğretmen yetiştiren lisans programlarındaki öğretmen adaylarının e-öğrenmeye hazır bulunuşluklarının incelenmesi: Hacettepe üniversitesi örneği. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 32*(4), 896–915.