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A New Perspective to University Students' Online Learning Self-Efficacy: A Structural Equation Modeling

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Abstract

The aim of this paper is to examine the relationship between university students' online learning self-efficacy and academic self-efficacy using structural equation modeling and to create a statistically significant model for online learning self-efficacy. In the study, the cross-sectional survey model, one of the quantitative research methods, was used. The sample of the study consists of 322 university students studying in various programs and at different grade levels in the faculty of education in the 2022-2023 academic year. Demographic information form, academic self-efficacy scale, student's engagement scale in online learning environments, online learning systems acceptance scale and online learning self-efficacy scale were used as data collection tools. The results obtained from the study indicated that academic self-efficacy had a positive and significant effect on student's engagement in online learning environments and online learning systems acceptance, while student's engagement in online learning environments and online learning systems acceptance had a positive and significant effect on online learning self-efficacy. In addition, academic self-efficacy was a stronger predictor for student's engagement in online learning environments, and student's engagement in online learning environments was a stronger predictor for online learning self-efficacy.

Keywords: *Online learning self-efficacy, academic self-efficacy, student's engagement in online learning environments, online learning systems acceptance, structural equation model*

Öz

Bu araştırmanın amacı üniversite öğrencilerinin çevrimiçi öğrenme özyeterlikleri ile akademik özyeterlikleri arasındaki ilişkiyi yapısal eşitlik modellemesi kullanarak incelemek ve çevrimiçi öğrenme özyeterliği için istatistiksel olarak anlamlı bir model oluşturabilmektir. Araştırmada, nicel araştırma yöntemlerinden kesitsel tarama modeli kullanılmıştır. Araştırmanın örneklemini 2022-2023 eğitim öğretim yılında, eğitim fakültesinin çeşitli programlarında ve farklı sınıf düzeylerinde öğrenim gören 322 üniversite öğrencisi oluşturmaktadır.Araştırmada veri toplama aracı olarak; demografik bilgi formu, akademik özyeterlik ölçeği, çevrimiçi öğrenme ortamlarında öğrenci bağlılık ölçeği, çevrimiçi öğrenme sistemleri kabul ölçeği ve çevrimiçi öğrenmeye yönelik öz-yeterlik ölçeği kullanılmıştır. Araştırmadan elde edilen sonuçlara göre akademik özyeterlik, çevrimiçi öğrenme ortamlarında öğrenci bağlılığı ve çevrimiçi öğrenme sistemleri kabulü üzerinde pozitif ve anlamlı bir etkiye sahipken çevrimiçi öğrenme ortamlarında öğrenci bağlılığı ve çevrimiçi öğrenme sistemleri kabulü ise çevrimiçi öğrenme özyeterliği üzerinde pozitif ve anlamlı bir etkiye sahiptir. Ayrıca akademik özyeterlik, çevrimiçi öğrenme ortamlarında öğrenci bağlılığı için çevrimiçi öğrenme ortamlarında öğrenci bağlılığı ise çevrimiçi öğrenme özyeterliği için daha güçlü bir yordayıcıdır.

Anahtar Kelimeler: *Çevrimiçi öğrenme özyeterliği, akademik özyeterlik, çevrimiçi öğrenme ortamlarında öğrenci bağlılığı, çevrimiçi öğrenme sistemleri kabulü, yapısal eşitlik modeli*

Introduction

The effects of rapidly developing technology in the 21st century show themselves in the field of education and all areas of life. It is possible to claim that developing technology is used primarily to provide individuals with more effective learning environments. In this respect, it is clear that technology has been an indispensable part of the educational process. Especially after the COVID-19 pandemic, technology-based approaches have been current education issues, and technology-supported learning environments have been created. In this context, comprehensive awareness of the importance of technology is provided, and most countries have adopted online learning. Online learning refers to using technology (Means et al., 2009). Considering the importance of online education today, it is seen that many studies discussing online learning from different aspects are conducted.

In the study conducted by Simándi (2017), it was expressed that the online learning environment could be effectively utilized for community learning. Meanwhile, the study by Homoki et al. (2023) revealed that most students perceived online education as effective, and it was further noted that students' digital competence showed improvement due to their engagement in online education. In another study conducted by Lu et al. (2022), individual characteristics, internal factors, external factors, and online learning strategies affecting adults' online learning were examined through 124 articles published between 2005 and 2021. The results indicated that self-efficacy in using information and communication technologies was an effective internal factor for online learning. In addition, according to Lai's (2011) study conducted with civil servants in Taiwan, self-efficacy for online courses was among the predictors of the effectiveness of online learning. At this point, it is possible to state that self-efficacy is essential for effective online learning. *Self-efficacy* focuses on the task or behavior an individual perceives s/he can do rather than his/her actual performance (Bandura, 2010). Online education experts stated that individuals with low self-efficacy preferred not to enroll in the program or were less likely to complete the program even if they were enrolled (Zimmerman and Kulikowich, 2016). On the other hand, *online learning self-efficacy (OLS)* can be described as an individual's perception of his/her ability to carry out prescribed tasks essential for online learning (Zimmerman and Kulikowich, 2016). There are various studies on the factors related to OLS in the literature. For example, according to Alqurashi's (2016) study, a literature review including research conducted from 1997 to 2015, a correlation existed between OLS and computer self-efficacy, internet and information-seeking self-efficacy, learning management systems self-efficacy, and academic self-efficacy. In a similar study conducted by Peechapol et al. (2018), a comprehensive analysis of the research literature encompassing the studies conducted between the years 2005-2017, the factors linked to self-efficacy in online learning were categorized into five different classifications: online learning experience and knowledge, feedback and reward, online communication and interactions, social impact, student motivation, and attitude.

According to studies in the literature, academic self-efficacy was found to have a positive effect on students' academic performance, motivation, and their perception of the effectiveness of internet-based or online learning systems (Chyung et al., 2010; Lim et al., 2016; Tsai et al., 2011). *Academic self-efficacy (AS)* can be described as an individual's confidence and belief in their ability to accomplish academic tasks (Schunk, 1985; Solberg et al., 1993; Zimmerman, 1995). According to Bandura (1997), who associated AS with the self-efficacy theory, AS was an individual's belief that s/he could succeed academically. It also included self-regulated learning, effective in the stages of students' resource use, execution of tasks or activities, planning, controlling, and analyzing in the preparing learning outcomes (Neilsen et al., 2018; Schunk and Pajares, 2009). Based on the structural equation model developed by Calaguas and Consunji (2022), AS had a positive predictive relationship with computer use, learning management system, and internet and information self-efficacy. Furthermore, computer use self-efficacy, learning management system self-

efficacy, and internet and information self-efficacy were positively associated with OLS.

There were indications of a connection between OLS and other variables, such as student engagement in online learning and the acceptance of online learning systems. *Student engagement*, defined as the effort and time students spend on education, is associated with voluntary participation in educational activities and perseverance (Carini et al., 2006; Junco et al., 2011; Krause and Coates, 2008). Accordingly, *student's engagement in online learning environments (SEOLE)* refers to the time and effort that students invest in these digital learning settings. In a meta-analysis study conducted by Chang and Chien (2015) involving 26 primary studies, the connection between AS and student engagement was explored, and a significant correlation was discovered between AS and student engagement. On the other hand, *online learning systems acceptance (OLSA)* incorporates the dimensions of perceived ease of use and perceived usefulness from the Technology Acceptance Model formulated by Davis (1986). Technology acceptance was employed to investigate why users accept or reject information technologies (Legris et al., 2003). Perceived usefulness reflects an individual's belief in how much the system they use can enhance their job performance, while perceived ease of use pertains to an individual's belief in the minimal effort required to use the system. Ease of use and perceived usefulness play crucial roles in determining the acceptance of the system (Davis, 1989).

Law et al. (2010) stated that self-efficacy was associated with individual attitudes and expectations, whereas Prior et al. (2016) found a significant relationship between attitude, digital literacy, and self-efficacy. A separate research conducted by Topal (2020) determined that SEOLE was significantly higher in the online learning group enriched with gamification compared to the online learning group without gamification. According to Fredricks et al. (2004), as a student's engagement in learning environments increased, his/her cognitive development and learning level also increased. Junco et al. (2011) stated that students with high engagement in educational settings were more willing and courageous to use

technology. In addition, Arbaugh (2000) noted that ease of use and perceived usefulness of the internet-based course environment made a student's attitude towards course experience positive. Accordingly, students would ask to attend internet-based courses again in the future. In the study of Koca and Usluel (2007), teachers' intention to use information and communication technologies was shaped based on ease of use, perceived usefulness, social impact, and self-efficacy factors. In their study, a structural equation model was constructed by Şahin and Shelley (2008) to determine students' perceptions of distance education. The study found that computer knowledge, flexibility, and utility variables explained more than half of the variance in satisfaction with distance education.

In addition, there is some evidence that OLS may be related to AS, SEOLE, and OLSA. However, it is determined that there is almost no research using a structural equation modeling based on the relationships between these variables. Pearl (2012) defined the structural equation model as a causal inference method. The basic steps of structural equation modeling are (1) determination of the model, (2) evaluation of the model definition (if the specific estimation of each parameter in the model is theoretically possible, that model is defined), (3) selection of the scales to be used, data collection and preparation for analysis, (4) model estimation (model fit is evaluated, parameter estimations are interpreted if the model is compatible with the data, equivalent or close equivalent models are taken into account), (5) re-determining the model if the model fit is not good enough, and (6) reporting the results (Kline, 2016; Tabachnick and Fidel, 2013).

The study aims to investigate the correlation between OLS and AS among university students using structural equation modeling and to establish a statistically significant model for OLS. To achieve this goal, a structural equation model (Figure 1) was developed based on the existing literature, and the model's fit was assessed through testing. The hypotheses, aligned with the study's objective, are presented below.
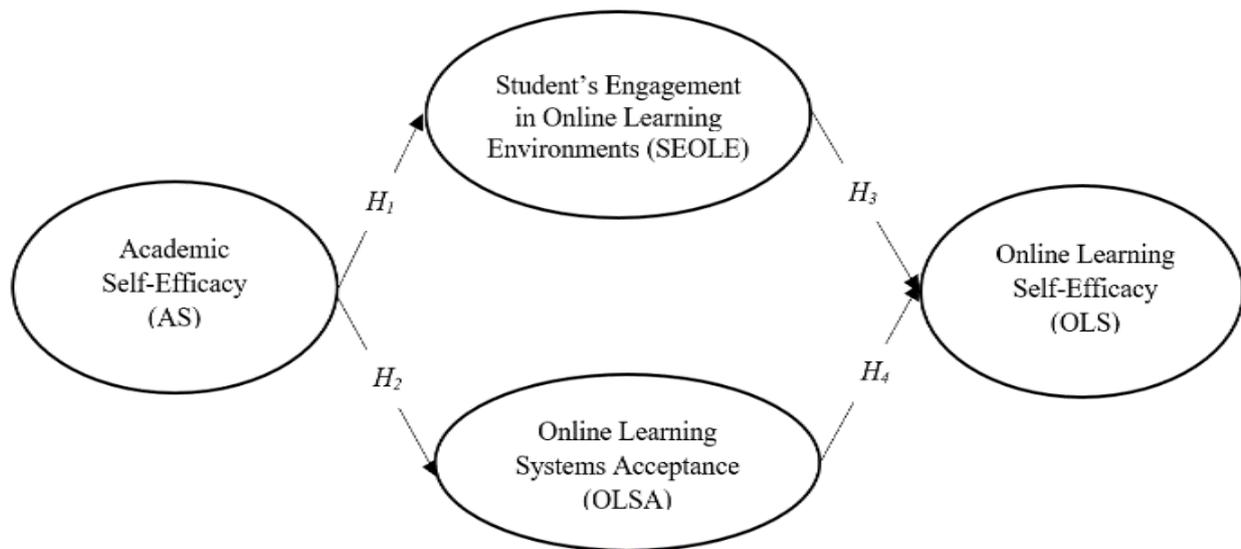
Figure 1. A model of university students' OLS

H_1: AS of university students affects SEOLE positively.
H_2: AS of university students affects OLSA positively.
H_3: SEOLE affects university students' OLS positively.
H_4: OLSA affects university students' OLS positively.

The significance of this study lies in the potential for its results to furnish educational policymakers, curriculum planners, and educators with valuable insights regarding OLS. In addition, this study is expected to provide valuable contributions to the related literature as it can be regarded as suggestive for future studies that aim to increase university students' academic achievement.

Method

The study was designed in a cross-sectional survey model, one of the quantitative research methods. In survey research, it is aimed to describe the characteristics of the sample according to one or more variables (Fraenkel and Wallen, 2009) and to describe the characteristics of the universe based on the sample (Creswell, 2012). In cross-sectional surveys, data on the current attitudes, thoughts, or beliefs of the sample drawn from a predetermined universe are collected (Creswell, 2012; Fraenkel and Wallen, 2009). Therefore, in this study, the cross-sectional survey model was used because it was tried to understand and describe the current situation regarding the sampling in a certain time period, the effort to generalize the results to the universe, and the presence of different developmental periods such as grade level in the sample.

Participants

This study included a sample of 322 university students studying in various teacher training programs in a state university and at different grade levels in the 2022-2023 academic year.
The reason why the participants were chosen from the faculty of education is that when pre-service teachers start working as a teacher, they will undertake tasks, such as utilizing information and communication technologies effectively during the teaching-learning process, planning the teaching process most effectively in accordance with current conditions, and preparing their students for the future (MoNE, 2020).

The participants were determined using a convenience sampling model. Students, who had received online, or hybrid education before, were included in the sample. Once the students were informed about the research, the study group was constituted of those who willingly chose to

participate. Table 1 indicates the demographic information of the participants.

Variable		N= 322	%
Age ($\bar{X} \pm sd$)	21.39 ± 3.10		
Department/Program	Physical Education and Sports	13	4.0
	Guidance and Psychological Counseling	62	19.3
	Fine Arts Education	18	5.6
	Maths Education	47	14.6
	Science Education	34	10.6
	Special Education	15	4.7
	Preschool Education	40	12.4
	Classroom Education	56	17.4
	Social Sciences Education	23	7.1
	Language Education	14	4.3
Class Level	1st Grade	24	7.5
	2nd Grade	95	29.5
	3rd Grade	142	44.1
	4th Grade	61	18.9
Gender	Female	239	74.2
	Male	83	25.8
Do you have a personal computer?	Yes	212	65.8
	No	110	34.2
Do you have internet access whenever you want?	Yes	248	77.0
	No	74	23.0

As indicated in Table 1, the mean age of the participants consisting of 322 university students was 21.39 (*sd*= 3.10). Students from 10 different teacher-training departments/programs of the university and four different class levels were included in the sample. The majority of the sample consisted of women (74.2%). In addition, it was seen that the rate of those who had a personal computer (65.8%) and those who had internet access whenever they wanted (77.0%) was high.

Data Collection Tools

While gathering the data, the researcher employed the "Demographic Information Form" and utilized the following scales: the "Academic Self-Efficacy Scale," the "Student's Engagement Scale in Online Learning Environments," the "Online Learning Systems Acceptance Scale," and the "Online Learning Self-Efficacy Scale." The reliability and validity of these scales were assessed using data obtained from the study's sample. Cronbach's

alpha coefficient and composite reliability (CR) values were computed to evaluate scale reliability. Cronbach's alpha assessed the internal consistency and homogeneity of the scale items. On the other hand, CR value indicated the construct reliability of the factors. If the construct reliability of the factors was high, it was accepted that concurrent validity was provided. Values between .60 and .70 for both indicated an acceptable level of reliability, and values greater than .70 were interpreted as highly reliable or high reliability (George and Mallery, 2003; Hair et al., 2005). In this respect, these values were expected to be above .70 for the scales used in the study. In addition, the construct validity of the scales was evaluated through the use of confirmatory factor analysis (CFA), and calculated goodness-of-fit indexes were interpreted considering the intervals suggested by Kline (2016) and Tabachnick and Fidell (2013). Google Forms, a web-based and free software, were used to collect the data. Google Forms, providing the opportunity to gather information online and to download the data in Excel file format, were sent to the participants via e-mail. The data were collected in the fall semester of the 2022-2023 academic year.

Demographic Information Form

The questions, including the student's department/program, grade level, gender, age, having/not having a personal computer, having/not having internet access at any time, and having/not having received online or hybrid education from a formal education institution before, were developed by the researcher and consisted of seven items.

Academic Self-Efficacy Scale

It was developed by Jerusalem and Schwarzer (1981) and adapted into Turkish by Yılmaz et al. (2007). The scale comprised a unidimensional structure and encompassed a total of seven items. The items in the scale were in a four-point Likert type with *(1) does not fit me at all, (2) fit me very little, (3) fits me, and (4) fits me completely.* Six items in the scale were positive, and one was negative (item 7). The minimum score that could be obtained from

the scale was 7, and the maximum score was 28. In the current study, the mean score obtained from the scale was 19.56 (*sd*= 3.10), and the total variance explained in unidimension was 41.76%. Cronbach's alpha coefficient and CR value were calculated as .74 and .83, respectively using the data acquired from the participants. These calculated values showed that the reliability of the scale was high. In addition, the goodness-of-fit indexes achieved as a result of CFA (χ^2[14, *N*= 322]= 41.186; *p*< .01; χ^2/df= 2.94; *CFI*= .94; *GFI*= .97; *SRMR*= .045; *RMSEA*= .078) indicated that the proposed one-factor model was well-fitted with the data and was acceptable.

Student's Engagement Scale in Online Learning Environments

It was developed by Sun and Rueda (2012) and adapted into Turkish by Ergün and Usluel (2015). The scale consisted of three dimensions: *Behavioral Engagement* (5 items), *Affective Engagement* (6 items), *Cognitive Engagement* (8 items), and included 19 items. The items in the scale were in a five-point likert type with *(1) strongly disagree, (2) disagree, (3) neither disagree nor agree, (4) agree, and (5) strongly agree*. 16 items in the scale are positive, and three items are negative (items 2, 3, 11). The minimum score obtained from the scale was 19, and the maximum score was 95. In the current study, the mean score obtained from the scale was 63.87 (*sd*= 10.43), and the total variance explained in the three dimensions was 54.03%. In the study, Cronbach's alpha coefficients calculated for the three sub-dimensions of the scale were calculated as .67, .91, .80, and CR values as 68, .92, and .82, respectively. Therefore, it was seen that while the *Behavioral Engagement* dimension of the scale had acceptable reliability, the other dimensions had high reliability. When goodness-of-fit indexes achieved as a result of the second level CFA and three modifications in total (χ^2[146, *N*= 322]= 397.640; *p*< .01; χ^2/df= 2.72; *CFI*= .90; *GFI*= .88; *SRMR*= .063; *RMSEA*= .073) were examined, it was found that the GFI was below the expected value. Jöreskog and Sörbom (1988) stated that GFI values of .85 and above indicated an acceptable model fit. Therefore, it was seen that the proposed three-

factor model, based on other goodness-of-fit indexes, was compatible with the data at an acceptable level.

Online Learning Systems Acceptance Scale

It was developed by Ilgaz (2008). The scale comprised two dimensions, *Perceived Ease of Use* (2 items), *Perceived Benefit* (4 items), and 6 items. The items in the scale were in seven-point Likert type with *(1) strongly disagree - (7) totally agree*. All of the items in the scale were positive. The minimum score that could be obtained from the scale was 6, and the maximum score was 42. In the current study, the mean score obtained from the scale was 28.80 (*sd*= 7.67), and the total variance explained in the two dimensions was 81.46%. In the study, Cronbach's alpha coefficients calculated for the three sub-dimensions of the scale were calculated as .84, .91, and CR values as .87 and .90, respectively. Accordingly, it was seen that both dimensions of the scale had high reliability. In addition, goodness-of-fit indexes obtained as a result of CFA (χ^2[8, *N*=322]= 20.510; *p*< .01; χ^2/df= 2.56; *CFI*= .99; *GFI*= .98; *SRMR*= .022; *RMSEA*= .070) indicated that the proposed two-factor model was well-fitted with the data.

Online Learning Self-Efficacy Scale

It was developed by Sun and Rogers (2020) and adapted into Turkish by Yörük and Özçetin (2021). The scale consisted of four dimensions, *Technology Use Self-Efficacy* (7 items), *Online Learning Self-Efficacy* (4 items), *Instructor and Peer Interaction and Communication Self-Efficacy* (7 items), *Self-Control and Motivation Effectiveness* (13 items), and included 31 items. The items in the scale were in six-point Likert type with *(1) strongly disagree, (2) disagree, (3) somewhat disagree, (4) somewhat agree, (5) agree, (6) strongly agree*. All of the items in the scale were positive. The minimum score that could be obtained from the scale was 31, and the maximum score was 186. In the current study, the mean score obtained from the scale was 135.14 (*sd*= 23.61), and the total variance explained in four dimensions was 63.60%. In the study, Cronbach's alpha coefficients calculated for the four sub-dimensions

of the scale were calculated as .89, .86, .93, .93, and CR values as .90, .76, .90, and .91, respectively. These values showed that all dimensions of the scale had high reliability. When goodness-of-fit indexes obtained as a result of the second level CFA and three modifications in total (χ^2[427, N= 322]= 1226.369; p< .01; χ^2/df= 2.87; CFI= .88; GFI= .80; $SRMR$= .078; $RMSEA$= .076) were examined, it was found that the GFI was below the expected value. However, considering that models that represent a theoretically meaningful and useful description of the data based on a single fit index should not be rejected (Jöreskog and Sörbom, 1988; Shevlin and Miles, 1998), it can be claimed that the four-factor model proposed for the scale based on other calculated goodness-of-fit indexes, was compatible with the data at an acceptable level.

Data Analysis

Before commencing the analysis of the gathered data, the requirements and assumptions of the structural equation model were tested. These include missing data, outliers, normality, linearity, multicollinearity and singularity, and sample size (Çokluk et al., 2012).

In the data collected from 327 university students via Google Forms, no missing data was observed in the data set since the "required" option was activated for all items in the data collection tool. Standardized z scores and Mahalanobis distance were calculated to examine the outliers in the data set. Three outliers outside the z score [-3,3] range (Tabachnick and Fidel, 2013) and two outliers in which Mahalanobis distance was greater than the critical chi-square table value χ^2(5)= 20.52, p<.001 (Kline, 2016) were removed from the dataset. As a result, the data of 322 students remained in the data set. Power analysis was performed using the statistical software G*Power v3.1.9.7 to determine the required sample size (Faul et al., 2007). The analysis results indicate that for a model with three predictors, power= .95, alpha= .05, and an effect size ranging from small to medium, specifically f^2= .075, the required sample size was calculated as 233 participants. Cohen (1988) classified the effect size as small, medium, and large for .02, .15, and .35, respectively. In addition, the Kaiser-Mayer Olkin (KMO) test

results, applied to determine whether the sample size was sufficient, were between .807 and .941, which could be interpreted as a sample size of 322 was sufficient (Çokluk et al., 2012).

Univariate normality was examined via skewness and kurtosis coefficients, and multivariate normality was examined via Bartlett's Sphericity test for the data of the study. When the skewness and kurtosis values were examined, it was seen that the calculated values were between -1.5 and 1.5; thus, univariate normality was achieved (Tabachnick and Fidel, 2013). In addition, it was seen that the results of Bartlett's Sphericity test were significant (p< .001), indicating that the assumption of multivariate normality was met (Tabachnick and Fidel, 2013). The fact that the assumption of multivariate normality was provided could be interpreted as the assumption of linearity was also provided (Çokluk et al., 2012). Therefore, it can be inferred that this study's linearity assumption was also met because the normality assumptions were met. Tolerance, variable inflation factor (VIF), and condition index values were examined to determine whether the research data fulfilled the assumption of multicollinearity and singularity. The tolerance values were found to range from .64 to .82. and were greater than .20 (Kalaycı, 2010), VIF values varied between 1.217 and 1.558 and were less than 3.00 (O'Brien, 2007), and condition index values were between 1.00 and 24.29 and were less than 30 (Freund and Littell, 2000). These obtained values were interpreted as there was no multicollinearity problem in the study data. As a result, all analyses of the current study were carried out on the data set of 322 university students, which provided the requirements and variances of the structural equation model.

In this study, the Structural Equation Model (SEM) was employed to examine the theoretical model of OLS and analyze the direct and indirect effects between the variables encompassed by this model (Çokluk et al., 2012). The recommended procedures outlined by Tabachnick and Fidell (2013) and Kline (2016) were followed during the structural equation modeling analysis. IBM SPSS Statistics 22 and AMOS 22 were utilized to conduct the analyses. Covariance-based, maximum likelihood–structural equation modeling (ML-

SEM) was used in the analysis of the data, based on the fact that the variables considered in the study were continuous, that the data provided univariate and multivariate normality assumptions, and that the sample was large enough (Hair et al., 2012). In the analysis process, firstly, it was examined whether the measurement model associated with the structural equation model developed in accordance with the existing literature was verified. Then, the research hypotheses in the structural model were tested. In evaluating model fit, χ^2 and its *p* value, χ^2/df, CFI, GFI, SRMR, and RMSEA, one of the most frequently used model fit indexes in the literature (Kline, 2016; Tabachnick and Fidell, 2013) were used.

Findings

In the current study, a structural equation model was created regarding the OLS of university students. In the structural equation model created, firstly, it was investigated whether the measurement model was verified. When fit indexes calculated after two modifications (χ^2[162, N= 322]= 414,211; *p*< .01; χ^2/df= 2.56; *CFI*= .92; *GFI*=

Table 2. Results of the structural model

Paths	β	C.R.	p	Hypotheses	Hypothesis results
AS→SEOLE	.55	5.84	< .001	H_1	Supported
AS→OLSA	.23	3.37	< .001	H_2	Supported
SEOLE→OLS	.76	5.79	< .001	H_3	Supported
OLSA→OLS	.32	4.93	< .001	H_4	Supported

β: Standardized path coefficient
C.R.= Critical ratio.

As seen in Table 2, the effect of AS on SEOLE (*β*= .55; *p*< .001) and OLSA (*β*= .23; *p* < .001) was found to be significant. Similarly, the effect of SEOLE on OLS (*β*= .76; *p*< .001) and the effect of OLSA on OLS (*β*= .32; *p*< .001) was also found to be significant. The Critical Ratio (C.R.) value, calculated by dividing the parameter estimate by the standard error, indicated statistical significance of parameters (Byrne, 2001). C.R. values exceeding 1.96 in absolute value were statistically significant at the *p*< .05 level, and the null hypothesis was rejected (Khine, 2013). It was seen that all C.R. values in Table 2 exceeded 1.96. These findings showed that all research hypotheses were supported. The path coefficients between the latent
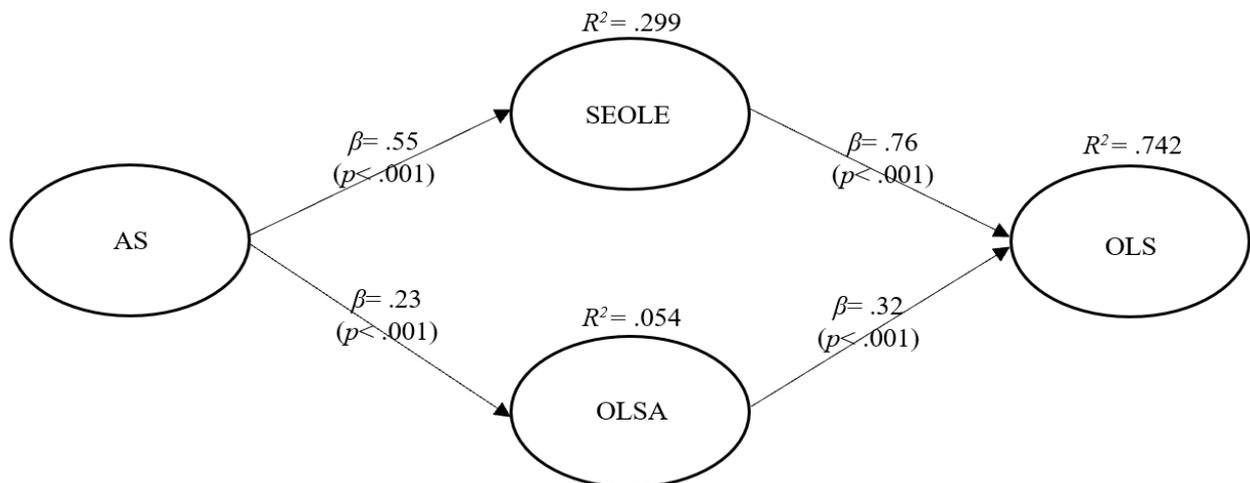
Figure 2. The structural model of OLS

.89; *SRMR*= .073; *RMSEA*= .070) were examined, it was seen that the measurement model was compatible with the data at an acceptable level and the measurement model was confirmed.

After verifying the measurement model, the research hypotheses were tested on the structural model. The analysis results of the structural model are presented in Table 2.

variables and the structural model of OLS are shown in Figure 2.

When Figure 2 was analyzed, it was seen that AS of university students had a positive and significant effect on both SEOLE and OLSA. In addition, it was seen that AS of university students was more effective on SEOLE. Similarly, SEOLE and OLSA had a significant and positive predictive

effect on university students' OLS. At this point, it was seen that SEOLE was more effective on students' OLS. In the created model, AS explained approximately 30% of the variance in SEOLE and approximately 5% of the variance in OLSA. In addition, the structural model explained about 74% of the variance in OLS. Therefore, it was seen

In the current study, it was aimed to create a statistically significant model that explained the OLS of university students. A comprehensive literature review was done, and it was inferred from this review that OLS might have a possible relationship with AS, SEOLE, and OLSA (Alqurashi, 2016; Calaguas and Consunji, 2022;
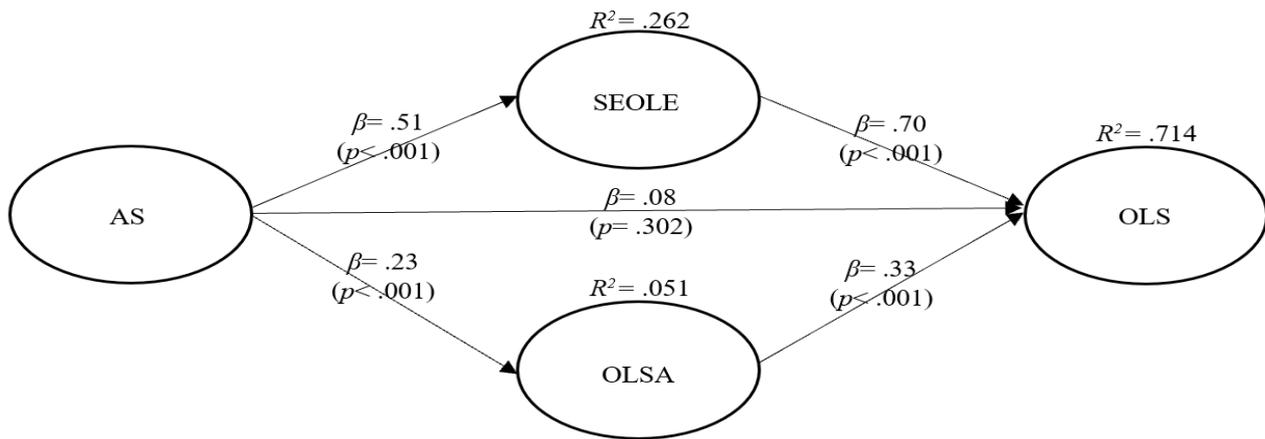
Figure 3. *The direct effect of AS on OLS*

that the structural model created with the support of the literature was a satisfactory model for OLS. As an alternative to the structural model in the study, the model in which the direct effect of university students' AS on OLS was examined is presented in Figure 3.

When the values presented in Figure 3 were compared with Figure 2, both the positive and significant effect of AS on SEOLE (β= .51; p< .001) and OLSA (β= .23; p< .001) and the positive and significant effect of SEOLE (β= .70; p< .001) and OLSA (β= .33; p< .001) on OLS remained almost the same. In addition, it was determined that AS had a positive and significant effect on OLS before other variables were included in the model (β= .45; p< .001), and approximately 21% of the variance in OLS was explained by AS. On the other hand, in the model in Figure 3, in which other variables were included, the effect of AS on OLS (β= .08; p= .302>.05) was not significant and approximately 71% of the variance in OLS was explained with AS, SEOLE and OLSA variables. It was seen that these calculated values also supported the structure created in the current study and presented in Figure 2.

Discussion and Conclusion

Chyung et al., 2010; Fredricks et al., 2004; Junco et al., 2011; Koca and Usluel, 2007; Lim et al., 2016; Şahin and Shelley, 2008; Topal, 2020; Tsai et al., 2011). Based on this, the possible effects of the three variables above on OLS were investigated. It was believed that the study would contribute to the related literature by providing a perspective on OLS. Accordingly, the model created for university students' OLS through structural equation modeling was statistically significant.

The results of the study indicated that AS predicted SEOLE and OLSA positively and significantly, and it was also a stronger predictor for SEOLE. The studies in the literature also supported these results. In their study, Deng et al. (2021) determined that self-efficacy and positive emotions mediated the relationship between regulatory focus and online learning engagement. The structural equation model study conducted by Oriol-Granado et al. (2017) determined that self-efficacy was a strong predictor of academic commitment and increased academic performance. The study conducted by Allen et al. (2002) determined that students resisted using of technology because technology was seen as easily perishable, they were not used to working with machines, and they thought that the created

technological environment could not replace the natural classroom environment. In addition, in the study conducted by Koca and Usluel (2007) to determine the predictors of teachers' intention to accept and use information and communication technologies, perceived usefulness, ease of use, social impact, and self-efficacy factors were determined as strong predictors.

In addition, according to the results of the structural equation model conducted by Bakır (2022), student engagement was predicted by positive and negative feelings toward success, and one of the variables that most affect student engagement in an online learning environment was feelings about being successful. The predictive relationship may be due to the power of AS to include learning-related issues. Individuals with high AS had abilities, such as controlling academic learning, generating and applying new ideas, setting difficult goals, and using their performance effectively (Chemers et al., 2001; Margolis and McCabe, 2004). These individuals were highly motivated and had characteristics such as resisting difficulties and minimizing emotional negativities (Bandura, 1994). In light of the findings supported by the literature, it can be deduced that higher AS results in higher SEOLE and OLSA. In other words, the high AS also increased the level of SEOLE and OLSA.

Another striking result was that SEOLE and OLSA in the constructed structural model predicted OLS positively and significantly, and SEOLE was a stronger predictor. Hence, a rise in a SEOLE and acceptance of the used systems will also provide an increase in self-efficacy in learning. Considering the studies revealing the relationship between OLS and SEOLE or OLSA, this positive correlation was expected. For example, Pintrich and De Groot (1990) and Sun and Rueda (2012) claimed that student engagement in the learning process was related to interest, high motivation, academic performance, self-efficacy, and self-regulation. In addition, it was revealed that students with high learning engagement showed intense effort and concentration in the academic tasks assigned to them (Skinner and Belmont, 1993). Lee and Mendlinger's (2011) study, which supported the results of the current study on

students studying in online classrooms, found that perceived self-efficacy positively affects acceptance of online learning, and perceived usefulness of online learning systems positively affected online learning acceptance and student satisfaction. Accordingly, it can be deduced that student engagement which was a mental, emotional, and behavioral process that uninterruptedly supported the student's desire to be involved in learning activities in positive or negative situations (Skinner and Belmont, 1993), and student acceptance, which referred to having a positive perspective on used learning systems (Davis, 1986; Davis, 1989) can be regarded as indicators of student's self-belief and confidence in learning. In this context, it is possible to infer that engagement in all learning processes can be regarded as a primary concern to provide acceptance of used systems, which may be the reason why SEOLE is a stronger predictor compared to OLSA.

The model created in the current study provided statistically significant evidence for the theoretically established relationships and contributed to the literature in the direction that AS should be improved to improve SEOLE and OLSA, and that SEOLE and OLSA should be improved to improve OLS. It was proven that the variables included in the model were statistically significant predictors of OLS. Therefore, the model provided insight into what influenced university students' OLS levels. In addition, it was anticipated that the model would provide educators with an idea about students with low OLS. Furthermore, it can be recommended that program executives should work on improving AS, SEOLE, and OLSA to improve OLS. Also, it was assumed that the findings would give an idea to the education policymakers, curriculum planners, and educators to develop OLS. High self-efficacy increases engagement to target (Bandura, 2010), which increases academic achievement (Alpaslan and Ulubey, 2021; Rodríguez-Muñoz et al., 2021; Tang et al., 2021). Education institutions, especially universities, should attach importance to AS and SEOLE to enhance OLS by conducting studies, which increase awareness for online learning. At this point, plans, interventions, and studies can be

conducted to increase efficiency in online learning environments based on the created model. It is recommended to make the curriculum well-aligned to the students' needs for online learning practices.

The results of the current study are limited to university students enrolled in teacher training programs. The study was applied to a limited sample. Thus, further research should be conducted using different universes and samples to increase the generalizability of the results of this study because learners who study in different departments of a university (social, science, health, etc.), or at different education levels (primary school, secondary school, high school) and who have received online education in a certain period of time may have different opinions. Additionally, cross-sectional survey design used in this study carries limitations in drawing causal inferences.

For future studies, it may be recommended to conduct longitudinal studies in which experimental design is preferred to present stronger cause-effect relationships. Apart from these, studies that include different variables associated with OLS can also be designed. In addition, qualitative studies can be designed to examine the variables explaining OLS in the tested model in depth. Independent from the model created in the current study, the direct effect of university students' AS on OLS was also examined through an alternative model in order to provide the opportunity to make comparisons and to provide an idea for future researchers. Although AS had a positive and significant effect on OLS before SEOLE and OLSA were included in the model, it was determined that the effect of AS on OLS was not significant in the model that included SEOLE and OLSA variables. Based on this, it can be deduced that SEOLE and OLSA may be mediating variables in the relationship between AS and OLS. In this respect, future studies can be conducted to examine the mediating effect of these variables.

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