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Research

Adapting the Self-Regulation Scale for Online Learning to the Turkish Context

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Abstract:

The Self-Regulation for Learning – Online (SRL-O) scale was developed to encompass a broad range of motivational beliefs and learning strategies commonly used in online or blended learning environments. This study aims to determine the validity and reliability of the SRL-O scale, developed by Broadbent et al. (2023) to address shortcomings in existing measurement instruments, within the Turkish context. The 44-item, 7-point Likert-type scale was administered to a total of 803 undergraduate and graduate students. A confirmatory factor analysis (CFA) was conducted to examine the 10-factor structure of the scale, which includes (1) online self-efficacy, (2) online intrinsic motivation, (3) online extrinsic motivation, (4) online negative achievement emotion, (5) planning and time management, (6) metacognition, (7) study environment, (8) online effort regulation, (9) online social support, and (10) online task strategies. The results indicated that the 10-factor structure was consistent with the original scale and demonstrated good model fit. Internal consistency coefficients were calculated for the entire scale and its subdimensions to assess reliability. Additionally, the scale was found to have two higher-order factors: motivational beliefs and learning strategies. The Cronbach's alpha coefficient for the overall scale was calculated as 0.91. The SRL-O is expected to meet the need for a comprehensive instrument that captures a wide range of motivational beliefs and learning strategies in the context of online self-regulated learning.

Keywords: Learning Strategies, Online Learning, Motivation, Self-Regulated Learning

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INTRODUCTION

In recent years, the proportion of students participating in online education has steadily increased (Ortagus, 2017; Yang & Chui, 2021; Xu & Xue, 2023). Online technologies have become integral to higher education, with many programs adopting blended learning formats that combine face-to-face instruction with digital tools and platforms (Rasheed et al., 2020). The shift toward digital learning environments was significantly accelerated by the COVID-19 pandemic, during which nearly all university students worldwide were exposed to what became known as "emergency remote teaching" (Hodges et al., 2020). More recently, the devastating earthquake that struck Türkiye and Syria in 2023 once again compelled universities in Türkiye to switch to fully online education, highlighting the ongoing vulnerability of traditional educational systems to unexpected disruptions.

Online learning is widely valued for its promise of flexibility—allowing students to access educational content anytime and anywhere. However, this flexibility often comes with a reduction in structured interaction with instructors and peers, which places a greater burden on learners to manage their own learning processes (Broadbent & Lodge, 2020). As a result, students must exercise higher levels of autonomy, responsibility, and self-direction to succeed in online learning environments. This underscores the importance of self-regulated learning (SRL)—a process through which learners actively control their motivation, behavior, and cognition to achieve academic goals (Zimmerman, 2000).

Extensive research has shown that SRL plays a critical role in students' academic achievement, particularly in online and blended learning contexts where external support is limited (Broadbent & Poon, 2015; Broadbent, 2017; Xu et. al., 2023). However, effective measurement of SRL in these contexts remains a challenge. There is a growing demand for psychometrically sound instruments that can capture both the motivational and strategic dimensions of self-regulated learning specific to digital environments.

To address this need, Broadbent et al. (2023) developed the Self-Regulation for Learning – Online (SRL-O) scale. This instrument was designed to reflect a comprehensive view of SRL in online settings, encompassing various motivational beliefs and learning strategies. The present study aims to adapt the SRL-O scale into Turkish and to examine its psychometric properties within a sample of Turkish higher education students. Using a well-established scale allows for comparability across studies and contexts, facilitating cumulative research and meta-analyses (Molenaar et al., 2022; Dağgöl, 2023). Adapting robust scales supports the advancement of SRL research by enabling researchers to focus on contextual differences and new applications, rather than repeatedly establishing basic measurement properties (Artino & Stephens, 2006). The field is moving toward integrating multimodal and technology-enhanced measurement approaches, but foundational, validated scales remain essential for benchmarking and validation (Molenaar et. al., 2022). In summary, the introduction of a scale adaptation study should clearly articulate the solid

foundations of the original scale and justify its selection. This approach ensures methodological rigor and supports the broader research community by building on established, validated instruments. By providing a culturally appropriate and methodologically robust tool, this study seeks to contribute to both the assessment and enhancement of self-regulated learning in online education. By providing a culturally appropriate and methodologically robust tool, this study seeks to contribute to both the assessment and enhancement of self-regulated learning in online education. Specifically, the study aims to test whether the original factor structure and constructs of the SRL-O scale hold true in the Turkish higher education context, thereby examining the potential influence of cultural and contextual differences on the measurement of self-regulated learning.

Self-Regulated Learning

University students' self-regulated learning (SRL) processes can take place not only in traditional classroom environments but also through digital learning platforms and online resources. This process supports students in guiding their own learning journeys and achieving personal goals. Empirical research has shown that self-regulated learning enhances students' motivation (Boekaerts, 1996), deepens their learning processes (Hattie & Timperley, 2007), and helps them develop sustainable learning habits (Dinsmore, Alexander & Loughlin, 2008). For university students, SRL plays a critical role by fostering motivation through the opportunity to select topics aligned with their interests and learning styles, providing flexibility to regulate their own pace and methods of learning, encouraging independence by taking responsibility for their learning, and offering opportunities to develop critical thinking skills. Beyond these benefits, identifying which strategies are effective in the SRL process and determining the instructional approaches needed to support online learning can provide valuable insights for researchers, improving the quality of university education and optimizing student achievement.

Learners vary in the extent of their engagement in self-regulation to achieve learning goals: setting objectives, planning, and applying strategies. Through processes of self-assessment and reflection, learners monitor and adjust these strategies to enhance their progress toward goals (Zimmerman, 1986). A successful self-regulated learner typically demonstrates goal orientation, persistence in the face of challenges, effective time management, and help-seeking when needed (Pintrich et al., 1993). Meta-analytic studies have shown that SRL strategies are positively associated with academic outcomes across primary, secondary, and higher education settings (Dignath & Büttner, 2008; Richardson et al., 2012), as well as in online learning environments (Broadbent & Poon, 2015). Furthermore, a meta-analysis on the effects of self-regulated learning (SRL) training demonstrated that it could improve academic achievement, motivation, metacognitive thinking, and the use of learning strategies such as resource management (Theobald, 2021). As students increasingly engage in online or blended learning—whether by necessity or

choice—it becomes important to understand which SRL strategies are most essential in these contexts.

Online Self-Regulated Learning Scale

This study addresses the need for the development and validation of a comprehensive measurement tool suitable for online or blended learning contexts for self-regulated learning (SRL) that encompasses motivational beliefs (such as self-efficacy) and SRL strategies (such as metacognition). This need has become even more critical in the post-pandemic era and in learning processes affected by emergency situations such as earthquakes and other natural disasters.

Based on a social-cognitive perspective and drawing on the key components of SRL theory highlighted in studies by Zimmerman and Moylan (2009), Pintrich et al. (1993), and Broadbent et al. (2023), the SRL scale developed by Broadbent et al. (2023) has been adapted into Turkish. The comprehensive SRL scale created in this context includes both motivational beliefs and self-regulated learning strategies. It has been observed that motivational beliefs are critical at both the beginning and throughout the learning process, while learning strategies become particularly important during the performance stage (Zimmerman & Moylan, 2009). To assess motivational beliefs, components such as expectations, values, and emotions have been emphasized (Pintrich et al., 1993).

Existing online SRL scales were reviewed, and components related to learning strategies and motivational beliefs were identified. This analysis provides guidance on the significance and necessity of a reliable SRL measurement tool that is both theoretically stable and contextually suitable for practical application in the current literature. The reason for preferring the SRL scale developed by Broadbent et al. (2023) lies in its comprehensiveness and its alignment with contemporary academic needs, in contrast to other frequently cited SRL-related scales (e.g., Pintrich et al., 1991; Artino & Mc, Coach, 2008; Barnard et al., 2009; Cheng & Tsai, 2011; Wang et al., 2013; Cho & Cho, 2017; Kizilcec et al., 2017; Tladi, 2017; Jansen et al., 2017; Alibak et al., 2019). Broadbent et al.'s (2023) scale extends the factor structures of these previous scales and provides a more up-to-date measure.

In summary, scales focusing on online learning are context-specific, with the most frequently included subscales in online SRL surveys being peer learning and help-seeking, time management, environmental structuring, metacognition, and self-efficacy. These scales predominantly focus on SRL motivational beliefs or strategies. However, most online SRL scales are centered around specific learning environments and do not adequately address motivational beliefs or the wide-ranging contexts of modern online education. Although the Motivation Strategies for Learning Scale, developed by Pintrich et al. (1991), is one of the most comprehensive tools, it may not fully meet the needs of modern learning environments, particularly in areas such as test anxiety or help-seeking. Broadbent et al.'s (2023) Online SRL scale provides an updated tool for online and blended learning contexts,

encompassing both motivational beliefs and learning strategies. This SRL scale adapts the best features from other scales in the literature, ensuring content validity through expert opinions and student feedback, followed by, testing the factor structure with exploratory and confirmatory factor analyses (Broadbent et al., 2023). The psychometric robustness of the scale, its wide coverage, and its cost-effectiveness offer an effective measurement for online SRL, particularly for undergraduate students.

A review of the literature on self-regulated learning found that no Turkish measurement tool has been specifically designed to assess online SRL. Taking this into consideration, the present study aims to adapt the Self-Regulation for Learning Online (SRL-O) Scale, developed by Broadbent et al. (2023) for higher education students, into Turkish.

METHOD

The main aim of this study is to test the validity and reliability of the Online Self-Regulated Learning Scale. In line with this purpose, this section of the study presents explanations regarding the research model, participants, validity and reliability, data collection, and data analysis.

Research Model

In this study, a general survey model has been used. General survey models are surveys conducted on the entire population or a sample selected from the population to make a general judgment about the population, which consists of many elements (Karasar, 2014, p. 79). In this context, a study group representing the population has been created for the research conducted using the general survey model.

Participants

This study was conducted with 803 higher education students aged between 18 and 44. Of the students, 67% (n=538) are female, and 33% (n=265) are male. When examining the distribution of students according to their academic year, 22.8% (n=185) are in the first year, 21.2% (n=168) are in the second year, 11.9% (n=96) are in the third year, 12.5% (n=98) are in the fourth year, and 31.6% (n=256) are in other academic levels (such as preparatory or extended programs). In the study, the data from 266 students were used for Exploratory Factor Analysis (EFA), 254 for Confirmatory Factor Analysis (CFA), and 230 for criterion validity testing. The participants came from two different universities, each with more than thirty years of educational activity. The university is divided into four faculties, each consisting of broad groups of related disciplines that are grouped into various departments. The four faculties are: (1) Education and Arts; (2) Health (Nutrition, Health and Social Development, Medicine, and Psychology); (3) Engineering; (4) Business and Law. Participants were not limited to any specific department or faculty. Both hybrid and online students were allowed to participate in the survey without distinction. It was determined that all students, regardless of enrollment status, had received 100% (or near 100%) online

education during the COVID-19 pandemic and the earthquake disaster in 2020 and 2021. Preparatory students who continued their education at the initial level were not distinguished.

Measurement Tool Used

The original English version of the Online Self-Regulated Learning Scale (SRL-O), developed by Broadbent et al. (2023), was obtained from the article in which the scale was published. The SRL-O consists of 10 factors and 44 items, which are: (1) Online Self-Efficacy (4 items), (2) Online Intrinsic Motivation (5 items), (3) Online Extrinsic Motivation (3 items), (4) Online Negative Achievement Emotion (5 items), (5) Planning and Time Management (5 items), (6) Metacognition (5 items), (7) Study Environment (3 items), (8) Online Effort Regulation (4 items), (9) Online Social Support (5 items), and (10) Online Task Strategies (5 items). Additionally, the SRL-O has two higher-order factors, motivational beliefs and learning strategies, which consist of ten factors in total. The first four factors represent motivational beliefs, while the last six factors form learning strategies.

Items 26, 27, 28, 29, and 30 are negatively worded, while all other items are positively worded. The scale administration time varies from 15 to 35 minutes. Participants indicate their degree of agreement with each statement on a scale from 1 (Strongly Disagree) to 7 (Strongly Agree).

The structural validity of the original scale was examined through confirmatory and exploratory factor analyses. As a result of the analyses, it was found that the two higher-order factor structures of the scale yielded the best fit values. For the criterion validity of the SRL-O, criteria were identified that aligned with the ten sub-factors described in the upper sections. Correlations calculated between these criteria and the factor scores of the SRL-O ranged from 0.50 to -0.56. The reliability of the factors in the original scale was examined using Cronbach's alpha coefficient. The alpha values found for the factors ranged from 0.76 to 0.90 (Broadbent et al., 2023).

Data Analysis and Procedures

During the adaptation process of the scale, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were used to examine the factor structure of the scores obtained from Turkish higher education students in line with the approach used in the scale's development. Thus, the construct validity of the scale was investigated using two different factor analysis techniques.

Exploratory factor analysis (EFA) aims to group a large number of related variables into fewer, conceptually meaningful variables (Stevens, 2002; Çokluk, Şekercioğlu, & Büyüköztürk, 2010). In EFA, when determining which factor an item should belong to, factor loadings are considered. Items with a factor loading of 0.30 or higher can be retained in the scale (Kline, 2023). Various methods, such as principal component analysis, maximum

likelihood factor analysis, image factor analysis, and principal factor analysis, can be used during the factor extraction process. Among these, principal component analysis is one of the most widely used and easiest-to-interpret techniques (Büyüköztürk, 2002). In this study, principal component analysis was used to reduce the number of variables, and combine them under a smaller number of components (Tabachnick & Fidell, 2013). SPSS 22.0 was used for exploratory factor analysis.

Confirmatory Factor Analysis (CFA) is an advanced statistical technique used to test a pre-established factor structure of a scale or measurement model. CFA primarily aims to assess the degree of fit between the proposed model and the real data, making it a hypothesis testing approach (Byrne, 2010). CFA is used to evaluate the relationships between the factors defined by the researcher and the observed variables (items), as well as the connections among these factors. This analysis examines model fit indices (such as RMSEA, CFI, TLI, SRMR) and factor loadings to determine the validity of a model. Factor loadings are generally expected to be 0.50 or higher, but this threshold may vary depending on the nature of the study (Hair et al., 2014). CFA is a crucial tool, particularly in scale development and adaptation processes. This technique allows researchers to test the accuracy of the theoretically proposed structure and provides valuable insights into the validity and reliability of the measurement model (Kline, 2023). AMOS 19.0 was used for confirmatory factor analysis.

To examine the factor structure of the scale, an initial unrotated principal component analysis was conducted. Subsequently, to make the factors easier to interpret and understand, the analysis was repeated using the equamax orthogonal rotation method. Equamax is a combination of the varimax and quartimax rotation methods and is used to simplify both the factors and the variables simultaneously (Çokluk, Şekercioğlu & Büyüköztürk, 2010). After completing EFA, CFA was applied to evaluate the suitability of the original scale for the Turkish culture, and test its construct validity. In this process, the maximum likelihood method was preferred for CFA.

The corrected item-total correlation was calculated to determine how well the items of the scale could differentiate individuals based on the features they measure, and to evaluate the internal consistency of the test. Additionally, the significance of the difference between the item scores of the bottom and top 27% of the total scores was analyzed using a t-test (Büyüköztürk, 2011). To assess the reliability of the scale, Cronbach's alpha internal consistency coefficients were calculated. Furthermore, the mean and standard deviation values for the factors were reported, and the relationships between the factors were examined using Pearson's correlation coefficient.

Cultural and Linguistic Adaptation into Turkish

The original English version of the scale was culturally and linguistically adapted into Turkish through a systematic and expert-guided translation process. Initially, the scale was independently translated into Turkish by three experts who conduct higher education

courses in English. These initial translations were then reviewed by three additional professionals with expertise in mathematics education, Turkish language education, and educational measurement and evaluation, leading to the development of a preliminary Turkish draft. To ensure cultural and contextual appropriateness, the Turkish draft was evaluated using an Expert Review Form. Specialists assessed the items based on cultural relevance, linguistic clarity, methodological soundness, and psychometric integrity. Items were retained if they met the criteria of a mean score of 4.0 or above and a standard deviation of 0.7 or below, indicating consensus among experts regarding item–factor alignment.

Following this step, the culturally adapted Turkish version was back-translated into English by a linguist and an education expert. Both the Turkish and back-translated English forms were then compared by two experts in English language teaching with the original version. The comparison confirmed a high level of consistency and conceptual equivalence between the original and adapted forms, supporting the validity of the Turkish version within its cultural context.

Ethical considerations

In the course of this research, we paid scrupulous attention to ethical guidelines, ensuring that the integrity and reliability of the study were never compromised. In the course of this research, ethical principles were carefully observed throughout the scale adaptation process, ensuring that the integrity and reliability of the study were never compromised. For the adaptation of the scale, permission for the use of the original scale was available at https://www.srl-o.com/, the official project website. However, an email request was sent to the authorized individuals to formally obtain permission. In addition, ethics committee approval was secured for conducting the validity and reliability studies.

The ethical approval for the study was obtained from the Istanbul Aydın University Educational Sciences Ethics Committee with the decision numbered 2023-07, dated June 22, 2023. Furthermore, the participation of individuals in the study was based on voluntary consent. Prior to their involvement, participants were informed about the purpose of the study clear instructions regarding their right to withdraw from the study at any time without any negative consequences. All personal and consent-related documents were stored securely, adhering to strict confidentiality measures.

Ethical Review Board: Istanbul Aydın University Educational Sciences Ethics Committee

Date of Ethics Review Decision: 22.06.2023

Ethics Assessment Document Issue Number: 2023-07

FINDINGS

Results of the Exploratory Factor Analysis (EFA)

Before performing Exploratory Factor Analysis (EFA), it is essential to assess the adequacy of the sample size (Çokluk, Yılmaz, & Demirtaş, 2010). In this context, the Kaiser-Meyer-Olkin (KMO) test yielded a value of 0.965, indicating that the sample size was sufficient and suitable for factor analysis (Tavşancıl, 2010). Additionally, it is emphasized in the literature that for the validity of EFA, the data should exhibit a normal distribution (Tabachnick & Fidell, 2013). The suitability of the data was tested using Bartlett's Test of Sphericity, which produced a Chi-square value of $\chi^2 = 24721.7$, $p < .000$, indicating that the data were appropriate for factor analysis.

The initial EFA revealed a six-factor structure. However, some items loaded significantly on more than one factor. To clarify the factor structure, the analysis was repeated using the Equamax rotation method, which resulted in a structure closely resembling the original version. Ultimately, a ten-factor solution—consistent with the original scale—was identified. These findings support the structural validity of the adapted scale. Detailed results of the EFA are presented in Table 1.

The ten identified factors explained a total of 79% of the variance. The eigenvalues and explained variance for each factor were as follows: the first factor had an eigenvalue of 18.83 accounting for 48.3% of the variance, the second factor had an eigenvalue of 4.14 accounting for 10.62%, the third had an eigenvalue of 1.77 accounting for 4.55%, the fourth had an eigenvalue of 1.27 accounting for 3.27%, the fifth had an eigenvalue of 1.18 accounting for 3.02%, and the sixth had an eigenvalue of 1.03 accounting for 2.64%, with the remaining factors contributing accordingly. The comparison between the EFA results and the original ten-factor structure showed a complete alignment of items with their respective factors, thereby confirming the construct validity of the scale.

Table 1

Factor Load Values of "Self-Regulation Scale for Online Learning" Items

Item	Common Factor Variance	Factor Loading Values*									
		F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
SE1	,799							,577			
SE2	,838							,669			
SE3	,822							,634			
SE4	,801							,661			
EM1	,840					,894					
EM2	,851					,927					
EM3	,719					,759					
PM1	,720						,718				
PM2	,741						,703				
PM3	,736						,729				
PM4	,777						,772				

PM5	,796					,539				
SEM1	,844	,356					,340			
SEM2	,800									-,516
SEM3	,830									-,344
SS1	,728			-,482						
SS2	,722			-,753						
SS3	,809			-,828						
SS4	,818			-,930						
SS5	,757			-,822						
IM1										
IM2	,845								-,508	
IM3	,835								-,356	
IM4	,855								-,530	
IM5										
NAE1	,692		,770							
NAE2	,811		,922							
NAE3	,765		,736							
NAE4	,846		,902							
NAE5	,845		,866							
M1	,808			,847						
M2	,778			,809						
M3	,727			,581						
M4	,753			,524						
M5	,740			,443						
ER1	,802	,617								
ER2	,791	,472								
ER3										
ER4	,769	,634								
TS1										
TS2										
TS3	,834							-,442		
TS4	,840							-,407		
TS5	,742	,333						-,364		

**Values below ±0.33 are not shown.*

Results of the Confirmatory Factor Analysis (CFA)

To assess the construct validity of the Online Self-Regulated Learning Scale (SRL-O), a Confirmatory Factor Analysis (CFA) was conducted to test whether the ten-factor structure of the original instrument could be replicated. Model fit indices were calculated for the ten-factor model as specified in the original version.

The initial CFA results yielded the following fit indices: $\chi^2(866) = 2515.276$, $p < .001$, CFI = .932, GFI = .88, AGFI = .84, RMSEA = .061, SRMR = .07, and NFI = .910. Although some of these indices indicated an acceptable model fit, others suggested suboptimal alignment between the model and the observed data.

An examination of the modification indices revealed substantial covariance between the error terms of several item pairs (IM1–IM5, NA3–TS1, TS5–TS4). These item pairs were found to belong to the same latent constructs in the original scale. In consultation with

subject-matter experts, it was decided to include these correlated error terms in the model to improve fit.

Following these modifications, the model was reanalyzed. The resulting CFA model showed statistically significant factor loadings ranging from 0.65 to 0.93 ($p < 0.001$), indicating strong and meaningful relationships between items and their respective latent factors. The final model is presented in Figure 1 and supports the structural validity of the Turkish adaptation of the SRL-O scale.

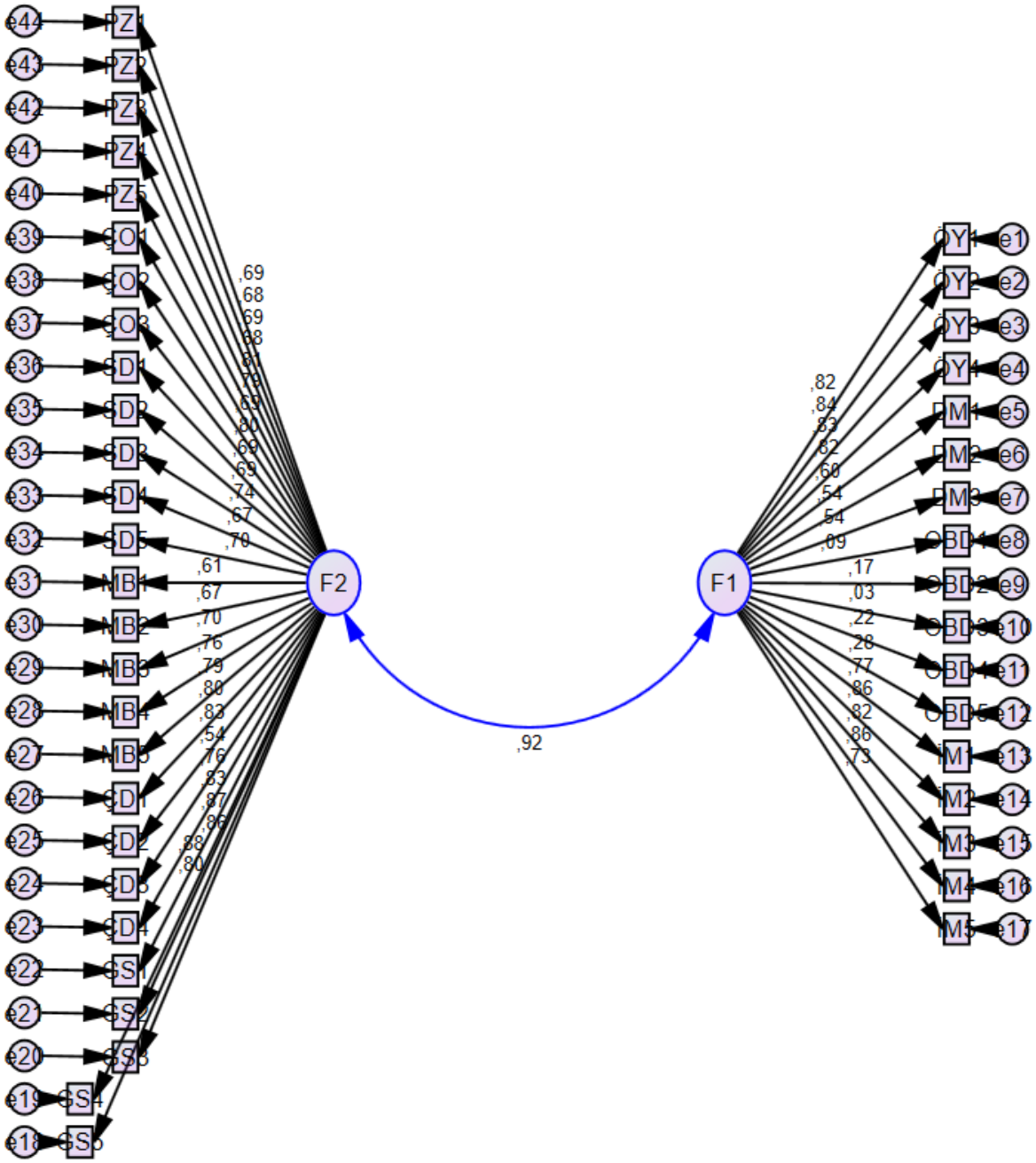

Figure 1. DFA with standardized results

The model tested through Confirmatory Factor Analysis (CFA) revealed that the Chi-square statistic was significant ($\chi^2 = 2515.276$, N = 765, df = 657, p <.001). However, since Chi-

square values are sensitive to large sample sizes—often resulting in significant outcomes regardless of model fit—, it is recommended to consider the ratio of Chi-square to degrees of freedom (χ^2/df) for a more accurate assessment of fit (Büyüköztürk, Akgün, Özkahveci, & Demirel, 2004). The calculated χ^2/df ratio was 3.82, which falls within the acceptable range, suggesting an adequate model fit.

Additional fit indices supported the model's suitability: RMSEA = .06, SRMR = .06, CFI = .932, GFI = .88, AGFI = .84, NFI = .910, and IFI = .92 (see Table 2). These results indicate that the ten-factor model demonstrates an acceptable level of fit, consistent with the original scale structure.

Table 2

Criteria for Acceptance of Model Fit Indices and Comparison with Original Scale

Fit Indices	Original Scale	Turkish Scale	Acceptable Fit
χ2 /sd	1.67	3.82	≤5
RMSEA	0.05	0.06	≤0.08
SRMR	-	0.07	≤0.08
GFI	-	0.78	≥0.85
AGFI	-	0.84	≥0.80
NFI	-	0.910	≥0.90
CFI	0.872	0.932	≥0.95

To assess the reliability of the Online Self-Regulated Learning Scale (SRL-O), Cronbach's alpha coefficients were calculated for each subdimension of the scale. Additionally, corrected item-total correlation values were computed to evaluate how well each item discriminated between individuals. To further test item discrimination, independent samples t-tests were conducted between the top 27% and bottom 27% groups based on total scores. The results obtained are presented in Table 3.

Table 3

Item Correlation Values and T-Test Results of Upper and Lower Groups According to Total Scores

Factor Name	Item No	Corrected Item-Total Correlation	t (top 27% - bottom 27%)	Factor Name	Item No	Corrected Item-Total Correlation	t (top 27% - bottom 27%)
Self-Efficacy	SE1	.78	23.06*	**Planning and Time Management**	PM1	,67	16.6*
	SE2	.79	22.4*		PM2	,63	15.6*
	SE3	.79	20.9*		PM3	,63	14.6*
	SE4	.78	19.9*		PM4	,62	15.8*
External Motivation	EM1	.56	14.8*		PM5	,78	21.6*
	EM2	.50	13.7*	**Effort Regulation**	ER1	,77	22.8*
	EM3	.52	11.9*		ER2	,81	22.7*
Social Support	SS1	,64	16.01*		ER4	,73	21.5*
	SS2	,65	16.8*	**Negative Achievement Emotions**	NAE1	,53	3.9*
	SS3	,71	17.3*		NAE2	,70	6.1*
	SS4	,62	15.5*		NAE3	,47	3.05*
	SS5	,65	16.8*		NAE4	,80	7.1*

Metacognition	M1	,52	12.2*	**Task Strategies**	NAE5	,80	8.0*
	M2	,58	14.5*		TS3	,78	20.8*
	M3	,61	14.1*		TS4	,81	21.7*
	M4	,69	17.8*		TS5	,73	17.9*
	M5	,72	18.7*	**Intrinsic Motivation**	IM2	,81	21.9*
Study Environment	SEM1	,81	25.1*		IM3	,78	24.7*
	SEM2	,72	18.2*		IM4	,81	22.2*
	SEM3	,82	22.7*				

According to the results, the corrected item-total correlation values of the items in the Online Self-Regulated Learning Scale (SRL-O) range from 0.47 to 0.82. The t-test results comparing the mean scores of the top 27% and bottom 27% groups to determine the discriminability of the scale indicated a significant difference for all items. Additionally, a t-test conducted on the total scores of the items to determine their discriminative ability between the top 27% and bottom 27% groups also showed a significant difference [t(341)=57.1, p<.01]. The Cronbach alpha values calculated for both the original and Turkish forms of the scale are presented in Table 4. The Cronbach alpha values for the Turkish form range from 0.84 to 0.92.

Table 4

Examining the Reliability of "Self-Regulation Scale for Online Learning Scale" Scores

Factor Name	Alpha		Factor Name	Alpha	
	Original	Turkish		Original	Turkish
Self-Efficacy	.88	.92	**Planning and Time Management**	.81	.89
External Motivation	.74	.84	**Effort Regulation**	.85	.89
Social Support	.86	.90	**Negative Achievement Emotions**	.91	.90
Metacognition	.75	.89	**Task Strategies**	.76	.91
Study Environment	.78	.90	**Intrinsic Motivation**	.86	.92

In the next step, the mean and standard deviation values for the dimensions of the SRL-O were calculated, along with the correlations between the dimensions of the SRL-O (Table 5). The correlation values between the dimensions of the scale range from -0.30 to 0.71.

Table 5

The Correlation Values Between Dimensions of The Scale

	Variables	ER	NAE	M	SS	EM	PM	SE	TS	IM	SEM
1	**ER**										
2	**NAE**	,18									
3	**M**	,33	-.06								
4	**SS**	-,40	-,02	-,50							
5	**EM**	,35	-,04	,35	-,46						
6	**PM**	,39	,04	,50	-,52	,42					

7	**SE**	,43	,21	,30	-,45	,40	,43			
8	**TS**	-,13	-,31	,28	-,18	-,25	-,14	-,31		
9	**IM**	-,22	-,22	,32	-,28	-,24	-,34	,11	-,22	
10	**SEM**	-,19	-,15	,23	-,18	-,19	-,26	,09	,14	-,15

**p<0.01

DISCUSSION AND RESULTS

In this study, the Online Self-Regulated Learning Scale (SRL-O), developed by Broadbent and others (2023), was examined for validity and reliability with a group of Turkish higher education students. To evaluate the construct validity of the scale, Exploratory Factor Analysis (EFA) was first conducted, followed by Confirmatory Factor Analysis (CFA) based on theoretical foundations and the structure obtained from the EFA.

When examining the EFA results of the SRL-O, it was found that a factor structure identical to the original scale emerged. The factors discovered in the EFA were consistent with the original scale and consisted of 10 factors: (1) online self-efficacy, (2) online intrinsic motivation, (3) online extrinsic motivation, (4) online negative success emotions, (5) planning and time management, (6) metacognition, (7) study environment, (8) online effort regulation, (9) online social support, and (10) online task strategies. It was also found that SRL-O determined two higher-order factors: motivational beliefs and learning strategies.

The ten-factor structure of SRL-O was tested using CFA, similarly to how the original scale was tested. The obtained fit values (x^2/sd = 2.10; RMSEA = 0.06, SRMR = 0.06, CFI = 0.93, GFI = 0.88, AGFI = 0.84, NFI = 0.91, IFI = 0.92) suggest that the model showed a very good fit, particularly with the x^2/sd ratio and IFI (0.92) (Bollen, 1989; Sümer, 2000). Other fit indices, RMSEA (0.06) and SRMR (0.06), have similar values, which indicates that the model has an acceptable fit. RMSEA and SRMR values ideally should be close to zero, with values equal to or less than 0.05, indicating very good fit (Browne & Cudeck, 1993; Cheung & Rensvold, 2002). Some researchers suggest that for more complex models, RMSEA values below 0.08 (Browne & Cudeck, 1993; Byrne, 1998; Hu & Bentler, 1999; Sümer, 2000) and SRMR values below 0.10 (Anderson & Gerbing, 1984; Cole, 1987; Marsh, Balla, & McDonald, 1988) are within acceptable limits. In this context, the RMSEA and SRMR values, which range from 0.05 to 0.08, show that the model's fit level is acceptable.

Other fit indices obtained in the study were the absolute fit indices Goodness of Fit Index (GFI) and Adjusted Goodness of Fit Index (AGFI). Studies indicate that GFI and AGFI values close to 0.80 are acceptable for fit (Anderson & Gerbing, 1984; Jöreskog & Sörbom, 1993; Schumacker & Lomax, 2016; Kline, 2023). The GFI and AGFI values obtained in this study indicate acceptable levels of fit.

The study also used incremental fit indices known as NFI (Normed Fit Index) and CFI (Comparative Fit Index). Values between 0.90 and 0.95 for these indices are considered to indicate acceptable fit (Bentler, 1992; Sümer, 2000). Recent literature shows that NFI and CFI values above 0.90 indicate good fit (Schumacker & Lomax, 2016; Kline, 2023). The NFI (0.91)

and CFI (0.93) values obtained in this study also meet these criteria, indicating that the model's fit is at an acceptable level.

When comparing the fit values of the original SRL-O with the ones obtained in this study, it was observed that the x^2/sd ratio and CFI indices are quite similar, and both values are at an acceptable fit level. On the other hand, while the RMSEA and SRMR values calculated for the original SRL-O indicate excellent fit, the RMSEA (0.06) and SRMR (0.06) values calculated in this study show that the model's fit is at an acceptable level.

In the study, t-test results based on the upper and lower 27% groups' scores revealed a significant difference in the mean scores of all items. This finding indicates that the scale's items have discriminatory features and the scale is effective in identifying differences between groups. The Cronbach's alpha coefficients calculated for the dimensions of SRL-O range from 0.80 to 0.94. These values are very close to the alpha coefficients calculated for the original form of the scale, and demonstrate that the internal consistency of the scale is high.

As a result of this study, it was found that the Turkish adaptation of SRL-O consists of ten factors, consistent with the original form, and fits well with the data of the higher education students who participated in the study. The internal consistency coefficients of the scale's factors are at acceptable levels, and the scale successfully serves its intended measurement purpose. These findings show that the Turkish version of SRL-O can be used as an effective tool for assessing online self-regulated learning resources for higher education students. In further studies, it can be used as a scale for Learning Strategies, Motivation, and Self-Regulated Learning for online or hybrid education at the higher education level. In addition, other studies can be conducted to use this scale at different levels of higher education.

REFERENCES

Alibak, M., Talebi, H., & Neshat-Doost, H. T. (2019). Development and validation of a test anxiety inventory for online learning students. *Journal of Educators Online, 16*(2), n2. https://eric.ed.gov/?id=EJ1223936

Anderson, J. C., & Gerbing, D. W. (1984). The effect of sampling error on convergence, improper solutions, and goodness-of-fit indices for maximum likelihood confirmatory factor analysis. *Psychometrika, 49*(2), 155–173.

Artino, A. R., Jr., & McCoach, D. B. (2008). Development and initial validation of the online learning value and self-efficacy scale. *Journal of Educational Computing Research, 38*(3), 279–303. https://doi.org/10.2190/EC.38.3.c

Barnard, L., Lan, W. Y., To, Y. M., Paton, V. O., & Lai, S. L. (2009). Measuring self-regulation in online and blended learning environments. *The Internet and Higher Education, 12*(1), 1–6. https://doi.org/10.1016/j.iheduc.2008.10.005

Bentler, P. M. (1992). On the fit of models to covariances and methodology to the Bulletin. *Psychological Bulletin, 112*(3), 400–404.

Boekaerts, M. (1996). Self-regulated learning at the junction of cognition and motivation. *European psychologist, 1*(2), 100-112.

Bollen, K. A. (1989). *Structural equations with latent variables*. Wiley.

Broadbent, J. & Lodge, J.M. (2020) Engaging large first year classes using digital technology: A case study. In S. Morrissey, G.J. Rich, A. Padilla-López, L. Karine de Souza, Taylor, J. Jaafar (Eds). Teaching Psychology Around the World (pp. 205–217). Cambridge Scholars Publishing.

Broadbent, J. (2017). Comparing online and blended learner's self-regulated learning strategies and academic performance. *Internet High. Educ.*, 33, 24-32. https://doi.org/10.1016/J.IHEDUC.2017.01.004.

Broadbent, J., & Poon, W. L. (2015). Self-regulated learning strategies & academic achievement in online higher education learning environments: A systematic review. *The Internet and Higher Education, 27*, 1–13. https://doi.org/10.1016/j.iheduc.2015.04.007

Broadbent, J., Panadero, E., Lodge, J. M., & Fuller-Tyszkiewicz, M. (2023). The self-regulation for learning online (SRL-O) questionnaire. *Metacognition and Learning*, *18*(1), 135-163.

Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K. A. Bollen & J. S. Long (Eds.), *Testing structural equation models* (pp. 136–162). Sage.

Büyüköztürk, Ş. (2002). Faktör analizi: Temel kavramlar ve ölçek geliştirmede kullanımı [Factor analysis: Basic concepts and use in scale development]. *Kuram ve uygulamada eğitim yönetimi*, *32*(32), 470-483.

Büyüköztürk, Ş. (2011). *Sosyal bilimler için veri analizi el kitabı: İstatistik, araştırma deseni* [Handbook of data analysis for the social sciences: Statistics, research design], *SPSS uygulamaları ve yorum* (15. bs.). Pegem Akademi.

Büyüköztürk, Ş., Akgün, Ö. E., Özkahveci, Ö., & Demirel, F. (2004). Güdülenme ve öğrenme stratejileri ile başarı arasındaki ilişki [The relationship between motivation, learning strategies and success]. *Kuram ve Uygulamada Eğitim Bilimleri*, *4*(2), 207–229.

Byrne, B. M. (1998). *Structural equation modeling with LISREL, PRELIS, and SIMPLIS: Basic concepts, applications, and programming*. Lawrence Erlbaum Associates.

Byrne, B. M. (2010). *Structural equation modeling with AMOS: Basic concepts, applications, and programming* (2nd ed.). Routledge.

Cheng, K. H., & Tsai, C. C. (2011). An investigation of Taiwan University students' perceptions of online academic help seeking, and their web-based learning self-efficacy. *The Internet and Higher Education, 14*(3), 150–157. https://doi.org/10.1016/j.iheduc.2011.04.002

Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling, 9*(2), 233–255. https://doi.org/10.1207/S15328007SEM0902_5

Cho, M. H., & Cho, Y. (2017). Self-regulation in three types of online interaction: A scale development. *Distance Education, 38*(1), 70–83. https://doi.org/10.1080/01587919.2017.1299563

Cole, D. A. (1987). Utility of confirmatory factor analysis in test validation research. *Journal of Consulting and Clinical Psychology, 55*(4), 584–594.

Çokluk, Ö., Şekercioğlu, G., & Büyüköztürk, Ş. (2012). *Sosyal bilimler için çok değişkenli istatistik: SPSS ve LISREL uygulamaları* (Vol. 2) [Multivariate statistics for the social sciences: Applications of SPSS and LISREL].Pegem akademi.

Çokluk, Ö., Yılmaz, K., & Demirtaş, H. (2010). *Sosyal bilimler için çok değişkenli istatistik: SPSS ve LISREL uygulamaları* [Multivariate statistics for the social sciences: Applications of SPSS and LISREL]. Pegem Akademi.

Dignath, C., & Büttner, G. (2008). Components of fostering self-regulated learning among students. A meta-analysis on intervention studies at primary and secondary school level. *Metacognition and Learning, 3*(3), 231–264. https://doi.org/10.1007/s11409-008-9029-x

Dinsmore, D. L., Alexander, P. A., & Loughlin, S. M. (2008). Focusing the conceptual lens on metacognition, self-regulation, and self-regulated learning. *Educational psychology review, 20*, 391-409.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2014). *Multivariate data analysis* (7th ed.). Pearson Education.

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of educational research, 77*(1), 81-112.

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The difference between emergency remote teaching and online learning. *Educause review*, *27*(1), 1-9.

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6*(1), 1–55. https://doi.org/10.1080/10705519909540118

Jansen, R. S., Van Leeuwen, A., Janssen, J., Kester, L., & Kalz, M. (2017). Validation of the self-regulated online learning questionnaire. *Journal of Computing in Higher Education, 29*(1), 6–27. https://doi.org/10.1007/s12528-016-9125-x

Jöreskog, K. G., & Sörbom, D. (1993). *LISREL 8: Structural equation modeling with the SIMPLIS command language*. Scientific Software International.

Kizilcec, R. F., Pérez-Sanagustín, M., & Maldonado, J. J. (2017). Self-regulated learning strategies predict learner behavior and goal attainment in Massive Open Online Courses. *Computers & Education, 104*, 18–33. https://doi.org/10.1016/j.compedu.2016.10.001

Kline, R. B. (2023). *Principles and practice of structural equation modeling*. Guilford publications.

Marsh, H. W., Balla, J. R., & McDonald, R. P. (1988). Goodness-of-fit indexes in confirmatory factor analysis: The effect of sample size. *Psychological Bulletin, 103*(3), 391–410.

Ortagus, J. (2017). From the periphery to prominence: An examination of the changing profile of online students in American higher education. *Internet High. Educ., 32*, 47-57. https://doi.org/10.1016/J.IHEDUC.2016.09.002

Pintrich, P. R. Smith, D. A., García, T., & McKeachie, W. J. (1991). *A manual for the use of the Motivated Strategies for Learning Questionnaire (MSLQ)*. Retrieved January 8, 2021 from https://eric.ed.gov/?id=ED338122

Pintrich, P. R., Smith, D. A., García, T., & McKeachie, W. J. (1993). Reliability and predictive validity of the Motivated Strategies for Learning Questionnaire (MSLQ). *Educational and Psychological Measurement, 53*(3), 801–813. https://doi.org/10.1177/0013164493053003024

Rasheed, R. A., Kamsin, A., & Abdullah, N. A. (2020). Challenges in the online component of blended learning: A systematic review. *Computers & education*, *144*, 103701.

Richardson, M., Abraham, C., & Bond, R. (2012). Psychological correlates of university students' academic performance: A systematic review and meta-analysis. *Psychological Bulletin, 138*(2), 353. https://doi.org/10.1037/a0026838

Schumacker, R. E., & Lomax, R. G. (2016). *A beginner's guide to structural equation modeling* (4th ed.). Routledge.

Stevens, J. (2002). *Applied multivariate statistics for the social sciences* (Vol. 4). Mahwah, NJ: Lawrence erlbaum associates.

Sümer, N. (2000). Yapısal eşitlik modelleri: Temel kavramlar ve örnek uygulamalar [Structural equation models: Basic concepts and sample applications]. *Türk Psikoloji Yazıları, 3*(6), 49–74.

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.). Pearson Education.

Tavşancıl, E. (2010). *Tutumların ölçülmesi ve SPSS ile veri analizi* [Measuring attitudes and data analysis with SPSS] (4. Edition). Nobel Yayın Dağıtım.

Theobald, M. (2021). Self-regulated learning training programs enhance university students' academic performance, self-regulated learning strategies, and motivation: A meta-analysis. *Contemporary Educational Psychology, 66*, 101976. https://doi.org/10.1016/j.cedpsych.2021.101976

Tladi, L. S. (2017). Perceived ability and success: Which self-efficacy measures matter? A distance learning perspective. *Open Learning: The Journal of Open, Distance and e-Learning, 32*(3), 243–261. https://doi.org/10.1080/02680513.2017.1356711

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. https://doi.org/10.1080/01587919.2013.835779

Xu, T., & Xue, L. (2023). Satisfaction with online education among students, faculty, and parents before and after the COVID-19 outbreak: Evidence from a meta-analysis. *Frontiers in Psychology, 14*. https://doi.org/10.3389/fpsyg.2023.1128034

Xu, Z., Zhao, Y., Liew, J., Zhou, X., & Kogut, A. (2023). Synthesizing research evidence on self-regulated learning and academic achievement in online and blended learning environments: A scoping review. *Educational Research Review*. https://doi.org/10.1016/j.edurev.2023.100510

Yang, Y., & Cui, Y. (2021, December). Proportion of College Students' Internet Education Data Based on Big Data Analysis Technology. In *International conference on Big Data Analytics for Cyber-Physical-Systems* (pp. 475-483). Singapore: Springer Singapore.

Zimmerman, B. J. (1986). Becoming a self-regulated learner: Which are the key subprocesses?. *Contemporary educational psychology, 11*(4), 307-313.

Zimmerman, B. J., & Moylan, A. R. (2009). Self-regulation: Where metacognition and motivation intersect. In D. J. Hacker, J. Dunlosky, & A. C. Graesser (Eds.), *Handbook of metacognition in education* (pp. 299–315). Routledge.

Author Contributions

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