Examining Prospective Teachers' Metacognitive Learning Strategies and Self-Regulated Online Learning Levels During Covid-19 Pandemic

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Abstract

The Covid-19 pandemic is a challenge to education. To address this crisis, online or distance learning came to the fore. Educators recommended student-centered practices to weather the storm. Therefore, the incorporation of self-regulated learning (SRL) and metacognitive learning strategies (MLS) into online learning is considered necessary. Therefore, the aim of this study was to investigate the use of self-regulated online learning (SROL) and students' MLS levels, explore the relationship between them, and find out how the use of MLS predicts the online SRL capacities of Turkish trainee teachers in the period of distance education and contributes to the new educational paradigm after the pandemic.The study was designed as a correlational survey model in which 567 prospective teachers from Fırat University Faculty of Education in Turkey participated. Data were collected using the MLS Determination Scale-SROL questionnaire for prospective teachers. Data were analysed using t-test, ANOVA and simple linear regression. The results revealed that the participants have high levels of SROL and use MLS frequently. While SROL and MLS levels of participants do not differ in terms of gender, they differ concerning participants' departments, class levels, and time of self-study. Lastly, the use of MLS was a positive predictor of SROL.

Keywords: Self-regulated online learning, Metacognitive learning strategies, Covid-19 Pandemic

Introduction

Covid-19 pandemic has accelerated transforming to distance learning cancelling in-person classes. The closure of schools caused anxiety not only among teachers and students but also among policymakers (Khazan, 2020; OECD, 2020). Thus, they determined to transition from face-to-face learning to online and distance learning to resolve the crisis. The move to distance education happened very quickly out of necessity without appropriate preparation. In other words, '*education has become an emergency matter*' (Williamson, Eynor & Potter, 2020) and then the distance education held during that time has been called Emergency Remote Education (ERE) (Bozkurt, et al., 2020). This emergency case has been experienced worldwide and its educational effects have been felt from kindergarten to higher education by all the stakeholders (Green, Burlow & Carvalho, 2020, p.907). Zimmerman (2020) discussed distance education during the Covid-19 pandemic, regarding it as a duty for universities to compare its strengths to the traditional face-to-face instruction to utilize it after that. It is a fact that the global pandemic has been compelling educators to find alternative ways to traditional face-to-face instruction. For this purpose, Bozkurt et al. (2020, p. 8) suggest conducting more student-centered practices to facilitate learning during the pandemic. In student-centred approaches, learners are allowed to control their learning taking responsibility by being involved in the learning process (Slunt & Giancario, 2004). The principles of student-centered learning are in line with self-regulated learning. Since both of them require active and reflective learning and learners (Wangid, 2014). As one of the prominent student-centered approaches, self-regulated learning (SRL) was proposed to remedy distance education during the pandemic. It was also suggested to study the effects of SRL on students (Cai et al., 2020). According to De Corte (1990), SRL is essential in an information technology integrated learning process.

Moreover, online learning environments support self-regulated learning (Baldan-Babayigit & Guven, 2020 Technology has been considered a facilitating factor for SRL in the higher education context (Salter, 2013). However, researchers do not address whether students use technology and the internet for academic purposes anymore. Instead, they seek how they can utilize it at most (Lee & Tsai, 2011). In technologic learning settings,

students are active constructors of their knowledge and skills. So SRL is a determinant in technology-integrated learning (Ng, 2010, p.10). Therefore, SRL should be fostered and utilized through the distance education period in which technology use is a requisite (Cai et al., 2020),

Self-regulated learners have been defined as '*metacognitively, motivationally, and behaviorally active participants*' (Zimmerman, 1989, p.329) in their learning process. In other words, self-regulated learners are responsible for planning, monitoring, and evaluating their learning in terms of metacognition. Through the motivational perspective, they are expected to strive hard to achieve their goals. They are also behaviorally active participants in their learning process and creating their ideal learning environment (Ng, 2010). To put it differently, learners regulate their learning environments, own thinking and motivational beliefs instead of depending on teachers feeding up and guiding them (Ng, 2010). Thus, SRL is the individual responsibility of learning, a live interaction of 'skill and will' (Baumert, 1993, p.328).

On the other hand, several researchers claimed that the self-regulation process can be directed both internally and externally, which means individuals can steer their learning with and without the help of teachers and textbooks (Boekaerts & Simons, 1995). SRL has been acknowledged as the key to successful learning both in school and out of it. It is believed to create productive learning environments where knowledge, skills, and attitudes can be procured and transferred to different learning contexts. However, it is more than sole successful learning which does not have a definitive aspect. Besides resulting in successful learning, it clarifies correlative interactions among components. It makes a tie among learning, achievement, and the self that is a person's ability to use his power (Boekaerts, 1999). There is a consensus on how to be an effective learner that s/he should actively affect his/her learning process and adapt it on cognitive, metacognitive, and motivational dimensions (Bransford, Brown & Cocking, 2000; Zimmermann, 2002). The cognitive aspect gets at the internal way of representing and processing information. On the other hand, the metacognitive aspect is the goal-oriented ability to regulate cognitive, behavioral and motivational courses (Pintrich, 2000). Self-regulated learners are proactive learners who are aware of their strengths and weaknesses since they set goals for themselves and choose appropriate strategies (Zimmerman, 2002). Thus, those learners have also been defined as autonomous ones to control their learning and find reasonable solutions when needed (Winne, 2015). Therefore, understanding metacognition is strongly related to self-regulation of abilities (Schunk, 2001; Saraff et al., 2010). Furthermore, metacognitive knowledge and self-regulation are considered the most important components of SRL (Schunk, 1990; Zimmerman, 1995) because "self-regulated learning is the application of metacognition" and both metacognition and self-regulation are intended to enhance learning (Mannon, 2020, p. 68). According to Mannon (2020, p. 69), educators need to understand the concepts of metacognition and self-regulated learning and how they are related to have more independent learners. In this way, they can understand the importance of providing students with possibilities to monitor and regulate their learning.

By the shift in educational research in recent years, the academic achievement concept started to be evaluated on students' activities that regulate their learning instead of their mental abilities, social environments, and experiences. In other words, students should be proactive in the process by determining proper strategies to improve their learning (Zimmermann, 2008), particularly metacognitive strategies that allow them to control and manage it.

Student learning research has discoursed on '*cognitive strategies, metacognition, motivation, task engagement, and student-centred learning*. SRL has embodied those arguments and disclosed a more integrative remark of learning strategies (Ng, 2010, p.10). The regulation of one's learning process is the core of metacognition (Borkowski & Turner, 1990) as they are mirror images of each other (Mannon, 2020). Research on this topic suggests examining SRL with each of its dimensions, such as cognitive, motivational and, metacognitive (Gomleksiz & Demiralp, 2012). From this perspective, for the current study, SRL will be viewed from a metacognitive framework. Metacognitive learning strategies (MLS) may be interpreted as essential tools for self-regulated learning. From this point, this research aims to investigate the metacognitive learning strategies and the level of self-regulated online learning of prospective teachers in relation to some variables and then correlate them with each other to reveal the relationship and contribute to the field.Studies have been seeking the role of cognition (Hofer, Yu & Pintrich, 1998; Wirth et al., 2020), motivation in SRL (Aguilar et al., 2021; Ariani, 2016; Daumiller & Dresel, 2019; Pintrich, 1999; Wolters, 2003), and both (Finn, 2020). However, a few studies address metacognition and self-regulated learning (Akamatsu, Nakaya & Koizumi, 2019; Mekala & Radhakrishnan, 2019; Saraff et al., 2020; Sperling et al., 2004) by the best knowledge of the researchers. Moreover, they were all conducted to regulate learning through in-person instructions. Previous research has shown that online learners sometimes have problems regulating their learnings (Lajoie &Azevedo, 2006). Furthermore, Baldan-Babayigit and Guven (2020) claimed that instructors, curricula, and instruction have significant roles to improve undergraduates' SRL skills. Recent evidence suggests undergraduates are not effective self-regulators in their

online courses although they pass their classes and graduate with bachelor's degrees (Pedrotti & Nistor, 2019). On the other hand, it is demonstrated that self-regulated online learners are more successful than the others (Barnard-Brak, Lan & Paton, 2010; Gao &Lehman, 2003; Yukselturk & Bulut, 2007). To be successful in online learning, self-regulated learners had better set additional goals for themselves since course objectives are frequently not clear in online learning (Margaryan, Bianco & Littlejohn, 2015). They also should engage actively through their learning process since they are more autonomous in online learning (Garrison, 2003). Completing the process, students need to reflect and evaluate themselves in the context of their learning goals (Zimmerman, 2002). Considering themselves they need to adjust their learning strategies for future learnings (Pintrich, 2000). SRL embodied self-regulation and metacognition components. To make learners independent in their learning, therefore it is necessary to know about the relationship between SRL and metacognition (Mannon, 2020). According to academics, the major goal of formal education should be preparing students properly with self-regulating skills for being life-long learners (Bandura, 1993; Zimmerman, 2008). Furthermore, higher education requires students to be more aware of effective learning strategies to enhance their learning (Cervin-Ellqvist et al., 2020). Therefore, it is essential to reveal how each of these components predicts the major term. However, there is no research to examine their relationship. The value and significance of this work, therefore, lie in the attempt to show that the metacognitive dimension is one of the most important aspects of self-directed learning and that the use of metacognitive learning strategies promotes this learning. By this aim, the current study seeks to address this gap in the literature by investigating the relationship between self-regulated online learning (SROL) and MLS and how the use MLS predict Turkish prospective teachers' online SRL capacity through the time of distance education and contributes to the new educational paradigm after the pandemic.

In particular, this research seeks to address the following questions:

1. What are SROL and MLS usage levels of prospective Turkish teachers?
2. a. Is there any significant difference between SROL levels and MLS usage levels of prospective teachers in terms of their genders?
   b. Is there any significant difference between SROL levels and MLS usage levels of prospective teachers in terms of their departments?
   c. Is there any significant difference between SROL levels and MLS usage levels of prospective teachers in terms of their class levels?
   d. Is there any significant difference between SROL levels and the MLS usage levels of prospective teachers in terms of their time of study?
3. Does Turkish prospective teachers' usage of MLS predict their SROL level?

Methodology

The study was designed as a correlational survey model. Correlational surveys investigate the existence of the relations among two or more variables and reveal the cause and effect relationship among them to have a better insight (Buyukozturk et al., 2010; Karasar, 2009). In correlational models, the casual comparative research design is used to examine the ties among the variables (Buyukozturk et al., 2010). In this regard, this study took the form of a casual comparison model to examine the differences between the genders, subject areas, grade levels, and years of study of prospective teachers in terms of the level of metacognitive learning strategy use and the level of self-regulated online learning. Moreover, a correlational model was utilized to examine the existence of a relation between metacognitive learning strategies and SRL levels of Turkish prospective teachers.

Research Sample

The research population consists of prospective teachers at Fırat University Faculty of Education. On the other hand, the research sample consists of 567 prospective teachers selected from the population using the convenience sampling method. Of the prospective teachers participating is shown descriptive information about the sample in Table 1. Of the prospective teachers participating in the study, 112 (20%) are male and 455 (80%) are female. Looking at the distribution of prospective teachers in terms of the departments in which they study, 76 (13.4%) are in the Department of Turkish Education, 53 (9.3%) in the Department of Social Studies Education, 98 (17.3%) in the Department of Mathematics Education, 71 (12,5%) at the Department of Science Education, 79 (13.9%) at the Department of English Education, 59 (10.4%) at the Department of Elementary Education, 55 (9.7) at the Department of Kindergarten Education, and 76 (13.4%) at the Department of Psychological Counseling and Guidance. 89 (15.7%) of the prospective teachers are 1st year students, 224 (39.5%) are 2nd year students, 119 (21%) are 3rd year students and 135 (23.8%) are 4th year students. When the distribution of prospective teachers according to their daily study time was examined, it was found that 14 (2.5%) study for less than 1 hour, 368

(64.9%) for 1-3 hours, 164 (28.9%) for 4-6 hours, and 21 (3.7%) for 7 hours or more. When the distribution of their daily internet use was examined, it was found that 222 (39.2%) used internet for 1-3 hours, 238 (42%) for 4-6 hours, and 107 (18.9%) for 7 hours or more.

Table 1. Descriptive statistics of the participants

Variable	Categories	N	%
Gender	Female	455	80
	Male	112	20
Department	Turkish Language Education	76	13,4
	Social Studies Education	53	9,3
	Mathematics Education	98	17,3
	Science Teaching	71	12,5
	English Language Teaching	79	13,9
	Elementary School Teaching Program	59	10,4
	Kindergarten Teaching Program	55	9,7
	Psychological Counselling and Guidance	76	13,4
Class level	1st year	89	15,7
	2nd year	224	39,5
	3rd year	119	21,0
	4th year	135	23,8
Daily study time	Less than 1 hour	14	2,5
	1-3 hours	368	64,9
	4-6 hours	164	28,9
	7 hours or more	21	3,7
Daily internet use time	1-3 hours	222	39,2
	4-6 hours	238	42,0
	7 hours or more	107	18,9

Data collection tools

The data collection tools used in the research were prepared digitally via Google Forms. The survey link was https://forms.gle/toiqrAnxWLETJFg46. The link of the prepared form was sent to prospective teachers through faculty members. The form consists of four parts. The first part consists of the "Informed Consent Form" in which the prospective teachers declare that they voluntarily participate in the study, the second part consists of a Personal Information Form in which the prospective teachers who have declared that they voluntarily participate provide their demographic information, the third part consists of the Metacognitive Learning Strategies Scale for the prospective teachers, and the last part consists of the Self-Regulated Online Learning Questionnaire for the prospective teachers.In addition, the prospective teachers who volunteered to participate in the study were notified that they could quit answering them at any time they wish.

Personal information form:

The personal information form developed by the researchers includes information on the gender, department, year of study, daily study time, and daily internet use time of the prospective teachers.

Metacognitive Learning Strategies Determining Scale:

Metacognitive Learning Strategies Determining Scale (MLS) was developed by Gundogan-Cogenli and Guven (2014). During the development phase of the scale, the applications were carried out with 263 prospective teachers studying at Uşak University, Faculty of Education, Department of Elementary School Teaching program. Developed as a 5-point Likert type, the scale consists of 28 items and four sub-dimensions. Cronbach Alpha reliability for the whole scale was found to be .87. Cronbach Alpha reliability for the sub-dimensions of the scale were found to be .76 for planning strategies, .68 for monitoring strategies, .58 for evaluating strategies, and.53 for affective strategies. The reconstructed CFA results of the present study confirm the five-dimensional structure of the scale (X^2/df = 1.801 GFI = .997, CFI = .999, AGFI = .984, TLI = .997, SRMR = .008, RMSEA = .038). Also, the Cronbach Alpha reliability of the scale was calculated as .90.

In evaluating the responses given to the scale items, the intervals were assumed to be equal, and the score interval for the arithmetic means was calculated as 0.80 (Score Range = (Highest Value - Lowest Value)/5 = (5 - 4)/5 = 4/5 = 0.80). According to this calculation, the evaluation range of arithmetic means is as follows: 1.00-1.80 " Strongly disagree", 1.81-2.60 " Disagree", 2.61-3.40 "Neither agree nor disagree", 3.41-4.20 "Agree", and 4.21-5.00 "Strongly agree".

Self-Regulated Online Learning Questionnaire:

Self-Regulated Online Learning (SROL) Questionnaire was developed by Jansen et al. (2017) and adapted into Turkish by Yavuzalp and Ozdemir (2020). In the adaptation study of the scale, the sample consisted of 569 university students who took at least one course through distance education at Bolu Abant İzzet Baysal University. Adapted as a 7-point Likert scale, the scale consists of 36 items and five sub-dimensions. Cronbach Alpha reliability for the whole scale was found to be .96. It was observed that the reliability values for the sub-dimensions of the scale ranged from .701 to .956. The reconstructed CFA results of the present study confirm the five-dimensional structure of the scale (X^2/df = 1.202 GFI = .997, CFI = .999, AGFI = .987, TLI = .997, SRMR = .014, RMSEA = .019). Also, the Cronbach Alpha reliability of the scale was calculated as .94.

In evaluating the responses given to the scale items, the intervals were assumed to be equal, and the score interval for arithmetic means was calculated as 0.86 (Score Range = (Highest Value - Lowest Value)/7 = (7 - 1)/7 = 6/7 = 0.86). According to this calculation, the evaluation range of arithmetic means is as follows: 1.00-1.86 "Not true at all", 1.87-2.71 "Rarely true", 2.72-3.57 "Occasionally true", 3,58-4,43 "Sometimes true", 4.44-5.29 "Frequently true", 5.30-6.14 "Mostly true", and 6.15-7.00   "Always true".

Accordingly, it can be stated that the scales are appropriate to be used in research.

Data analysis

In the study, SPSS 22 program was used for basic statistical analysis, and AMOS 21 program was used to test the suitability of the scales for this study. Before starting data analysis, the data of 748 prospective teachers who responded were examined. First, the data forms of 39 prospective teachers who gave a negative response to the consent form were excluded from the analysis. Later, the data was checked for invalid or missing data. As a result, it was seen that 56 prospective teachers did not fill in the data collection tools completely. Z scores were calculated to remove outliers from the data, and Skewness and Kurtosis coefficients were calculated to test the normal distribution. The "∓1" interval for the Skewness and Kurtosis coefficients (Cokluk, Sekercioglu & Buyukozturk, 2016), and the "∓3.29" interval for Z scores (Field, 2013) were taken into account. In this context, 86 forms out of the 653 forms collected were excluded and analyses were carried out on the remaining 567 forms. Examining the kurtosis and skewness values of the scales, it can be seen that the kurtosis value of the MLS determination scale is in the range of [-.162; -.699] and its skewness value is in the range of [.268; -.119], while the kurtosis value of the SROL questionnaire is in the range of [.480; -.538] and its skewness value is in the range of [.091; -.939]. Thus, it can be concluded that the normality assumption is satisfied.With 567 forms, arithmetic means for SROL and MLS of the prospective teachers were calculated. The t-test was used to determine whether SROL and MLS of the prospective teachers differ according to their gender. One-way analysis of variance (ANOVA) was used to test whether the prospective teachers' self-regulated online learning and metacognitive learning strategies differ according to their department, year of study, and daily study duration. After the one-way ANOVA in which the main effects of the variables were examined, Bonferroni tests were used to determine the sources of possible differences. In the inferential analysis, the significance level was determined as p < .05. Based on Student's t statistics, Bonferroni is a widely used multiple comparison test and does not require the principle of "equal sample size" (Miller, 1969). The effect sizes (η^2) obtained due to the calculations were interpreted by being compared with certain criterion values. These values are (Green & Salkind, 2005, p. 157) "η^2< 0.01" indicates that there is small effect size, "η^2< 0.06" indicates that there is medium effect size, and "η^2< 0.14" indicates that there is large effect size.

Whether prospective teachers' metacognitive learning strategies predicted their self-regulated online learning was tested using a simple linear regression analysis. The Pearson Product Moment Correlation Coefficient (r) was used to determine the relationships between the variables. In interpreting the correlation coefficient, .00 means no relationship, 0.01-0.29 means a low relationship, 0.30-0.70 means a moderate relationship, 0.71 -0.99 means a high relationship, and 1.00 means a perfect relationship (Koklu, Buyukozturk & Cokluk, 2006).

Findings

In this section, the level of self-regulated online learning and the level of use of metacognitive learning strategies of Turkish prospective teachers were compared separately by gender, subject area, grade level and period of study.

R.Q.1: What is the level of self-regulated online learning (SROL) and use of metacognitive learning strategies (MLS) among Turkish prospective teachers?

Table 2 shows the means and standard deviations related to self-regulated online learning and use of metacognitive learning strategies among Turkish prospective teachers.

Table 2. SROL and MLS scores

	N	Mean	Std. Deviation
SROL	567	5,14	,77030
MLS	567	4,24	,34505

The arithmetic mean of SROL level of Turkish prospective teachers was calculated as 5.14. According to the seven-level Likert-scale rating, the level of self-regulated online learning of the prospective teachers was analyzed at the "frequently applies" level. The arithmetic mean of the MLS usage level of the prospective teachers was calculated as 4.24. According to the five-point Likert rating, the use of metacognitive learning strategies was rated as 'strongly true' by prospective teachers.

R.Q.2. a: Is there any significant difference between SROL levels and MLS use levels of prospective teachers with respect to their gender?

A T-test was conducted to determine if there was a significant difference between prospective teachers' SROL levels and MLS usage levels in relation to their gender. The results can be seen in Table 3.

Table 3. SROL and MLS scores by Gender

	Gender	N	Mean	Std. Deviation	p	t
SROL	Female	455	5,17	,756	0.64	1,856
	Male	112	5,02	,817		
MLS	Female	455	4,24	,337	0.95	,061
	Male	112	4,24	,375		

As Table 3 shows, SROL levels of prospective teachers do not differ significantly in terms of their genders. But the arithmetic means of female students ($\overline{X}$ =5.17) are higher than those of males concerning online self-regulated learning levels. The other finding from the same table shows that there is no statistically significant difference between MLS usage levels of students and their genders (female: $\overline{X}$ = 4.24; male: $\overline{X}$ = 4.24).

R.Q.2.b: Is there any significant difference between SROL levels and MLS usage levels of prospective teachers in terms of their departments?

One-way ANOVA is used to highlight a significant difference between SROL levels and MLS usage levels of prospective teachers in their departments. The results of the analysis are set out in Table 4.

Table 4. SROL and MLS scores by Departments

		Sum of square	df	Mean square	F	p	η^2	
SROL	Between Groups	15,752	7	2,250	3,930	,000	,046	*ELT>PCG,
	Within Groups	320,094	559	,573				PST>PCG,
	Total	335,847	566					SST>PCG,
MLS	Between Groups	2,540	7	,363	3,127	,003	,038	*KT>MT
	Within Groups	64,849	559	,116				
	Total	67,389	566					

*The abbreviation ELT is used for the English language teaching department, PCG for psychological counselling and guidance, KT for kindergarten teaching, SST for social science teaching, and MT for math teaching.

The results indicate that there is a statistically significant difference among SROL levels of prospective teachers in terms of their departments (F= 3,930; p= .000). However, the difference is in 'medium effect size" (η^2=.046). According to the data, SROL scores of the ELT ($\overline{X}$=5.34) groups, PST ($\overline{X}$=5.37) groups, SST ($\overline{X}$=5.40) differed significantly PCG ($\overline{X}$=4.93) groups.

The other result obtained from the table above revealed that MLS usage levels of prospective teachers differ significantly in 'medium effect size" (η^2=.038) in regards to their departments (F= 3,127; p=.003). According to the analysis, MLS usage scores of the PST ($\overline{X}$=4.35) groups differ significantly MT ($\overline{X}$=4.16) groups.

R.Q.2.c: Is there any significant difference between SROL levels and MLS usage levels of prospective teachers in terms of their class levels?

One-way ANOVA is used to compare whether SROL levels and MLS usage levels of prospective teachers differ significantly from one another in terms of their class levels. The results of the analysis are presented in Table5.

Table 5. SROL and MLS Scores by Class Levels

		Sum of square	df	Mean square	F	p	η^2	
SROL	Between Groups	5,343	3	1,781	3,034	,029	,016	2>3
	Within Groups	330,504	563	,587				
	Total	335,847	566					
MLS	Between Groups	1,162	3	,387	3,292	,020	,017	4>2
	Within Groups	66,227	563	,118				
	Total	67,389	566					

A statistically significant difference was found among SROL levels of prospective teachers in 'medium effect size" (η^2=.016) in terms of their class levels (F= 3,034; p=.029). Data obtained from Bonferroni test show that SROL scores of the "2nd class" ($\overline{X}$=5.24) groups differed significantly from "3rd class" ($\overline{X}$=5.00) groups. The other result revealed that MLS using levels of prospective teachers differ significantly in 'medium effect size" (η^2=0.17) about their class levels (F= 3,292; p=.020). Furthermore, MLS scores of the "4th class" ($\overline{X}$=4.32) groups differed significantly from the "2nd class" ($\overline{X}$=4.23) groups.

R.Q.2.d: Is there any significant difference between SROL levels and MLS usage levels of prospective teachers in terms of their time of study?

One-way analysis of variance (ANOVA) was used to compare whether the level of self-regulated online learning and the level of use of metacognitive learning strategies of prospective teachers differ significantly in relation to their study period. The results are presented in Table 6.

Table 6. SROL and MLS Scores by Time of Study

		Sum of square	df	Mean square	F	p	η^2	
SROL	Between Groups	12,573	3	4,191	7,299	,000	,037	4-6 hours>less than 1 hour,
	Within Groups	323,273	563	,574				4-6 hours>1-3 hours,
	Total	335,847	566					More than 7 hours> Less than 1 hour
MLS	Between Groups	4,516	3	1,505	13,481	,000	,067	4-6 hours>1-3 hours, More than 7 hours> Less than 1 hour, More than 7 hours> 1-3 hours

The result is significant at SROL scores of prospective teachers in "medium effect size" (η^2=0.37) with regard to their time of study (F= 7,299; p=.000). From this analysis, it can be seen that SROL scores of the "4-6 hours" ($\overline{X}$ =5.33) groups differ significantly from the "Less than 1 hour" ($\overline{X}$=4.65) groups and, the "1-3 hours" ($\overline{X}$ =5.06) groups. In addition, SROL scores of the "more than 7 hours" ($\overline{X}$ =5.38) groups differed significantly from the "1-3 hours" ($\overline{X}$ =5.06) groups.

The other result about MLS using levels of prospective teachers shows statistically significant difference in "large effect size" (η^2=0.37) in terms of their time of study (F= 13,481; p=.000). It can be inferred from the Table 5 that MLS using scores of the "4-6 hours" ($\overline{X}$ =4.34) groups differed significantly from the "1-3 hours" ($\overline{X}$ =4.19) groups. Besides, MSL using scores of the "more than 7 hours" ($\overline{X}$ =4.53) groups differed significantly from the "less than 1 hour" ($\overline{X}$ =4.14) groups and, "1-3 hours" ($\overline{X}$ =4.19) groups.

R.Q.3:Does Turkish prospective teachers' usage of MLS predict their SROL level?

Whether prospective teachers' use of MLS predicted their SROL levels was investigated by regression analysis. The results of the regression analysis are summarized in Table 7.

Table 7. The Relationship between MLS and SROL Scores

	B	Std. Error	ß	t	p	r
fixed	-,302	,327		-,924	,356	,574
MLS	1,282	,077	,574	16,682	,000	
R= ,574	R²= ,330	F(1-565) = 278,291 p= ,000				

According to the data obtained from the regression analysis, it can be seen that there is a statistically significant ($F_{(1-565)}$ = 278,291; p=.000), positive and, at a moderate level (r=.574 p=.000) relationship between MLS use and SROL level of prospective Turkish teachers. It is also revealed that students' use of MLS predicted their level of SROL (R= ,574, R²=.330). In this case, it can be observed that students' using MLS explains 33% of their SROL levels. Given these results, the regression equation for predicting SOL levels of students from their use of MLS can be written as: SROL level = -0,302+ (1,282 x using MLS).

Discussion and Conclusion

As mentioned in the introduction part, the distance education conducted through the pandemic goes on compelling educators to find rewarding ways to sustain education. Sustainable learners are the ones who benefit whatever to become effective judges to evaluate their learnings (Boud & Soler, 2016). Particularly in online learning, students should have the ability to control their learning (Gao, 2003; Ally, 2009) and they are required to be at the center of the learning process. Herein, student-centered approaches make ground for sustainable learning in times of emergencies. As one of the student-centered practices, SRL has been suggested as a remedy for distance education during the pandemic by scholars. The use of MLS, relatedly, has been set forth to help regulate one's learning. Teachers and teacher candidates are expected to be self-regulated learners to train students accordingly and prepare them for their future lives. The current research has been designed to reveal SRL and MLS use levels of prospective teachers from various departments from this starting point. The researchers aimed to predict the relationship between SRL levels and MLS use levels of students in online education during the Covid 19 Pandemic.

The first question in this study sought to determine the SROL and MLS use levels of students. SROL levels of students were found out at 'frequently true' level; it was also revealed that their MLS use was at 'strongly agree' level. Therefore, it seems that students participating in this study use MLS and regulate their online learnings easily, which is demonstrated by high scores attained from both of the scales. Recent evidence suggests that flexible learning environments support SRL (Baldan-Babayigit & Guven, 2020; Pintrich, 2004). This finding of the present research has also shown that prospective teachers have high levels of self-regulation in flexible online learning environments. Boud and Soler (2016) remarked on the fact that self-regulation in higher education is subject to metacognition and self-assessment. This finding supports previous research that found high levels of SRL (Aybek & Aslan, 2017; Guler, 2015) and metacognitive awareness and metacognitive skills in students (Ay & Baloglu-Ugurlu, 2016; Baykara, 2011; Kilinc & Uygun, 2015; Ozsoy & Gunindi, 2011; Tuysuz, Karakuyu &

Bilgin, 2008; Unal, 2010; Yesilyurt, 2013). This result may be explained by the strong relationship among SRL, metacognition and MLS. So a high score of one indicates a high score of the other. Another possible explanation for this result is that higher metacognitive knowledge implies higher autonomy and self-regulation (Saraff, et. al., 2010). This result also implies the result of the 3rd research question, which was about the prediction level of both, which we will discuss later.Returning to the second question posed at the beginning of the present study, it is now possible to state that there was no statistically significant difference between SROL levels of students and their genders. This finding is in agreement with Wolters and Pintrich's (1998) finding showing no difference between self-regulatory strategy use levels and genders of participants. This also accords with the studies of Gomleksiz and Demiralp (2012), Oettingen et al. (2015), Ozturhan-Sagirli and Azapagasi (2009), Turan, Demirel and Sayek (2009) and Yukselturk and Bulut (2009), which found no relationship between self-regulation abilities and genders of undergraduates. In contrast to the current study, some research implied significant differences in using SRL in favor of females in traditional (Bidjerano, 2005), and in an online context (Artsin, Kocdar & Bozkurt, 2019). Thus, this result shows that both male and female Turkish prospective teachers are equally concerned about how they regulate their online learning. Considering the research on the relationship between SRL and gender, it should be noted that new research should be conducted to find a more accurate reason for the contradictory results.Likewise, it was also found that their use of MLS did not differ in terms of gender. Therefore, it can be inferred that males and females engage MLS similarly. Several research findings support the present study (Baykara, 2011; Kilinc & Uygun, 2015; Tuysuz, Karakuyu & Bilgin, 2008). However, this current research finding does not support the previous studies (Akin, 2013; Handel, Artelt & Weinert, 2013; Unal, 2010; Wolters & Pintrich, 1998), which showed a significant difference in strategy use levels of students on behalf of females.

There was a meaningful difference between SROL levels of students and their departments. Based on this finding of the current research, it is possible to claim that different departments have different viewpoints and cultures in nurturing their students to be lifelong learners. Baldan-Babayigit and Guven (2020) considered that instruction, curricula and lecturers in higher education play a significant role in improving students' SRL skills. This finding of the current study is consistent with previous research (Aybek & Aslan, 2017; Gomleksiz & Demiralp, 2012; Grossman and Stodolsky, 1994; Wolters & Pintrich, 1998). They all found that students' self-regulation levels varied by discipline. Similarly, a statistically significant difference was found between students' use of MLS and their disciplines. This finding is consistent with the findings of Cervin-Ellqvist et al. (2020) who found a statistically significant difference between different types of courses and students' use of learning strategies.Yesilyurt (2013) on the other hand, found significant differences between planning strategies use levels of undergraduates and their departments. However, several other studies have not demonstrated meaningful differences between undergraduate major and students' MLS usage (Okcu & Kahyaoglu, 2007; Ozsoy & Gunindi, 2011; Veenman, Wilhelm & Beishuizen, 2004).

A statistically significant difference was found between SROL levels of students and their class levels (2>3). Thus, this result demonstrates that students in lower grades have higher SROL scores. This result matches those observed in earlier studies (Aybek & Aslan, 2017; Ozturhan-Sagirli, et. al., 2010; Ozturhan-Sagirli & Azapagasi, 2009). Ozturhan-Sagirli and Azapagasi (2009) commented on this finding as prospective teachers have high SRL levels when they start university. Then some factors such as high self-esteem and less effort make them decrease their level of self-regulation. According to Ozturhan-Sagirli et al. (2010), the high level of self-regulation of the 1st graders depends on their being motivated for university entrance exams while graduating from high school. Contrarily, it was found that prospective teachers' use of MLS differed in favor of upper classes (4>2). This finding shows that the older the students getting the more MLS they use. This finding of the study is in line with the related literature that claims experiences contribute to metacognition development and metacognitive strategies (Brown, 1987). Grolnick and Ryan (1989) also hypothesized that metacognitive development is related to cognitive maturity. This finding of the present research partly affirms the hypothesis. Since fourth graders have higher scores when using MLS. Veenman, Wilhelm, and Beishuizen (2004) conducted a study with different age groups and found that metacognitive skills increased with age. Similarly, students were found to have higher scores in metacognition (Handel, Artelt & Weinert, 2013) and MLS use (Ozsoy & Gunindi, 2011) with increasing age.There was a statistically significant difference between SROL and MLS use levels of students and their self-study time. Hence, these results explained that the more students study, the more they regulate their online learnings and the more they use MLS. This result accords with the finding of the study of Ozturhan-Sagirli and Azapagasi (2009) which confirms that time of study affects self-regulation levels of students. Researchers explained this finding remarking the high SRL levels of students when starting university. Finding the lessons sufficient they did not study more. As a result, it is thought students' levels of SRL would be affected. Another important finding was that some external factors affect students' focus on learning, such as spending too much time on the Internet or social media, which affects not only their study time but also their SRL and use of metacognitive strategies (Saraff, et al., 2020). In line with the findings of the present study, Ay and Baloglu-Ugurlu (2016) and Doganay and Demir (2011) have shown that prospective teachers who study more than two

hours a day use MLS more than the rest and achieve academic performance.Examining the third question posed in the current study, there is a significant, positive, and moderate relationship between MLS and SROL. And MLS are predictors of SROL. Broadbent and Poon (2015) examine several studies to have a meta-analysis and concluded that metacognition is one of the self-regulated learning strategies to have a positive relationship with online learning. This finding of the current study seems to be consistent with the research which found that students using metacognitive strategies have higher self-control in their learnings. They also claimed that students use learning strategies to regulate their learnings (Saraff et al., 2020). Zheng et al. (2020) also demonstrated that the more learners are competent self-regulated, the more effective strategies they adopt and the more accomplished they become. Although it was not conducted in the higher education context the study also revealed that self-regulated learning increases learner independence to control their learning (Ariani, 2016). Ozturhan-Sagirli and Azapagasi (2009) found that self-regulated prospective teachers prefer metacognitive strategies as learning strategies. According to the researchers, this relationship is the result of self-regulation, which means that they know themselves well and then use metacognition to regulate their learning. Saraff et al (2020) designed an experimental study to determine the relationship between SRL and the use of metacognitive strategies.They indicated that higher metacognitive knowledge implies higher autonomy and self-regulation. This finding differs from Van-Laer and Elen's (2019). They expressed that no matter whether the learning is self-regulated or not, learners need to be controlled and directed to choose and apply metacognitive strategies.

Metacognition and self-regulation are two essential components of successful learning (Mekala & Radhakrishnan, 2019; Schraw, 1998) in the 21st century (Handel, Artelt & Weinert, 2013). As online learning in higher education becomes part of distance education during the pandemic, the need for self-regulated and metacognitively competent students grows accordingly. This study highlighted the positive relationship between SROL and use of MLS levels of prospective teachers. It is somewhat surprising that although the present study claims a positive correlation between SROL and MLS use levels of students there are some differences in findings regarding different variables. For instance, different departments have varied scores in SROL and MLS use. Moreover, while a lower grade has higher SROL scores, an upper grade has higher MLS using scores, which should be investigated in future research.

The study also has some limitations due to its sample, method and variables. Therefore, the results obtained should be tested in larger samples, with other research methods and with other variables. In this regard, experimental studies should be conducted to determine whether MLS is a predictor of SROL in online learning environments designed according to SROL. The needs of prospective teachers to increase their use of MLS and SROL should be determined. Studies should be conducted to determine the effects of age, online learning opportunities, and motivational variables on MLS and SROL.

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