An Investigation into Pre-Service Teachers' Self-Regulated Online Learning Perceptions

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Abstract

The sudden outbreak of Covid-19 pandemics has accelerated the process of technological transformation experienced by educational institutions. Traditional face-to-face education has been replaced by distance education as a precaution to minimize physical contact among the teachers and the students. As a result, self-regulatory skills have become a more significant factor for academic success in distance education. In line with this, the main aim of the study is to identify the level of self-regulated online learning perceptions of pre-service teachers in Turkish higher education context. Furthermore, the study also aims to reveal whether the pre-service teachers' self-regulated online learning perceptions differ according to several variables such as their gender, department, class, level of digital literacy and the time they daily spend online. A total of 353 pre-service teachers from various departments have participated in the study. The findings of the study indicate that pre-service teachers' perceptions of self-regulated online learning are at moderate level; thus, it can be argued that the level of their perceptions is far from satisfactory. Additionally, it has been observed that the pre-service teachers' self-regulated online learning perceptions differ according to their gender, level of digital literacy and time daily spent online. To be more precise, it has been noted that self-regulated online learning perceptions of female pre-service teachers are higher than those of male pre-service teachers. In a similar vein, it has been observed that the higher the level of digital literacy and the more time spent online, the higher the self-regulated online learning perceptions of pre-service teachers. The overall results of the study suggest that self-regulation skills of the pre-service teachers need to be emphasized and improved with the aim of contributing to the efficient implementation of distance education.

Key words: Self-regulation, Self-regulated online learning, Distance education.

Introduction

Prior to the global outbreak of Covid-19 pandemics, higher education institutions across the world had already started offering online and technology-enhanced instruction with the main aim of internationalizing the instruction they provide (Krusekopf, 2019); however, the sudden outbreak of Covid-19 pandemics in the first quarter of 2020 accelerated this process and educational institutions at all levels adopted some form of distance education (DE) as a compulsory and emergency alternative to traditional face-to-face education. In line with this, it has even been envisioned that "…the mere concept of eLearning will be obsolete in the near future as there will be no learning without technology" (Obexer, 2017, p. 7). Accordingly, the availability of computers, laptops, smartphones, tablets and easier and faster access to the internet has reformed the concept of DE (McAvinia, 2016; Simonson et al., 2015) and it has come to be seen both as companion and alternative to traditional face-to-face education; thus, distance learners can get exposed to more personalized and self-regulated instruction (Karasu & Sarı, 2019). More precisely, distance learners are expected take on more responsibility of their learning and become more active and autonomous throughout the process. In this context, the concept of self-regulation (SR) has grown to become a more central factor that contributes to the success in the challenging process of DE. Thus, the concepts of DE and self-regulated learning will be dwelled upon in the following section of the article.

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Theoretical Framework

Distance Education

Distance education (DE) is not a phenomenon of the 21st century since it has been practiced in various forms for nearly three centuries (Moore & Kearsley, 2011). As a matter of fact, DE started in the form of written correspondences between the teachers and learners in the 1720s and, in the course of its evolution, innovations such as radio and television have been utilized. The computers and the internet have also made their way into the implementation of DE in the last fifty years and, as a result, DE has become much more effective and widespread. Although a multitude of definitions exist in the relevant literature, DE can be defined as "…the use of the internet to access materials; to interact with the content, instructor, and other learners; and to obtain support during the learning process, in order to acquire knowledge, to construct personal meaning, and to grow from the learning experience" (Ally, 2008, p. 5). To put it differently, DE refers to a broad field of action; however, the distinctive requirement for DE is the physical, geographical and temporal space between the teacher and the learners (Hartnett, 2016). Consequently, DE has currently been adopted by educational institutions at all levels as a direct outcome of the global Covid-19 pandemics as a measure to avoid physical contact among the teachers and the students.

DE has generally been regarded as more democratic, accessible, flexible and open in that it enables learners to study anytime and anywhere in their own pace (Boettcher & Conrad, 2016; Eby, 2013; Jansen et al., 2017). As a result, it would be justified to argue that DE adopts a student-centered (Simonson et al., 2015) and constructivist approach (Boz Yüksekdağ, 2016). Furthermore, by removing the limitations mandated by location and time, DE may provide students with a personalized instruction that is compatible with their learning styles (Kışla, 2016). Potential benefits of DE have been summarized by Simonson et al. (2015) as follows: *a)* DE enables students to progress at their own pace; *b)* It is easier for students to reach the course materials as well as extra materials related to the course content; *c)* It becomes much easier for the teachers to update and upgrade their course materials to catch up with the latest innovations once they have developed them; *d)* DE has the potential to facilitate active learning by encouraging students' intellectual development; *e)* A well-designed online course may cater for a variety of learning styles by offering a range of learning experiences and opportunities; *f)* DE may also improve students' digital literacy skills, which is regarded as a key 21st century skill.

DE is not without its critics, though. As has been pointed out by Eygü and Karaman (2013), Devran and Elitaş (2016) and Simonson et al. (2015), the main weaknesses of DE are: *a)* Whereas DE is effective in improving students' cognitive skills, it has serious limitations in the development of affective and psycho-motor skills; *b)* Courses that have practical components may not lend themselves easily to DE; *c)* For individuals who lack the willingness to take on more responsibility or who lack self-study skills and autonomy, DE may not yield positive results; *d)* The limited interaction between and among the teacher and the students may lead to problems in terms of students' social skills; *e)* Availability of technological tools and access to internet may not be possible for every learner and the phenomenon of 'digital divide' surely exists, particularly, in lower socioeconomic and rural regions; *f)* It may be a challenge for the teachers to design their courses in the best way as it requires time, effort, expertise and resources; *g)* Adopting a student-centered approach may be a novel experience for many teachers, which may also become a limitation; *h)* The provision of feedback may not be as immediate as it is in traditional face-to-face education, which may upset some students.

Considering the advantages and challenges of DE, it would be fair to claim that the shift from traditional face-to-face education to DE requires teachers to master certain competences. To be more precise, they need to be more aware of the individual differences among their students, foster learner autonomy (Karasu & Sarı, 2019), improve their own technological, techno-pedagogical and communication skills, provide a student-centered and cooperative learning environment, guide their learners' self-development and offer timely and constructive feedback (Kavrat & Türel, 2013). Likewise, the availability and efficiency of interaction between and among the teacher and the students have been viewed as conducive to greater interest and motivation in the process of DE on the part of the students (Koç, 2020), which implies that teachers need to be open to communication. In a similar vein, learners are expected to take on more responsibility in DE (Boz Yüksekdağ, 2016; Eby, 2013; Simonson et al., 2015); therefore, teachers should be ready to provide more support for their students by taking their individual characteristics, interests and learning styles into consideration (Bayrak et al., 2017; Özgür, 2013). It should also be noted that learners need to improve their self-regulation skills if they are to get the most out of their experience with DE.

Self-regulation

Although the mystery of how humans learn has not been unearthed yet, it has been argued that learning should be viewed as a social activity that requires active involvement of the learner. In addition, thanks to the internet technology and unprecedented advancements in many fields of study, the quantity of data to be mastered by the learners has become more than manageable; thus, teachers need to focus on *how* their students can learn rather than *what* they should learn (Kramarski, 2017). As has been highlighted by Hattie,

…we learn by employing effective and flexible strategies that help us to understand, reason, memorize and solve problems; learners must know how to plan and monitor their learning, how to set their own learning goals, and how to correct errors; sometimes prior knowledge can stand in the way of learning something new, and students must learn how to solve internal inconsistencies and restructure existing conceptions when necessary; and learning takes considerable time and periods of practice to start building expertise in that area (2009, p. 246).

As has been aforementioned, DE grants more freedom and autonomy to the learners in comparison to traditional face-to-face education, which implies that distance learners need to regulate their process of learning to a greater extent and make use of a variety of strategies and behaviors such as planning their work, setting goals and monitoring their progress (Jansen et al., 2017; Jansen et al., 2018). In this respect, the concept of self-regulation (SR) in education has been highlighted as a key 21st century skill and it has been argued that SR may yield benefits both in academic and professional contexts (Kramarski, 2017; Pintrich, 2000; Usher & Shunk, 2017; Zimmerman, 2008). The term self-regulation can be defined as "the process of systematically organizing one's thoughts, feelings, and actions to attain one's goals" (Usher & Shunk, 2017, p. 19). According to Hadwin et al. (2017), self-regulated learning "…refers to individual learners taking metacognitive control of cognitive, behavioral, motivational, and emotional conditions/states through iterative processes of planning, monitoring, evaluation, and change" (p. 83). In this respect, regulation has been regarded as a multifaceted skill that assumes human agency; involves cyclical adaptation; draws from personal socio-historical experiences; involves adaptively responding to new challenges, situations, or failure; and is socially situated involving dynamic interplay between learners, tasks, teachers, peers, parents, context, and cultures (Hadwin et al., 2017, pp. 84-85).

In a similar vein, it has been reported that both internal and external circumstances guide the construct of SR and it can be learned via a four-stage process; observation, emulation, self-control and self-regulation (Usher & Shunk, 2017). Furthermore, it has been argued that SR has a tripartite structure (see Figure 1) and self-regulated learners are not only active during the actual process of learning, but also before and after this process (Jansen et al., 2018; Puustinen & Pulkkinen, 2001). While Jansen et al. (2017) employ the terms *preparatory, performance* and *appraisal*, Zimmerman (2000) adopts a social cognitive perspective and prefers to use *forethought, performance or volitional control* and *self-reflection* for the same stages by highlighting cyclical nature of the process. In this respect, the data collection tool utilized in this study comprises of five factors; namely, *Metacognitive Skills, Help Seeking, Persistence, Environmental Structuring,* and *Time Management.* Whereas the factor of *metacognitive skills* extend over three stages, the other factors focus on the performance phase (Jansen et al., 2017). To put it differently, the tripartite structure of SR has also been reflected in the data collection tool.
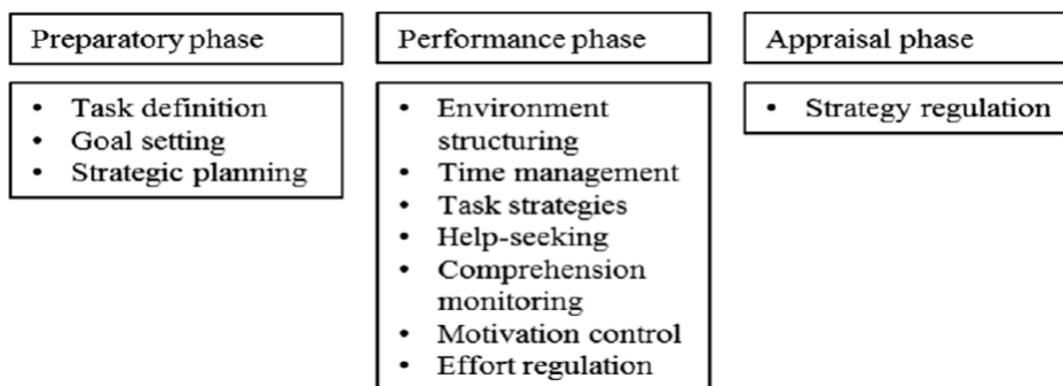
Figure 1. Overview of SRL activities categorized into three phases (Jansen et al., 2017, p. 7).

In traditional face-to-face education learners are usually not involved in the preparatory phase whereas in DE they are expected to define the task, set their own goals and conduct a strategic plan with the aim of achieving their goals. Zimmerman (2000) also incorporates the process of task definition within the stage of forethought and perceives *goal setting* as deciding on particular consequences of learning. In a similar way, *strategic*

planning can be understood as making the best use of "methods that are appropriate for the task and the setting" (Zimmerman, 2000, p. 17). Moreover, learners need to structure their environment in the best way, decide on when and how long they are going to study, employ a variety of strategies to perform the task, seek help if they need, check and monitor their level of comprehension and keep their motivation at the highest throughout the course. Furthermore, learners need to undergo a process of reflection and formative self-assessment on their progress at the end of the task and, if they are not satisfied with their level of their mastery, they may decide to make use of a different strategy in their next experience to attain the goals they have set. Therefore, this tripartite process can be regarded as a cycle and each phase is closely interrelated with the other (Shunk & Greene, 2017).

According to Sinatra and Taasoobshirazi (2017), the construct of SR is built upon three key components; *metacognition*, referring to the knowledge and skill to understand and regulate one's cognition; *cognition*, referring to the knowledge and skill to solve problems and think critically; *motivation*, referring to the beliefs and attitudes guiding the growth and utilization of cognition and metacognition. In a similar vein, Mevarech et al. (2017) draw a parallel between the GPS (Global Positioning System) and metacognition in that, similar to the GPS, metacognition assists learners in the processes of planning, monitoring, regulating and reflection particularly when they need to deal with complex, unfamiliar and unusual problems.

It should be noted that promoting students' self-regulated learning (SRL) has recently been regarded as the main aim of educators and SRL is viewed as instrumental to higher academic achievement (Wolters & Won, 2017). In a similar vein, Kramarski (2017) assigns a dual role to teachers in that teachers must, first of all, become self-regulated learners and, secondly, self-regulated teachers if they are to help their students attain SRL. In plain terms, teachers need to design their online courses in such a way that they can enable their learners to become more active by directing their personal learning experiences in DE. More specifically, learners should be able to spend more time on thinking, reflecting, searching, sharing, collaborating, reading, writing and peer-reviewing (Boettcher & Conrad, 2016). In a similar vein, the software or platform employed with the aim of conducting DE should also provide the students with the opportunities for both classroom learning and autonomous learning following the course (Jansen et al., 2018; Wang, 2019).

Purpose and Significance of the Study

The sudden outbreak of Covid-19 pandemics led to transformations globally in many sectors from healthcare and tourism to trade and education among many others. As a response, educational institutions have adopted DE to minimize and avoid physical contact. However, none of the stakeholders (including administrators, teachers and students) seemed to be ready for such a radical transformation and it brought with it certain challenges for all the parties. Thus, the effects of Covid-19 pandemics on education continue to be investigated from different perspectives. In this context, the main aim of this study is to pinpoint the level of self-regulated online learning perceptions of pre-service teachers in Turkey. In addition, the study also aims to reveal whether the pre-service teachers' self-regulated online learning perceptions differ according to their gender, department, class, level of digital literacy and the time they daily spend online. Consequently, the results gathered by this study will enable teacher trainers and researchers in the field of teacher training to identify the factors that guide the perceptions of pre-service teachers on self-regulated online learning and DE courses can be designed in such a way that will increase the learners' awareness and utilization of self-regulated learning.

Statement of the Problem and Research Questions

The question this research mainly deals with is:
Do pre-service teachers' self-regulated online learning perceptions differ according to their gender, department, class, level of digital literacy and the time they daily spend online?

As a response to this question, this study aims to identify self-regulated online learning perceptions of pre-service teachers by shedding light on the variables that have an influence on their perceptions. Therefore, the research questions to be dealt with in this study are:
1. What is the level of overall perception of pre-service teachers on self-regulated online learning?
2. Do pre-service teachers' self-regulated online learning perceptions differ according to their gender?
3. Do pre-service teachers' self-regulated online learning perceptions differ according to their department?
4. Do pre-service teachers' self-regulated online learning perceptions differ according to their class?
5. Do pre-service teachers' self-regulated online learning perceptions differ according to their level of digital literacy?

6. Do pre-service teachers' self-regulated online learning perceptions differ according to the time they daily spend online?

Method

This section of the study deals with the research design, participants, data collection procedures and tool(s) as well as data analysis processes.

Research Design

In this study a quantitative research method; namely correlational model, one of the scanning models, has been employed. The main purpose of the study is to reveal the current state of a situation that has been experienced or is being experienced (Karasar, 2000). Accordingly, 353 pre-service teachers studying at the Faculty of Education, Süleyman Demirel University have agreed to participate in the study. The participants have been asked to fill in an online self-report questionnaire consisting of two parts; namely, 'demographic information' and 'Self-Regulated Online Learning Scale'.

Participants

The study group of the present research consists of a total of 353 volunteer pre-service teachers studying in six different departments at the Faculty of Education, Süleyman Demirel University. The technique of 'convenience sampling' (Dörnyei, 2007; Nunan, 1992) has been employed within this study in that the participants have been selected because of their convenient accessibility and proximity to the researchers. Since all the participants provided the requested information, there was no lost data. Demographic information of the participants is presented in Table 1.

Table 1. Demographic Information of the Participants

| Departments | Number of Participants | | | |
	Female	Male	Total	Department %
English Language Teaching	35	11	46	13
Elementary Mathematics Education	37	5	42	12
Science Education	37	11	48	13
Primary School Teacher Education	75	30	105	30
Turkish Language Teaching	44	16	60	17
Social Studies Education	42	10	52	15
Total	270	83	353	100

Data Collection Tool(s)

The data collection tool employed with the aim of gathering the necessary data for the statistical analyses consists of two sections. In the first section of the tool, participants are requested to provide their demographic information such as their genders, departments, classes, digital literacy levels and time they daily spend online. The second section of the data collection tool aims to collect participants' perceptions of self-regulated online learning; thus, 'Self-regulated Online Learning Scale' (SOLS), developed and validated by Jansen et al. (2018), has been employed. The procedures of adaptation of SOLS into Turkish and details as to the validity of SOLS have been explained below.

Self-regulated Online Learning Scale (SOLS)

SOLS has originally been developed by Jansen et al. (2017) and validated and revised form of the SOLS has been released by Jansen et al. (2018). Existing scales and questionnaires to measure SRL such as the *Motivated Strategies for Learning Questionnaire* (Pintrich et al., 1991), *the Online Self-regulated Learning Questionnaire* (Barnard et al., 2009), *the Metacognitive Awareness Inventory* (Schraw & Dennison, 1994), and *the Learning Strategies Questionnaire* (Warr & Downing, 2000) have been scanned and items of the SOLS have been

collected from these data collection tools. While these scales and questionnaires are designed with traditional face-to-face education in mind, the SOLS has been constructed for online education. The initial version of the SOLS involved 53 items under 11 factors. However, as a result of the exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) conducted on two different datasets, the revised version of the SOLS has been structured in a 7-point Likert-type design (1: not at all true for me and 7: very true for me) and there are a total of 36 items in the scale. Items between 1 and 18 (18 items) comprise *Metacognitive Skills* (MS); items between 19 and 21 (3 items) comprise *Time Management* (TM); items between 22 and 26 (5 items) comprise *Environmental Structuring* (ES); items between 27 and 31 (5 items) comprise *Persistence* (P); and items between 32 and 36 (5 items) comprise *Help Seeking* (HS) factors.

Therefore, the revised version of the SOLS has been adopted within this study and it has been translated into Turkish by the researcher. As a next step, the original and the translated forms of the SOLS have been examined by three experts who hold PhDs in English language teaching. Their suggestions for revision have been implemented and final version of Turkish form of the SOLS has been checked by another expert holding her PhD in Turkish language education. The final version of the Turkish form of the SOLS has been achieved in line with the recommendations of the expert holding her PhD in Turkish language education. At the end of this process, it has been regarded by the researchers that the inner validity of the SOLS has been mastered. After the final version of the Turkish form of the SOLS has been arrived at, the first stage of pilot study with seven English language teaching department students has been conducted and the readability as well as comprehensibility of the SOLS has been assured. Ultimately, the second stage of the pilot study has been conducted with 303 pre-service teachers to demonstrate the confirmatory factor analysis (CFA), built upon a structural equation model (see Figure 2).
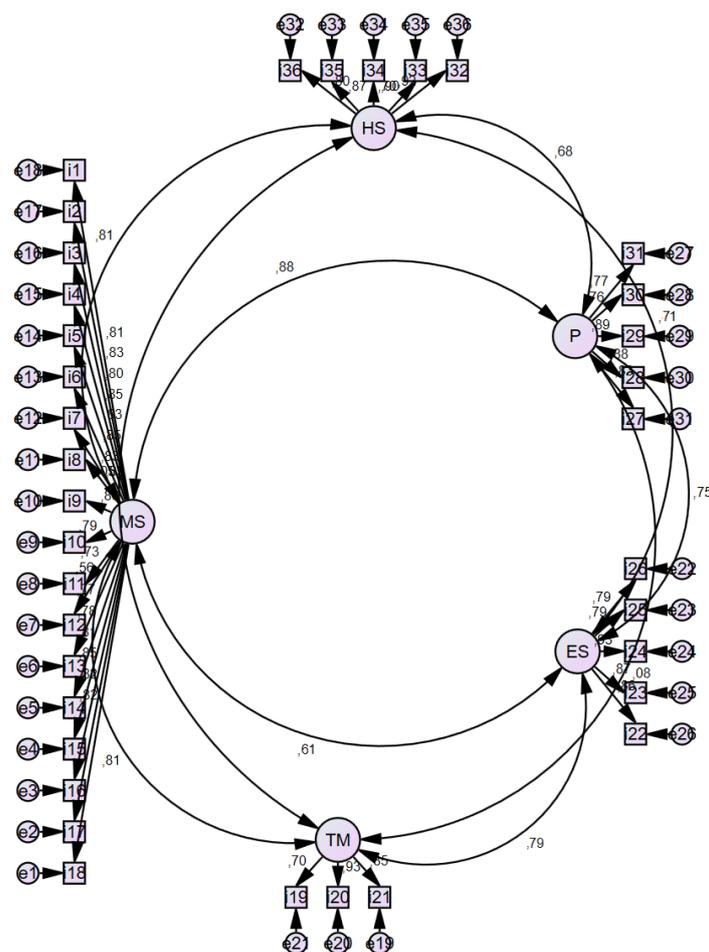

Figure 2. SOLS Factor Analysis
(MS: Metacognitive Skills, HS: Help Seeking, P: Persistence, ES: Environmental Structuring, TM: Time Management)

Figure 2 presents the relationship between the factors of the SOLS and the items in each factor. It has been observed that the correlation coefficients calculated between the factors and their items vary between .67 and .91. According to Büyüköztürk (2002), the relationship coefficient of 0.60 and above can be interpreted as high-level correlation. When the numerical values are examined, it can be argued that the correlation coefficients calculated between the factors and their items are perfectly acceptable. As a result of the analyses, it is seen that $\chi2 = 1707$, $p = .000$, $df = 566$, $\chi2 / df = 3.02$ are significant. Furthermore, Figure 2 demonstrates that the adapted form of the SOLS includes five factors and it is compatible with the original form of the SOLS. Results of the confirmatory factor analysis (CFA) have been provided in Table 2.

Table 2. Confirmatory Factor Analysis Results for SOLS

Index	Perfect fit criteria	Good fit criteria	Research finding	Result
x2/df	0-3	3-5	3.02	Good fit
RMSEA	$.00 \leq RMSEA \leq .05$	$.05 \leq RMSEA \leq .10$	.08	Good fit
SRMR	$.00 \leq RMSEA \leq .05$	$.05 \leq RMSEA \leq .10$	.06	Good fit
GFI	$.95 \leq RMSEA \leq 1.00$	$.90 \leq RMSEA \leq .95$	.92	Good fit
CFI	$.95 \leq CFI \leq 1.00$	$.90 \leq CFI \leq .95$	.90	Good fit
NFI	$.95 \leq NFI \leq 1.00$	$.90 \leq NFI \leq .95$	.94	Good fit
RFI	$.95 \leq RFI \leq 1.00$	$.90 \leq RFI \leq .95$	.91	Good fit

When Table 2 is examined, the value ($\chi2 / df = 3.02$) obtained by proportioning the chi-square fit index value to the degree of freedom indicates that it is below 5, which is regarded as an acceptable value (Henson & Roberts, 2006; Stevens, 2002). In addition, when RMSEA, SRMR, GFI, CFI, NFI, RFI values are examined, it is seen that the model is acceptable (Jöreskog & Sörbom, 1993; Hu & Bentler, 1991 ; Schmitt, 2011, Tabachnick & Fidell 2014, pp.712-713).

The internal consistency coefficient, which indicates the reliability of the scale, has been found as stratified coefficient alpha = .98. Likewise, the reliability of the factors are computed as; Metacognitive Skills α = .97, Time Management α = .72, Environmental Structuring α = .93, Persistence α = .91, Help Seeking α = .92. Therefore, the scale is considered to have internal consistency. It should also be noted that the obtained results concur with the findings reported by Jansen et al. (2018). In this respect, as a result of the CFA conducted, it can be argued that the adapted form of the SOLS is a valid and reliable data collection tool.

Data Collection Procedures

The data collection process for this study started in October, 2020 following the approval of Süleyman Demirel University Ethics Board (September 14, 2020 / 96-6) and ended at the end of November, 2020. Due to the restrictions mandated by Covid-19 pandemic, no physical contact has been allowed; therefore, the data collection tool has been uploaded on an online platform (forms.google.com) and the link has been shared with the pre-service teachers. Participants have been informed about the content as well as the aim of the study and their consents have been obtained before they have been asked to participate in the study.

Data Analysis

For the analysis of the data obtained, independent samples t-test and one-way analysis of variance (ANOVA) are to be employed. Before these analyses have been conducted, the data have been examined in line with the assumptions offered by Mertler & Vannatta (2005), Tabachnick & Fidell (2014) and Thode (2002). More specifically, the number of data collected (N=353) and continuity of the data have fulfilled the assumptions. As a next step, the values obtained by dividing the skewness and kurtosis coefficients of the data into standard errors need to be checked to ensure normality (Howitt & Cramer, 2011; Tabachnick & Fidell, 2014) and it has been observed at the end of this analysis that the skewness value is outside the ± 2 limit. In addition, since the total number of participants is over 50, Kolmogorov-Smirnov test has been implemented and, in line with its results ($p < .05$), it can be argued that it does not meet the normal distribution condition. Similarly, the Q-Q charts also support this finding. Finally, it has been decided that the data are not distributed normally. Since the

data are not distributed normally, analysis of variance homogeneity has been skipped. As a result, Mann-Whitney U test and Kruskal-Wallis H test, which are non-parametric tests, have been employed for the analyses.

Findings

In this section of the study, the findings of the analyses conducted for each research question have been presented.

Research Question 1. What is the level of overall perception of pre-service teachers on self-regulated online learning?

The arithmetic mean and standard deviation values are given in Table 3 with the aim of answering the first research question.

Table 3. Statistics for SOLS and its Factors

Factors / SOLS	N	$\bar{x}$	Percentage of scores (%)	Standard deviation	Minimum and maximum scores that can be achieved
Metacognitive Skills	353	81.03	64.31	25.05	18-126
Time Management	353	13.42	63.91	3.73	3-21
Environmental Structuring	353	24.86	71.03	7.87	5-35
Persistence	353	23.89	68.26	7.62	5-35
Help Seeking	353	23.11	66.03	8.25	5-35
SOLS	353	166.31	66	45.90	36-252

Except for items 19 and 21, which have been scored reversely, all the items in the SOLS are positive and the mean scores of the responses given to the items have been computed. In addition, as the number of items in the factors is different from each other, the total scores that can be obtained are different. With the aim of making a comparison among the factors possible and easier, mean scores have been converted into percentages by correcting them according to the total score. Accordingly, the highest mean score has been observed in the '*Environmental Structuring*' factor with a score of % 71.03. There are 5 items in this factor of the SOLS. The highest score that can be obtained here is 35 whereas the lowest possible score is 5. It can be argued that pre-service teachers' perceptions on the environmental structuring factor of SOLS are relatively high and they mostly agree with the items under the factor of environmental structuring. Similarly, the percentage of scores in the '*Persistence*' factor is % 68.26. There are 5 items in this factor of the SOLS. While the highest score that can be obtained in this factor is 35, the lowest possible score is 5. It can be argued that the pre-service teachers' perceptions on the persistence factor of SOLS are somewhat high. The percentage of scores in the '*Help Seeking*' factor is % 66.03. There are 5 items in this factor of the SOLS. The highest score that can be obtained in this factor is 35 and the lowest possible score is 5. It can be contended that pre-service teachers' perceptions on the help seeking factor of SOLS are at moderate level. Similarly, in the '*Metacognitive Skills*' factor, the percentage of overall scores is % 64.31. There are 18 items in this factor of the SOLS. The highest possible score in this factor is 126 while the lowest possible score is 18. It can be said that pre-service teachers' perceptions on the factor of metacognitive skills are at moderate level. Finally, the percentage of pre-service teachers' scores in the '*Time Management*' factor is % 63.91. There are 3 items in this factor of the SOLS. The highest score that can be obtained in this factor is 21 whereas the lowest possible score is 3. It should be noted that pre-service teachers' perceptions on the factor of time management is the lowest in comparison to the other factors.

When it comes to the pre-service teachers' overall perceptions of the SOLS, the percentage of their scores in the SOLS is % 66. There are a total of 36 items in the SOLS. Therefore, while the highest score that can be obtained in the SOLS is 252, the lowest possible score is 36. Considering the percentage of their mean scores, it can be argued that the pre-service teachers' perceptions on the SOLS are also at moderate level.

Research Question 2. Do pre-service teachers' self-regulated online learning perceptions differ according to their gender?

In line with the second research question, Mann-Whitney U test has been conducted to reveal whether the

perceptions of pre-service teachers on self-regulated online learning differ according to their gender. The findings of the analysis have been presented in Table 4 below.

Table 4. U-Test Results for SOLS according to Gender

Gender	N	Mean rank	Sum of rank	U	p	Effect size
Female	270	183.16	49454.50	9540.50	,041	0.219
Male	83	156.95	13026.50			

*p<0.05

As can be understood from the figures given in Table 4, the mean scores of female pre-service teachers on SOLS (183.16) are higher than those of their male counterparts (156.95). Moreover, findings reveal that this difference between the mean scores female and male pre-service teachers is statistically significant (U = 9540.50; p <0.05). In other words, it can be argued that pre-service teachers' perceptions, to some extent, differ according to their gender in that female pre-service teachers' perceptions on the SOLS are higher than their male counterparts.

Research Question 3. Do pre-service teachers' self-regulated online learning perceptions differ according to their department?

In line with the third research question, Kruskal-Wallis H test has been conducted to reveal whether the perceptions of pre-service teachers on self-regulated online learning differ according to the department they study. The findings of the analysis have been presented in Table 5 below.

Table 5. Kruskal-Wallis H Test Results for SOLS according to Department

Department	n	Mean rank	df	χ2	p	Significant difference
English Language Teaching	46	172.43				No difference
Elementary Mathematics Education	42	183.85				
Science Education	48	209.04	5	9.05	.11	
Primary School Teacher Education	105	162.94				
Turkish Language Teaching	60	162.98				
Social Studies Education	52	190.50				

Table 5 shows that the mean scores of pre-service teachers studying at the department of science education are the highest (209.04) whereas the mean scores of pre-service teachers studying at the department of primary school teacher education are the lowest (162.94). Nevertheless, Kruskal-Wallis H test results indicate that the observed difference is not statistically significant (χ^2 (5) = 9.05, p>0.05). To put it differently, the perceptions of pre-service teachers on self-regulated online learning do not differ according to the department they study.

Research Question 4. Do pre-service teachers' self-regulated online learning perceptions differ according to their class?

In line with the fourth research question, Kruskal-Wallis H test has been conducted to reveal whether the perceptions of pre-service teachers on self-regulated online learning differ according to their class. The findings of the analysis have been presented in Table 6 below.

Table 6. Kruskal-Wallis H Test Results for SOLS according to Class

Class	n	Mean rank	df	χ2	p	Significant difference
Freshman	132	169.08				No difference
Sophomore	118	175.51				
Junior	59	177.89	3	3.81	.28	
Senior	44	203.57				

Table 6 indicates that the mean scores of senior pre-service teachers studying are the highest (203.57) whereas the mean scores of freshman pre-service teachers are the lowest (169.08). Nonetheless, Kruskal-Wallis H test results suggest that the observed difference is not statistically significant (χ^2 (3) = 3.81, p>.05). More plainly, the perceptions of pre-service teachers on self-regulated online learning do not differ according to their classes.

Research Question 5. Do pre-service teachers' self-regulated online learning perceptions differ according to their level of digital literacy?

In line with the fifth research question, Kruskal-Wallis H test has been conducted to reveal whether the perceptions of pre-service teachers on self-regulated online learning differ according to their level of digital literacy. It should be noted at this point that the participants have been asked about their self-perceived digital literacy levels and a data collection tool has not been employed with the aim of identifying their levels of digital literacy. The findings of the analysis have been presented in Table 7 below.

Table 7. Kruskal-Wallis H Test Results for SOLS according to Level of Digital Literacy

Digital Literacy Level	n	Mean rank	df	χ2	p	Significant difference	Effect size
Basic	138	146.60				Good-basic	0.46
Good	181	192.95	2	21.51	.00	Very good-basic	0.56
Very Good	34	215.47					

Table 7 shows that the mean scores of pre-service teachers with basic digital literacy is the lowest (146.60) whereas the mean scores of pre-service teachers with very good digital literacy is the highest (215.47). Furthermore, Kruskal-Wallis H test results indicate that the difference observed is statistically significant (χ^2 (2) = 21.51, p< 0.05). As a next step, Mann Whitney U test has been conducted to determine the level of difference between and among the groups. The findings show that the mean scores of pre-service teachers with good level of digital literacy are higher than the mean scores of pre-service teachers with basic level of digital literacy, with the difference being at moderate level. Similarly, it has been observed that the mean scores of pre-service teachers with very good level of digital literacy are higher than the mean scores of pre-service teachers with good level of digital literacy, with the difference being at moderate level.

Research Question 6. Do pre-service teachers' self-regulated online learning perceptions differ according to the time they daily spend online?

Finally, for the analysis of the sixth research question, Kruskal-Wallis H test has been conducted to reveal whether the perceptions of pre-service teachers on self-regulated online learning differ according to the time they daily spend online. The findings of the analysis have been presented in Table 8 below.

Table 8. Kruskal-Wallis H Test Results for SOLS according to Time Daily Spent Online

Time Daily Spent Online	n	Mean rank	df	χ2	p	Significant difference	Effect size
1-2 hours	79	146.33					0.52
3-4 hours	140	173.63					
5-6 hours	82	203.26	3	13.73	.00	5-6 hour - 1-2 hour	
7+ hours	52	191.26					

Table 8 indicates that the mean scores of pre-service teachers who daily spend 1-2 hours online is the lowest (146.33) whereas the mean scores of pre-service teachers who daily spend 5-6 hours online is the highest (203.26). Moreover, Kruskal-Wallis H test results show that the difference observed is statistically significant

(χ^2 (3) = 13.73, p< 0.05). Subsequently, Mann Whitney U test has been implemented to determine the level of difference between and among the groups. The findings show that the mean scores of pre-service teachers who daily spend 5-6 hours online are higher than the mean scores of pre-service teachers who daily spend 1-2 hours online, with the difference being at moderate level.

Discussion

The findings demonstrate that pre-service teachers' perceptions are the highest in the factor of *environmental structuring* whereas their perceptions are the lowest in the factor of *time management*. The reason for this finding may be related to the assignment of too much homework or project work on the part of the pre-service teachers. As a result, they may not be able to organize their time properly to fulfill the requirements of various courses they are taking. Furthermore, their overall perceptions of the SOLS have also been observed to be at moderate level. More precisely, in line with the wording of the 7-point Likert-type items in the SOLS, their mean score is somewhere between 'somewhat true of me' and 'true of me' rather than 'very true of me', which implies that pre-service teachers' self-regulated online learning perceptions need to be supported and improved.

The findings also show that pre-service teachers' perceptions, to some extent, differ according to their gender in that female pre-service teachers' perceptions on the SOLS are higher than male pre-service teachers' perceptions on the SOLS, which is consistent with the findings of the study conducted by Weis et al. (2013). Pre-service teachers from six different departments have participated in this study and the findings indicate that the perceptions of pre-service teachers on self-regulated online learning do not differ according to the department they study. In a similar vein, the perceptions of pre-service teachers on self-regulated online learning do not differ according to their classes. Nevertheless, it should be noted that although the observed difference is statistically insignificant, the perceptions of the pre-service teachers increase as they move toward graduation, which implies that their awareness of SR improves as they continue their tertiary education. As has been aforementioned, pre-service teachers have been asked to specify their perceived level of digital literacy and the findings show that there exists a mutual correlation between the digital literacy levels and the SOLS perceptions of pre-service teachers as the higher their digital literacy levels, the higher their perceptions on the SOLS, which is consistent with the findings of Karasu and Sarı (2019), Usher and Shunk (2017) and Jansen et al. (2018). Similarly, it has been observed that SOLS perceptions of pre-service teachers who daily spend 5-6 hours online are higher than those of pre-service teachers who daily spend 1-2 hours online, with the difference being at moderate level. This finding also supports the presumption that as the pre-service teachers spend more time on the internet, their digital literacy level increases and this directly contributes to their perceptions of SR.

Conclusion and Educational Implications

The field of education is characterized by constant change as "learning does not happen in a vacuum but takes place in constantly changing contexts and is reformed every time" (Järvenoja et al., 2015, p. 204). In this sense, the main aim of formal schooling should be to teach students how to learn, which can only be achieved via SR (Hoyle & Dent, 2017). Moreover, it seems certain that the significance of SR will multiply as the integration of technology into the field of education continues.

It has been reported by Winne (2017) that undergraduate students appear to be undereducated in terms of self-regulation; however, it should also be noted that self-regulation skills can be learned without much effort with the help of remedial instruction on certain study tactics and learning strategies (Winne, 2017). When it comes to Turkish context, it can be construed by the findings of the study that pre-service teachers' level of perceptions of self-regulated online learning is far from satisfactory as the percentage of their perceptions are somewhere between 'somewhat true of me' and 'true of me' rather than 'very true of me'. This clearly suggests that pre-service teachers' self-regulated online learning perceptions need to be supported and improved. Furthermore, the findings of the present study also indicate that the gender, level of digital literacy and time daily spent online have an influence on the SOLS perceptions of the pre-service students. To be more precise, it has been observed that female pre-service teachers' perceptions of the SOLS are higher than those of their male counterparts. This finding has been supported by Tseng et al. (2017) who have reported that female students have better control in strategy use than male students in the context of foreign language learning. On the other hand, Gestsdottir et al. (2014) have reported conflicting results at the end of the longitudinal study they have conducted in European context in that while female students have outperformed males in Iceland, the opposite has been observed in France and Germany, which has been attributed to the effect of cultural setting. In a similar vein, Meece and Painter (2008) have examined gender differences in elementary and secondary students' use of SRL strategies

and found that males outperform females; however, they have admitted that cultural stereotypes of male and female abilities may have significant implications. As an example, it has been argued that females are more frequently expected to conform to socials norms; thus, their experience and skill in regulating their emotions and behaviors tend to be superior compared to males (Davis, 1995). As to the relationship between SRL and digital literacy, it has been observed that as the participants' digital literacy levels and the time they daily spend online increase, their perceptions of SRL improve. A recent study conducted by Demirbag and Bahcivan (2021) support this conclusion by highlighting the interrelationship among their participants' epistemological beliefs, self-regulation skills and digital literacy. Similarly, Arias Soto and González Gutiérrez (2019) have aimed to reveal the possible effects of digital literacy training on the participants' SR skills and foreign language speaking skills. Their results indicate that improved levels of digital literacy yield in development in basic SR skills and attitudes as well as foreign language oral skills. As has been argued by Karasu and Sarı (2019) and Usher and Shunk (2017), utilization of technology contributes to SR and, by the same token, deployment of SR also facilitates the process of DE (Cho & Shen, 2013). More specifically, Cho and Shen (2013) explain SRL via several constructs (namely; *goal orientation, academic self-efficacy, effort regulation, metacognitive regulation,* and *interaction regulation*) and report that multiple types of regulations such as effort regulation, metacognitive regulation, and interaction regulation are utilized in students' SRL in online learning environments.

To sum up, DE has entered into the field of education at an unprecedented scale and in the period of new normal in the aftermath of Covid-19 pandemics, it seems that DE may not cease to be employed totally. On the contrary, latest technology and DE will possibly continue to be utilized in some form, especially for the instruction of courses with theoretical content. In this respect, the facilitative effects of technology on SR skills of the learners have been underscored by several researchers (Demirbag & Bahcivan, 2021; Karasu & Sarı, 2019; Usher & Shunk, 2017). The development of students' digital literacy and SR skills stands as a prerequisite for success in DE. Given the importance of SR for academic and professional success, educational institutions of all levels need to aim at improving not only the students' but also the teachers' SR skills (McInerney & King, 2017). To be more specific, both in-service and pre-service teachers should be considered as life-long learners, which comes to mean that they constantly need to be aware of their dual roles as self-regulated learners and self-regulated teachers with the aim of fostering their students' self-regulation abilities (Kramarski, 2017; Perry et al., 2008; Thiede & de Bruin, 2017). To achieve this, strategy training sessions should be planned and conducted for both pre-service and in-service teachers. Additionally, both groups of teachers should be encouraged to develop and support their own students' SR skills.

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Appendix

Öz-düzenleyici Çevrimiçi Öğrenme Ölçeği (ÖÇÖÖ)

	*1	2	3	4	5	6	7
1. Çevrimiçi derslerde bir göreve başlamadan önce gerçekten ne öğrenmem gerektiğini düşünürüm.							
2. Çevrimiçi derslerde eğitime başlamadan önce neye çalışmam gerektiği konusunda kendimi sorgularım.							
3. Hem kısa vadeli (günlük veya haftalık) hem de uzun vadeli (aylık veya tüm çevrimiçi eğitim süresince) hedefler belirlerim.							
4. Çevrimiçi derslerde çalışma zamanımı yönetmeme yardımcı olması için hedefler belirlerim.							
5. Çevrimiçi derslerde bir göreve başlamadan önce özel hedefler belirlerim.							
6. Çevrimiçi derslerde sorunların çözümü için alternatif yollar düşünerek, en iyisini seçerim.							
7. Geçmişte işime yarayan stratejileri çevrimiçi derslerde kullanmaya çalışırım.							
8. Çevrimiçi derslerde kullandığım her strateji için belirli bir amacım vardır.							
9. Çevrimiçi derslere çalışırken kullandığım stratejilerin farkındayımdır.							
10. Günlük olarak derslere katılmak zorunda olmasam da, çevrimiçi derslere çalışma zamanımı yine de haftanın günlerine eşit şekilde yaymaya çalışırım.							
11. Çevrimiçi derslerdeki önemli ilişkileri anlamama yardımcı olması için düzenli aralıklarla ders tekrarı yaparım.							
12. Çevrimiçi dersleri anlama düzeyimi kontrol etmek amacıyla, kendimi düzenli aralıklarla duraksamış bulurum.							
13. Çevrimiçi derslerde bir şeyler öğrenirken ne düzeyde öğrendiğim konusunda kendimi sorgularım.							
14. Çevrimiçi derslerde çalışmamı bitirdikten sonra öğrendiklerim hakkında düşünürüm.							
15. Çevrimiçi derslerde çalışmamı bitirince, hedeflerime ne düzeyde ulaştığımı sorgularım.							
16. Çevrimiçi derslerde ilerleyemediğim zaman kullandığım stratejileri değiştiririm.							
17. Çevrimiçi derslere çalışırken kendimi kullandığım stratejilerin yararlılık düzeyini analiz ederken bulurum.							
18. Çevrimiçi derslerde çalışmamı bitirdikten sonra yaptığım şeyi başka hangi yollarla yapabileceğimi sorgularım.							
19. Çevrimiçi derslerde bir çalışma planına bağlı kalmakta zorlanırım.							
20. Çevrimiçi dersler için haftalık okuma ve ödevleri kaçırmamaya özen gösteririm.							
21. Diğer etkinlikler nedeniyle çevrimiçi derslere çok zaman harcamadığımı sık sık görürüm.							
22. Dikkatimin dağılmasını önlemek için çevrimiçi derslere							

çalıştığım mekanı dikkatle seçerim.							
23. Çevrimiçi derslere çalışmak için konforlu bir yer bulurum.							
24. Çevrimiçi derslere en etkin nerede çalışabileceğimi bilirim.							
25. Çevrimiçi derslere çalışmak için düzenli olarak kullandığım bir yer vardır.							
26. Çevrimiçi derslerde öğretmenimin benden öğrenmem gereken konularla ilgili beklentilerini bilirim.							
27. Çevrimiçi ders çalışırken sıkıldığım zaman, dikkatimi toplamak için kendimi zorlarım.							
28. Çevrimiçi ders esnasında zihnim dersten uzaklaşmaya başladığında, derse tekrar odaklanmak için özel çaba gösteririm.							
29. Çevrimiçi derslere ilgimi kaybetmeye başladığımda kendimi daha çok teşvik etmeye çalışırım.							
30. Yapmam gerekenler hoşuma gitmese de, çevrimiçi derslerde başarılı olmak için çok çalışırım.							
31. Çevrimiçi ders materyalleri sıkıcı olsa bile bitirinceye kadar çalışmaya devam ederim.							
32. Çevrimiçi derslerde bir şeyi tam olarak anlamadığım zaman sınıf arkadaşlarıma fikirlerini sorarım.							
33. Çevrimiçi derslerde sorunlarımı sınıf arkadaşlarımla paylaşarak nerede zorlandığımızı ve sorunları nasıl çözebileceğimizi bulurum.							
34. Çevrimiçi ders eğitmeninden yardım alma konusunda ısrarcıyımdır.							
35. Çevrimiçi ders materyallerinde emin olamadığım bir şey olursa sınıf arkadaşlarımla görüşürüm.							
36. Çevrimiçi derslerde nasıl performans gösterdiğimi öğrenmek için sınıf arkadaşlarımla iletişim kurarım.							

*1. Benim için hiç doğru değil.
2. Benim için doğru değil.
3. Benim için biraz doğru değil.
4. Kararsızım.
5. Benim için biraz doğru.
6. Benim için doğru.
7. Benim için oldukça doğru.