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# Unpacking the Relationship Between Online Student Engagement and Online Self-Regulation in Higher Education

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Online student engagement refers to the level of students' involvement and effort in online learning activities. Individuals with self-regulation skills actively and constructively set their goals and strategies based on their own knowledge, independent of environmental influences. However, research exploring the relationship between self-regulation and student engagement in online learning environments is limited. This study aimed to examine this relationship within online learning environments. The research utilized survey, causal-comparative, and correlational research models to address its questions. Participants included 660 bachelor's degree students, and data was collected using an online student engagement scale and an online self-regulation skills scale. The findings indicated that both online self-regulation skills and online student engagement were at moderate levels. The study found that online student engagement did not significantly differ by gender. However, university students aged 25 and over had significantly higher online engagement than other age groups. Additionally, fourth-year university students exhibited significantly higher online involvement than students in other grade levels, and students from numeric fields demonstrated significantly higher online engagement compared to those from other fields. In terms of online self-regulation, there were no significant differences by age and grade level. Nevertheless, female students exhibited significantly higher self-regulation skills than male students, and students from numeric fields had significantly higher self-regulation skills than those from other fields. Moreover, the study found a significantly positive moderate correlation between online student engagement and online self-regulation skills. The findings also revealed that online self-regulation skills could explain 40.4% of the variance in online student engagement.

## Introduction

With the COVID-19 pandemic in the 2020s, distance education has become more prevalent, quickly permeating every aspect of our lives. Thus, institutions and organizations

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have increasingly adopted distance education to expand access to educational and training activities (Khoo & Bonk, 2022). Post-pandemic, there has been a significant trend towards offering education both as fully online learning and blended campus courses (Bates, 2022). In this context, online learning, as a subset of distance education (Anderson, 2008), is a method where the teacher and learner are remote from each other, and the learner uses technology to access instructional materials and interact with the teacher and other students (Ally, 2008). Online learning can also be defined as learning that takes place through computers and other supporting resources (Carliner, 2004). In such a learning environment, students can access information from anywhere through synchronous education via applications such as Skype, WhatsApp, Microsoft Teams, or asynchronous education through forums, emails, videos, and podcasts (Gonzalez & Louis, 2018). Online learning provides education tailored to individual needs, unbound by the constraints of time and place, making it a more flexible and convenient way to take courses. Learners can pursue education using their own learning methods without the constant need for a teacher. However, completing an online course requires greater learner autonomy and initiative (Kearsley, 2002). At this point, since learners are not physically present in online courses, the concepts of student engagement and self-regulation skills, both of which make the learning process more effective, become even more important.

### *Student engagement*

Online learning brings both challenges and opportunities. One challenge is that students have fewer opportunities to interact with the institution or teacher. To address this, experts emphasize creating more opportunities for students by focusing on the concept of "student engagement" (Günüç & Kuzu, 2014; Martin & Bolliger, 2018). Student engagement is defined as the quality of students' involvement and effort in learning activities (Kuh, 2009a). Specifically, online student engagement refers to the realization of this engagement in an online learning environment. Kuh (2001, 2003, 2009a, 2009b) expanded the definition of student engagement to include institutional actions that increase students' participation in activities.

Student engagement consists of three sub-dimensions: cognitive engagement, affective engagement, and behavioral engagement (Fredricks et al., 2004). Behavioral engagement includes observable and measurable behaviors such as attending classes, completing assigned tasks, and participating in activities. Affective engagement encompasses the positive or negative feelings a person has towards the classroom environment, friends, teacher, and institution. Cognitive engagement involves personal efforts to succeed, strategies developed to achieve goals, self-regulation, learning values, individual goals, and self-determination (Doğan, 2014; Ekşi et al., 2017; Fredricks et al., 2004). Archambault et al. (2009) also noted that self-regulation is a component of cognitive engagement and that it affects learning engagement both directly and indirectly (Doo et al., 2021).

### *Self-regulation*

In online learning, students can carry out their own education process without being dependent on time or a teacher. This independence from time and space provides significant advantages, but it also presents challenges. These challenges can be physical, such as connection problems, device malfunctions, or issues arising from the application, or they can involve difficulties like the inability to self-manage or lack of knowledge on how to use the system (Özarslan et al., 2007). Self-regulation skills are crucial in this context. Self-regulated learning is a person's self-development through personal effort, without relying on metacognitive, motivational, and behavioral strategies to gain knowledge and skills

(Zimmerman, 1989). Individuals with self-regulation skills actively and constructively form their goals and strategies based on their own knowledge, independent of environmental factors (Pintrich, 2000). They create their own learning strategies and motivation in line with their goals, aiming to be proactive rather than passive. Research shows that individuals with high self-regulation skills tend to have higher academic achievement (Cho & Shen, 2013; Park & Kim, 2022).

Self-regulation skill consists of six sub-dimensions: goal setting, environmental arrangement, time management, study strategies, seeking help, and self-evaluation (Lan et al., 2004). It encompasses organizing one's academic success, social skills, emotional and cognitive thoughts, and managing one's own development in the learning process. Self-regulation skills can also be developed with external help (Çiltaş, 2011). Online self-regulation, thus, is the application of self-regulation skills in an online learning environment. Researchers are particularly interested in the self-regulation of online learners due to the physical distance between teachers and students in online learning (Koh et al., 2023).

### *Online student engagement and online self-regulation*

The literature indicates a relationship between student engagement and self-regulation. Self-regulation is a crucial element of student engagement (Wong & Liem, 2022). There is a noted relationship between cognitive engagement, one of the sub-dimensions of student engagement, and self-regulation skills (Archambault, 2009; Doğan, 2014; Fredricks et al., 2004). Cognitive engagement involves using self-regulation strategies that support deep understanding and expertise (Fredricks et al., 2004). Wolters and Taylor (2012) also highlighted the presence of a metacognitive link between self-regulation skills and student engagement.

Furthermore, student engagement and self-regulation are significant predictors of academic achievement (Ghelichli et al., 2023; Soner, 2021). Sun and Rueda (2012) found a significant positive correlation between self-regulation and each dimension of student engagement (behavioral, emotional, cognitive) in an online learning environment. They also found that self-regulation significantly predicts all dimensions of student engagement. Similarly, Kokoç (2019) found that self-regulation in online learning has a moderately significant effect on behavioral, affective, and cognitive engagement. Soner (2021) also identified a significant positive correlation between online self-regulation and online student engagement. Another research by Zhong et al. (2022) revealed a significant positive correlation between self-regulation and student engagement among students studying in blended synchronous learning modes. They also found that self-regulation positively and significantly affects student engagement. However, Zhong et al. (2022) noted that their study participants were students attending a specific course, which might limit the generalizability of their findings. They recommended using random sampling methods in future research to ensure generalizability.

There are a limited number of studies examining the relationship between self-regulation and student engagement in online learning environments. Researchers suggest that studies on this topic should aim to reach the population or use random sampling methods for generalization. In this context, the current study examined the relationship between student engagement and self-regulation skills in online learning environments by attempting to reach the entire research population. To this end, answers to the following research questions were sought.

(1)What is the level of student engagement in an online learning environment?
(2) Does the student engagement in an online learning environment differ according to

(a) age,
(b) gender,
(c) year of study, and
(d) field of study?

(3) What is the level of students' self-regulation skills in an online learning environment?
(4) Does the level of students' self-regulation skills in an online learning environment differ according to
(a) age,
(b) gender,
(c) year of study, and
(d) field of study?
(5) Is there a significant relationship between student engagement and self-regulation skills in online learning environment?
(6) Is self-regulation skill a significant predictor of student engagement in online learning environment?

## Method

In the first and third research questions of the study, the survey model was used. The survey model is a method of collecting information from a group of people to describe some aspects or characteristics of the population of which the group is a part (Büyüköztürk et al., 2022; Fraenkel et al., 2012). In this study, the survey model was employed to determine the level of student engagement in online learning environments for the first research question and the level of self-regulation skills in online learning environments for the third research question.

For the second and fourth research questions, the causal-comparative research model was utilized. Causal comparison is a research method that aims to identify the causes of an event or situation and the variables that affect these causes (Büyüköztürk et al., 2022). The second research question aimed to determine whether student engagement in online learning environments varies according to age, gender, year of study, and field of study. Similarly, the fourth research question aimed to determine whether students' self-regulation skills in online learning environments vary according to the same demographic variables.

In addressing the fifth and sixth research questions, the correlational research model was used. This model is employed to determine whether there is a relationship between variables and, if so, how these variables change together (Bedir Erişti et al., 2013). The correlational model examined the relationship between student engagement and self-regulation skills in online learning environments for the fifth research question, while for the sixth one, it investigated whether self-regulation skills predict student engagement.

### *Participants*

The research population consists of 2735 undergraduate students studying at the Faculty of Education of a state university. Initially, no sampling was conducted, and an attempt was made to reach the entire population. However, only 660 students volunteered to participate, making the research sample consist of these 660 students. This sample size represents the population with a confidence level of 99.68% and a 5% margin of error. The research population got distance education during the COVID-19 pandemic, so the participants have online learning experience. Demographic information about the study group is provided in Table 1.

Table 1. Demographic information on the study group

| Demographic Variables | Categories | *n* | Percentage (%) |
|---|---|---|---|
| Gender | Female | 468 | 70.9 |
| | Male | 192 | 29.1 |
| Age | 18 and younger | 31 | 4.7 |
| | 19 | 71 | 10.8 |
| | 20 | 142 | 21.5 |
| | 21 | 152 | 23.0 |
| | 22 | 129 | 19.5 |
| | 23 | 76 | 11.5 |
| | 24 | 28 | 4.2 |
| | 25 and older | 31 | 4.7 |
| Year of study | 1 | 130 | 19.7 |
| | 2 | 229 | 34.7 |
| | 3 | 148 | 22.4 |
| | 4 | 153 | 23.2 |
| Field of study | Numerical | 158 | 23.9 |
| | Verbal | 185 | 28.0 |
| | Equally-weighted | 170 | 25.8 |
| | Foreign Language | 120 | 18.2 |
| | General Aptitude | 27 | 4.1 |

*Note*. Based on the data obtained from the departments, the decision was made to compare fields rather than departments due to insufficient data from some departments. Fields were categorized according to university entrance areas, resulting in the creation of numerical, verbal, equally-weighted, foreign language, and general aptitude field types. Specifically, the numerical field included departments such as Computer Education and Instructional Technology, Science, Chemistry, and Mathematics. The verbal field encompassed Geography, Preschool, Special Education, Social Sciences, and Turkish Language Education departments. The equally-weighted field consisted of Guidance and Psychological Counseling, and Primary School Education departments. The foreign language field included English and Japanese departments, while the general aptitude field comprised Music and Art departments.

## *Data collection tools*

### *Online student engagement scale*

The online student engagement scale developed by Sun and Rueda (2012) and adapted into Turkish by Ergün and Usluel (2015) was used in this study. The purpose of the scale is to measure students' engagement in online environments. The version adapted by Ergün and Usluel (2015) consists of 19 items under three factors: behavioral, cognitive, and affective engagement. According to confirmatory factor analysis, the scale shows a good fit. The reliability coefficients of the scale factors were calculated to be between .62 and .90, and the item-total correlations of the scale items were between .265 and .658. In this study, the reliability coefficient of the overall scale was found to be .859, with .641 for the behavioral dimension, .903 for the affective dimension, and .782 for the cognitive dimension.

### *Online self-regulation scale*

The online self-regulation scale used in this study was originally developed by Lan et al. (2004), with the short form created by Barnard et al. (2008). The validity and reliability of the short form were calculated by Barnard et al. (2009), and the form was adapted into Turkish by Kilis and Yıldırım (2018). The purpose of the online self-regulation scale is to measure students' self-regulation skills in online environments. The version adapted by Kilis and Yıldırım (2018) consists of 24 items under six sub-dimensions: goal setting, environment

structuring, task strategies, help seeking, time management, and self-evaluation. Confirmatory factor analysis found the scale to be valid. Cronbach's alpha reliability coefficients were calculated to be between .67 and .87 for the scale factors and .95 for the overall scale, indicating the scale's reliability. In this study, the reliability coefficient of the overall scale was .872, with .786 for the goal setting dimension, .756 for the environment structuring dimension, .625 for the task strategies dimension, .671 for the time management dimension, .576 for the help seeking dimension, and .728 for the self-evaluation dimension.

### *Data analysis*

Within the scope of the research, quantitative data were collected using the online student engagement scale and the online self-regulation skills scale, with the p significance value set at .05. Five-point Likert-type scales were coded as follows: "Strongly Disagree=1" to "Strongly Agree=5". Equal ranges were determined for interpreting the scale means: 1-1.80 as "strongly disagree", 1.81-2.60 as "disagree", 2.61-3.40 as "moderately agree", 3.41-4.20 as "agree", and 4.21-5 as "strongly agree". Mean and standard deviation were used to analyze the data obtained from the first and third research questions.

To determine which analysis methods to use for the other questions, initially, the normal distribution of the data was to be assumed in terms of the skewness and kurtosis values. The data were considered normally distributed for research questions two, four, five, and six, as the skewness and kurtosis values were within the range of ±1 (Hair et al., 2014). All other assumptions were also met, so parametric tests were used. Accordingly, independent samples *t*-tests were used for questions comparing two groups, one-way ANOVA for independent samples for questions comparing more than two groups, Pearson correlation to measure the relationship between two variables, and simple linear regression analysis to measure the predictive status between two variables. Tukey's test was used as a post hoc test to determine the source of the difference in findings significant in ANOVA analysis because it controls the type 1 error rate very well, and group variances are similar (Field, 2009).

### *Compliance with ethical standards*

For this study, approval was obtained from the Scientific Research Ethics Committee of School of Graduate Studies at Çanakkale Onsekiz Mart University (Date: 02.10.2020, Protocol Number: 2020/90).

## Findings

### *Online student engagement level*

The mean level of online student engagement is 3.12 (SD = .58), which corresponds to "moderately agree". The mean level of online student engagement in the behavioral engagement dimension is 3.44 (SD = .70), corresponding to "agree". Similarly, the mean level of online student engagement in the cognitive engagement dimension is 3.51 (SD = .65), also at the "agree" level. However, the mean level of online student engagement in the affective engagement dimension is 2.34 (SD = .93), which corresponds to "disagree".

### *Differences in online student engagement by age*

Descriptive statistics of online student engagement according to age are given in Table 2.

Table 2. Descriptive statistics of online student engagement according to age

| **Age** | **f** | $\bar{x}$ | **SD** |
|---|---|---|---|
| 18 and under | 31 | 3.04 | .45 |
| 19 | 71 | 3.12 | .61 |
| 20 | 142 | 3.01 | .53 |
| 21 | 152 | 3.04 | .58 |
| 22 | 129 | 3.20 | .56 |
| 23 | 76 | 3.20 | .60 |
| 24 | 28 | 3.19 | .65 |
| 25 and above | 31 | 3.53 | .49 |

One-way ANOVA test for independent samples was conducted to examine the change in student engagement in online learning environment according to age (Table 3).

Table 3. Differences in online student engagement by age

| **Source of variation** | **Sum of Squares** | ***df*** | **Mean Square** | ***F*** | ***p*** | **Differences** |
|---|---|---|---|---|---|---|
| Between groups | 9.67 | 7 | 1.38 | 4.31 | **.001*** | 8>1; 8>2; 8>3; 8>4 |
| Within groups | 208.89 | 652 | .32 | | | |
| Total | 218.55 | 659 | | | | |

*Note*. *p<.05; 1: 18 years and younger; 2: 19 years; 3: 20 years; 4: 21 years; 5: 22 years; 6: 23 years; 7: 24 years; 8: 25 years and older

As a result of the test, it was concluded that online student engagement differed statistically significantly according to age ($F_{(7\text{-}652)}$=4.31; p=.001<.05; d=.90). A Tukey test was conducted to determine between which age groups the differences occurred. The student engagement of undergraduate students aged 25 years and above was found to be significantly higher than that of those aged 18 years and below ($\Delta\bar{x}_{(25 \text{ and older} - 18 \text{ and younger})}$=.49; p=.017<.05), 19 years ($\Delta\bar{x}_{(25 \text{ and older} - 19)}$=.42; p=.016<.05), 20 years ($\Delta\bar{x}_{(25 \text{ and older} - 20)}$=.52; p=.001<.05), and 21 years ($\Delta\bar{x}_{(25 \text{ and older} - 21)}$=.49; p=.001<.05).

### *Differences in online student engagement by gender*

Independent samples t-test was conducted to examine the change in student engagement in online learning environment according to gender (Table 4).

Table 4. Variation of online student engagement by gender

| **Gender** | **n** | $\bar{x}$ | ***SD*** | ***df*** | ***t*** | ***p*** |
|---|---|---|---|---|---|---|
| Female | 468 | 3.13 | .57 | 658 | .741 | .459 |
| Male | 192 | 3.10 | .60 | | | |

As seen in Table 4, the results of the t-test did not yield a significant difference between the genders in online student engagement ($t_{(658)}$=.741; p=.459).

### *Differences in online student engagement by year of study*

Descriptive statistics of online student engagement according to year of study are given in Table 5.

Table 5. Descriptive statistics of online student engagement according to year of study

| **Year of Study** | **f** | $\bar{x}$ | **SD** |
|---|---|---|---|
| 1 | 130 | 3.10 | .54 |
| 2 | 229 | 3.03 | .57 |
| 3 | 148 | 3.14 | .57 |
| 4 | 153 | 3.26 | .59 |

One-way ANOVA test for independent samples was conducted to examine the change in student engagement in online learning environment according to grade level (Table 6).

Table 6. Differences in online student engagement by year of study

| **Source of variation** | **Sum of Squares** | ***df*** | **Mean Square** | ***F*** | ***p*** | **Difference** |
|---|---|---|---|---|---|---|
| Between groups | 4.66 | 3 | 1.55 | 4.77 | **.003*** | 4>2 |
| Within groups | 213.89 | 656 | .326 | | | |
| Total | 218.55 | 659 | | | | |

*Note*. *p<.05; 1: 1st year; 2: 2nd year; 3: 3rd year; 4: 4th year

The analysis found that students' online engagement levels differed according to their grade level ($F(3\text{-}656)=4.77$; $p=.003<.05$; $d=.40$). A Tukey test determined between which grade levels the differences occurred. Fourth-grade students had significantly higher engagement than second-grade students ($\Delta\bar{x}(4-2)=.22$; $p=.001<.05$).

### *Differences in online student engagement by field of study*

Descriptive statistics of online student engagement according to field of study are given in Table 7.

Table 7. Descriptive statistics of online student engagement according to field of study

| **Field of Study** | **f** | $\bar{x}$ | **SD** |
|---|---|---|---|
| Numerical | 158 | 3.28 | .53 |
| Verbal | 185 | 3.10 | .63 |
| Equal weight | 170 | 3.03 | .57 |
| Foreign language | 120 | 3.09 | .53 |
| General aptitude | 27 | 3.07 | .52 |

One-way ANOVA test for independent samples was conducted to examine the change in student engagement in online learning environment according to the field type (Table 8).

Table 8. Differences in online student engagement by field of study

| **Source of variation** | **Sum of Squares** | ***df*** | **Mean Square** | ***F*** | ***p*** | **Differences** |
|---|---|---|---|---|---|---|
| Between groups | 6.01 | 4 | 1.50 | 4.63 | **.001*** | 1>2; 1>3; 1>4 |
| Within groups | 212.54 | 655 | .324 | | | |
| Total | 218.55 | 659 | | | | |

Note. *p<.05; 1: Numerical; 2: Verbal; 3: Equally-Weighted; 4: Foreign Language; 5: General Aptitude

The analysis found that students' online engagement levels differed according to the field type ($F_{(4\text{-}655)}$=4.63; p=.001<.05; d=.45). A Tukey test determined between which field types the differences occurred. The online engagement of students from the numerical field type was significantly higher than that of students from the verbal field type ($\Delta\bar{x}_{(\text{numerical – verball})}$=.19; p=.021<.05), students from the equally-weighted field type ($\Delta\bar{x}_{(\text{numerical – equally-weighted})}$=.26; p=.001<.05) and students from the foreign language field type ($\Delta\bar{x}_{(\text{numerical – foreign language})}$=.19; p=.043<.05).

### *Online self-regulation skill level*

The overall mean of the online self-regulation skill level scale is 3.19 (SD=.54), which corresponds to "moderately agree". The goal setting dimension ($\bar{X}$=3.16; SD=.75), task strategies dimension ($\bar{X}$=2.77; SD=.77), time management dimension ($\bar{X}$=2.76; SD=.84), help seeking dimension ($\bar{X}$=3.28; SD=.75) and self-evaluation dimension ($\bar{X}$=3.22; SD=.83) are all at the "moderately agree" level. The environment structuring dimension ($\bar{X}$=3.88; SD=.74) is at the "agree" level.

### *Differences in online self-regulation skills by age*

Descriptive statistics of online self-regulation skills according to age are given in Table 9.

Table 9. Descriptive statistics of online self-regulation skills according to age

| **Age** | **f** | $\bar{x}$ | **SD** |
|---|---|---|---|
| 18 and under | 31 | 3.12 | .33 |
| 19 | 71 | 3.21 | .59 |
| 20 | 142 | 3.12 | .48 |
| 21 | 152 | 3.22 | .55 |
| 22 | 129 | 3.24 | .56 |
| 23 | 76 | 3.17 | .59 |
| 24 | 28 | 3.19 | .71 |
| 25 and above | 31 | 3.35 | .42 |

One-way ANOVA test for independent samples was conducted to examine the change in online self-regulation skills according to age (Table 10).

Table 10. Differences in online self-regulation skills by age

| Source of variation | Sum of Squares | *df* | Mean Square | *F* | *p* |
|---|---|---|---|---|---|
| Between groups | 2.25 | 7 | .322 | 1.10 | .362 |
| Within groups | 191.14 | 652 | .293 | | |
| Total | 193.40 | 659 | | | |

The analysis did not reveal any significant difference in online self-regulation levels according to the age of the participants ($F_{(7\text{-}652)}$=1.10; p=.362>.05).

### *Differences in online self-regulation skills by gender*

Independent samples t-test was conducted to examine the differentiation of online self-regulation skills according to gender (Table 11).

Table 11. Differences in online self-regulation skills by gender

| Gender | n | $\bar{x}$ | *SD* | *df* | *t* | *p* | d |
|---|---|---|---|---|---|---|---|
| Female | 468 | 3.24 | .54 | 658 | 3.50 | **.001*** | .30 |
| Male | 192 | 3.08 | .53 | | | | |

Note. *p<.05

Female undergraduate students' online self-regulation skills ($\bar{X}$=3.24; SD=.54), were significantly higher than those of male undergraduate students ($\bar{X}$=3.08; SD=.53) as seen in Table 7 ($t_{(658)}$=3.50; p<.05; d=.30).

### *Differences in online self-regulation skills by year of study*

Descriptive statistics of self-regulation skills according to year of study are given in Table 12.

Table 12. Descriptive statistics of online self-regulation skills according to year of study

| Year of Study | f | $\bar{x}$ | SD |
|---|---|---|---|
| 1 | 130 | 3.22 | .50 |
| 2 | 229 | 3.15 | .52 |
| 3 | 148 | 3.21 | .57 |
| 4 | 153 | 3.22 | .57 |

One-way ANOVA test for independent samples was conducted to examine the change in online self-regulation skills according to grade level (Table 13).

Table 13. Differences in online self-regulation skills by year of study

| Source of variation | Sum of Squares | *df* | Mean Square | *F* | *p* |
|---|---|---|---|---|---|
| Between groups | .666 | 3 | .222 | .756 | .519 |
| Within groups | 192.72 | 656 | .294 | | |
| Total | 193.40 | 659 | | | |

The analysis revealed that online self-regulation skills did not differ according to the year of study ($F_{(3\text{-}656)}$=.756; p=.519>.05).

### *Differences in online self-regulation skills by field of study*

Descriptive statistics of self-regulation skills according to field of study are given in Table 14.

Table 14. Descriptive statistics of online self-regulation skills according to field of study

| **Field of Study** | **f** | $\bar{x}$ | **SD** |
|---|---|---|---|
| Numerical | 158 | 3.31 | .48 |
| Verbal | 185 | 3.21 | .57 |
| Equal weight | 170 | 3.13 | .54 |
| Foreign language | 120 | 3.07 | .54 |
| General aptitude | 27 | 3.33 | .56 |

One-way ANOVA test for independent samples was conducted to examine the change in online self-regulation skills according to field type (Table 15).

Table 15. Differences in online self-regulation skills by field of study

| **Source of variation** | **Sum of Squares** | ***df*** | **Mean Square** | ***F*** | ***p*** | **Differences** |
|---|---|---|---|---|---|---|
| Between groups | 5.28 | 4 | 1.32 | 4.60 | **.001*** | 1>3; 1>4 |
| Within groups | 188.11 | 655 | .287 | | | |
| Total | 193.40 | 659 | | | | |

*Note*. *p<.05; 1: Numerical; 2: Verbal; 3: Equally-Weighted; 4: Foreign Language; 5: General Aptitude

As seen in Table 15, according to the results of the analysis, online self-regulation skills differ significantly according to the field type ($F_{(4\text{-}655)}$=4.60; p=.001<.05; d=.47). Tukey test was used as a post hoc test. The online self-regulation skills of students in the numerical field type were significantly higher than the online self-regulation skills of students in the equally-weighted ($\Delta\bar{x}_{(\text{numerical – equally-weighted})}$=.19; p=.015<.05) and those in the foreign language field types ($\Delta\bar{x}_{(\text{numerical – foreign language})}$=.24; p=.002<.05).

### *The relationship between online student engagement and online self-regulation skills*

The Pearson correlation analysis revealed a moderate and positive significant relationship between online student engagement and online self-regulation skills. (r=.636; p<.05). In other words, the more self-regulated the students are in an online learning environment, the more they are engaged.

### *Online self-regulation skills predicting online student engagement*

Simple linear regression analysis was performed to examine how well students' online self-regulation skills predict their online student engagement. The analysis indicated that online self-regulation skills are a significant predictor of online student engagement ($F_{(1,658)}$=446.51; p<.000). Online self-regulation skill explained 40.4% ($R^2$ = .404) of the change in online student engagement. The regression equation was as follows:

Student engagement = .963 + .676 * (Self-regulation skill)

## Discussion and Conclusion

The study determined that undergraduate students' engagement in the online learning environment was at a moderate level. Sel and Şad (2023) also concluded that students' online engagement levels were moderate. The online engagement of undergraduate students aged 25 and over was significantly higher than those aged 18 and under, 19, 20, and 21. Similarly, Soner (2021) found that the engagement of the 24-25 age group was significantly higher than the 18-20 age group. However, Yıldırım and Altınpulluk (2022) found no significant difference in online engagement among undergraduate distance education students based on age.

No significant difference was found between the online student engagement of male and female undergraduate students. Emrecik and Ozan (2019) and Yıldırım and Altınpulluk (2022) also found that online student engagement did not differ according to gender, but Banihashem et al. (2021) and Soner (2021) found that female students had higher online engagement. Although the mean online engagement of fourth-grade students was higher than all other grades, the engagement levels of fourth-grade students were significantly higher than those of only second-grade students. Contrary to these findings, Yurçiçek Eren et al. (2022) reported that first-year students exhibited higher levels of online learning engagement compared to second-year students. Soner (2021) concluded that online engagement did not differ according to class level. This inconsistency in the literature indicates that the differentiation of learning engagement according to grade level may vary by context. This research revealed that the online engagement of students in the numerical field type was significantly higher than that of students in the verbal, equally-weighted, and foreign language field types.

Undergraduate students' online self-regulation skills were found to be at a moderate level. Barut Tuğtekin (2022) found that students' online self-regulation skills were "above medium". The analysis revealed no significant difference in online self-regulation skills in terms of age. Contrary to this finding, Soner (2021) concluded that online self-regulation skills differed between ages 18-20 and 24-25, favoring the 24-25 age group.

In the present study, the online self-regulation skills of female undergraduate students were significantly higher than those of male undergraduate students, which corroborates with the findings of Banihashem et al. (2021), Soner (2021), and Tülübaş (2022). On the other hand, Koç (2019) found that male students had higher self-regulation skills than female students. However, Koç's study sample consisted of students in the pedagogical formation certificate program, who were undergraduate graduates from different fields, while the other studies focused on undergraduate students at a faculty of education.

Online self-regulation skills did not differ according to grade level. Soner (2021), Barut Tuğtekin (2022), and Tülübaş (2022) also had similar findings. The online self-regulation skills of students in the numerical field type were significantly higher than those of students in the equal weight and foreign language field types. In contrast, Tülübaş (2022) found that self-regulation skills did not significantly differ according to the department.

A moderate and positive relationship exists between student engagement and online self-regulation in online learning environments, which is also supported by other studies (Doo et al., 2021; Kokoç, 2019; Soner, 2021; Sun & Rueda, 2012). This finding also corraborates the literature stating that there is a metacognitive link between student engagement and self-regulation (Wolters & Taylor, 2012) and a relationship between cognitive engagement, one of

the sub-dimensions of student engagement, and self-regulation skills (Archambault et al., 2009; Doğan, 2014; Fredricks et al., 2004; Pellas, 2014). Lastly, the current study determined that online self-regulation skill explained 40.4% of the variance in online student engagement, revealing that self-regulation and student engagement in online learning environments are related and that self-regulation is an important variable affecting student engagement.

## Suggestions

### *Suggestions for further research*

Based on age, this study identified significant differences in online engagement. The literature, however, offers contradictory findings, indicating the need for additional research to fully explore these age-related disparities while taking into account variables like prior online learning experiences. Furthermore, although this study revealed that female students had better online self-regulation skills than the male students, other research has reported different results. This means that that more thorough research is required, research that takes into account contextual factors like educational backgrounds. The impact of grade level on engagement and self-regulation has been found to have mixed results. These findings highlight the necessity for longitudinal research to monitor changes over time and pinpoint significant factors, such as student workload. Significant differences in engagement and self-regulation across different field types (numerical, verbal, equal weight, foreign language) also warrant further investigation. Future research should examine the specific challenges and supports needed for each field to enhance online learning outcomes. The moderate and significant relationship between engagement and self-regulation and the fact that self-regulation predicts engagement emphasise the need for further research on how interventions aimed at improving self-regulation can increase student engagement.

### *Suggestions for applications*

To address the specific needs of different age groups in online learning, targeted interventions should be developed. For younger students, structured guidance might be beneficial, while older students could benefit from flexible learning options that accommodate their life responsibilities. Implementing support strategies that cater to the distinct self-regulation needs of male and female students is also important. For instance, workshops focusing on time management and self-discipline could help male students improve their online self-regulation skills. Designing engagement techniques that are appropriate for different grade levels is crucial. Introductory modules for first-year students could build foundational skills in self-regulation and engagement, while advanced modules for fourth-year students could focus on enhancing intrinsic motivation and self-directed learning. Creating and implementing online learning resources tailored to the unique requirements of different academic fields is also recommended. Numerical fields might benefit from interactive simulations and problem-solving exercises, while verbal fields could utilize discussion forums and collaborative projects. Lastly, integrating training programs that develop self-regulation skilld into online curricula is essential. These programs should teach students how to plan, monitor, and evaluate their learning processes, thereby enhancing both self-regulation and engagement.

## Note

This research is a part of first author’s master thesis supervised by the second author

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