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Research Paper

# The Impact of ICT Instruction on Online Learning Readiness of Pre-Service Teachers

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**ABSTRACT**

The present study aimed to investigate the impact of a course that included ICT skills on the online learning readiness of pre-service teachers in a completely distance education environment. In the research, single group pre-test post-test model was adopted. The study was conducted with 123 pre-service teachers. The E-Learning Readiness Scale for College Students was used to collect the data. Furthermore, the course academic achievement final scores of the participants were employed. The data collection process continued during the 2020-2021 academic year fall term. The study findings demonstrated that total online learning readiness and sub-dimension scores increased after the Information Technologies Course. It was found that there was no difference across the scores based on gender. The academic achievements of female students were higher. At the beginning of the term, it was revealed that ease of use, online learning readiness and computer self-efficacy, internet self-efficacy and learner control variables varied based on personal computer ownership. At the end of the term, both these variables and academic achievement did not differ across personal computer ownership. There was a correlation between the ease of use variable and online learning readiness both at the beginning and the end of the term. On the other hand, there was no correlation between the academic achievement and ease of use or online learning readiness. It could be suggested that the present study findings could contribute to future studies in terms of online learning readiness.

## INTRODUCTION

In history, various events that significantly impacted human life have always been witnessed. One of these events is the Covid-19 pandemic. It started towards the end of 2019 and became a pandemic within a short time as declared by the World Health Organization (WHO, 2021). According to Worldometer (2021), more than 271 million people have been infected and over 5 million people lost their lives. This pandemic is not only a health problem, but also has cultural, sociological and political consequences (Bozkurt & Sharma, 2020). The new normal that governs the life is a good summary of the current state of affairs. Several restrictions have been placed on our lives to prevent the spread of the virus. Mass concerts, theater activities were prohibited or limited, and social spaces such as restaurants and cafes have been closed for in-house activities. Professional life has evolved, and several people started to work at home except mandatory circumstances. Also, education has been mostly online. This has been true for particularly the higher education institutions. All procedures have been conducted online, including exams, except for applied science departments and other applied courses in these institutions. However, the implementation of this approach necessitates the determination of the readiness of learners for online learning environments. Therefore, the investigation of the online learning readiness was deemed necessary.

### Online Learning Readiness (OLR)

It is important to examine the factors that affect online learning to develop active instructional environments (Ćukušić, Alfirević, Granić, & Garača, 2010). This is critical for the institutions to develop adequate strategies. The OLR is the key factor for the success of the process (Hukle, 2009). Thus, it is critical to determine the online readiness of individuals and reflect this determination in planning. According to Smith, Murphy, and Mahoney (2003) OLR is the recognition of the personal learning style, self-guidance skill via time management, adoption of the internal motivational resources, and the experiences acquired in this process. Readiness is affected by the physical, emotional, social and communication skills (Wynn, 2002). Online readiness is a complex phenomenon affected by several factors such as computer self-efficacy, online communication self-efficacy and self-control efficacy (Hung, 2016; Keramati, Afshari-Mofrad, & Kamrani, 2011). Also, according to Yu (2018), social competencies with instructor and classmates, technical competencies, and communication competencies are among these factors. Information and communication technologies (ICT) skills are prominent among these factors. Because communication is possible via ICT in online learning. The online learning efficacy was associated with the skills to use these tools (Keramati et al., 2011; Selim, 2007; Tang & Lim, 2013). In other words, the process is efficient with the effective ICT uses of individuals (de Bruyn, 2004). On the other hand, it was reported that OLR was associated with adaptation to the online media time management and experiences on online media (Smith, 2005; Smith et al., 2003). The time spent in these media contributes to the comprehension of the dynamics of the process (Vonderwell &

Savery, 2004). Due to the fact that the time spent on the Internet was associated with OLR (Firat & Bozkurt, 2020), the online readiness of students is even more important. Thus, the OLR of pre-service teachers should be investigated.

**Information Technologies Course**

The undergraduate teacher training curricula was revised by the Higher Education Council (2021) in the 2018-2019 academic year in Turkey. Thus, Computer 1 and Computer 2 Courses that included ICT skills were replaced by the Information Technologies and Instructional Technologies Courses. Although these courses were criticized due to the reduction in weekly course hours and completely theoretical course content, it was reported that the new courses were beneficial for ICT (Haseski, 2019; 2020; İlic, 2019; 2021c). The Information Technologies Course content was described as follows (Higher Education Council, 2021):

> "Information technologies and computational thinking, problem solving concepts and approaches, algorithms and flow charts, computer systems, basic software and equipment concepts, foundations of operating systems, current operating systems, file management, utilities (third-party software), word processing software, calculation/tabulation/graphics software, presentation software, desktop publishing, database management systems, web design, internet in education, communication and collaboration technologies, internet use, information ethics and copyrights, the effects of computers and internet on children/young adults."

The review of the course content demonstrated that it included basic ICT skills such as internet use, educational communication and collaboration technologies. Thus, the ICT skills of the individuals who attend the course are expected to improve.

**Personal Computer (PC) Ownership**

The impact of PC ownership on learner behavior was analyzed based on computer self-efficacy in Social Cognitive Theory (Bandura, 1997). Previous studies reported positive impact of PC ownership on computer self-efficacy (Selwyn, 1998; Teo, Wan, Chan, & Lim, 2002). Computer owners also feel more confident and comfortable (Kahveci, Sahin, & Genc, 2011) and exhibit more positive attitudes towards technology in education (Akgün & Topal, 2015; Harvey & Wilson, 1985; Rahimi, 2011; Roussos, 2007). It was reported that technological skills such as the attitude towards the computer and computer self-efficacy and were also effective on online readiness (Pillay, Irving, & Tones, 2007). Other studies reported no correlation between PC ownership and attendance on an online course (Kharma, 2019). It was also found that perceptions about online education did not differ based on PC ownership (Gündüz & İşman, 2018). Thus, the analysis of the PC ownership variable was considered beneficial.

**Ease of Use**

Perceived ease of use and perceived usefulness are the key factors in technology acceptance (Venkatesh & Davis, 2000). According to Davis (1989), the perceived usefulness is the belief of the individual that her or his performance would improve with technology use. Perceived ease of use was described as the belief that technology would reduce the required effort to complete a task. The facilities owned by the individual are an important obstacle to the increase in these beliefs (Sánchez-Prieto, Olmos-Migueláñez, & García-Peñalvo, 2019). To overcome this obstacle, the facilities should be improved to maximize the ease of use. Thus, the concept of ease of use was examined in the study.

**The Aim of the Study**

There are several studies that investigated the correlations between OLR and academic achievement (Bernard, Brauer, Abrami, & Surkes, 2004; Dray, Lowenthal, Miszkiewicz, Ruiz-Primo, & Marczynski, 2011; Horzum, Önder, & Beşoluk, 2014; Kerr, Rynearson, & Kerr, 2006) and perceived learning (Horzum, Kaymak, & Gungoren, 2015). Furthermore, it was reported that there was correlation across ICT skills and academic achievement in online education (Ilgaz & Gülbahar, 2015; Schrum & Hong, 2002). Computer self-efficacy and technical skills such as attitude towards the computer were also effective on OLR (Pillay et al., 2007). The positive effects of ICT skills on learning environments are known (Abbitt, 2011; Wang, Shannon, & Ross, 2013). Although there are several studies in the field of health that investigated the pandemic and its outcomes, the number of educational studies is limited (Dehghanbanadaki et al., 2020; Hossain, 2020). For instance, it was reported that the digital competencies of the learners were inadequate despite expectations (Alipio, 2020). Furthermore, it was emphasized that further studies on ICT skills (Bozkurt, 2020), the correlation between learner achievements and OLR (Chung, Subramaniam, & Dass, 2020; Hung, Chou, Chen, & Own, 2010; Joosten & Cusatis, 2020), and OLR levels of individuals in completely distant learning environments (Yu, 2018) were required. Thus, it could be suggested that the analysis of an online learning environment would be significant. Therefore, the present study aimed to determine the impact of an ICT course on the OLR of pre-service teachers.

## METHODOLOGY

**The Research Model**

The present study was designed with the single group pre-test post-test model. According to Creswell and Creswell (2018), single group pre-test post-test design includes a post-test measurement after a pre-test in a single group. This model was selected to measure

the consequences of an application conducted with a specific group (Gottman, McFall, & Barnett, 1969). Thus, the E-Learning Readiness Scale for College Students was applied to the pre-service teachers who attended the Information Technologies Course at the beginning of the semester. Then, the 14-week Information Technologies Course was instructed. At the end of the semester, the same data collection instrument was applied to all participants. The study aimed to investigate the impact of the Information Technologies Course on OLR of the pre-service teachers. Furthermore, the correlation between OLR and academic achievement was analyzed based on their final grades in the course.

**The Study Group**

In the study, the criterion sampling method was used to assign the participants based on the single group pre-test post-test model. In this method, the subjects that meet specific criteria determined in advance or by the authors are analyzed (Yıldırım & Şimşek, 2011). The pre-service teachers who attended the Information Technologies Course at the faculty of education where the present study was conducted, in the 2020-2021 academic year fall semester. Furthermore, the inclusion criteria also included attendance in the course during the term and in both OLR pre- and post-tests. Eleven students who did not meet these criteria were excluded and 123 pre-service teachers participated in the research. The majority of them were female (69.9%) and participant age ranged between 17 and 24.

**Data Collection Instruments**

The study data included student achievement and scale scores. Furthermore, the participants were asked about their age, gender, PC ownership and ease of participation in the course to determine demographics. Pre-service teachers were requested to score the ease of use variable between 1 and 10 points as well.

The E-Learning Readiness Scale for College Students used within the scope of the research was developed by Yurdugül and Demir (2017). The 7-point Likert-type scale includes 33 items in 6 factors. There are no reverse items in the scale. The scale could be considered as a highly reliable data collection instrument (Cronbach Alpha = .93). The scale pre-test internal consistency coefficient was determined as .92 in the present study, and the post-test internal consistency coefficient was .91. Based on these findings, it could be said that the internal consistency of the scale was high (DeVellis, 2012; Kline, 2000).

The achievement score was determined as the grade the student received at the end of the course instructed by the author. The grade included student exam grades, course and extracurricular activity grades and the final grade in the term. The activities determined 60% and the final exam determined 40% of the achievement score. In-course and extracurricular activities were compulsory for the students in each topic. The topic weights were taken into account when these activities were graded. The final exam was based on course achievements and topic weights. Thus, the students were graded based on a specification table. The exam included 25 multiple choice questions with 5 possible answers. The form was revised by 3 Computer Education and Instructional Technology experts. The questions were then reviewed by a language specialist, a Measurement and Evaluation expert, before the exam was finalized. For the reliability of the test, correct responses were scored 1 point and incorrect answers were scored 0. The analyses revealed that the internal consistency coefficient of the test was KR-20 = .81. The findings demonstrated that the test had high internal consistency (Wainer & Thissen, 1996).

**Procedure and Data Collection**

The study data were gathered during the 2020-2021 academic year fall term. In the research, the OLR pre-test was applied by the author before the 14 weeks long Information Technologies Course. Then, the concept of technology, the impact of computers and the Internet on children/young adults, basic search tips, the concept of computer, computer-assisted instruction, basic hardware and software concepts, operating system basics, word-processing software, presentation software, spreadsheet software, algorithms and computational thinking, and Scratch application were instructed. All lessons were conducted online. The lectures were generally pre-recorded and provided before the classes. And the classes included discussions and activities associated with the lecture. After the course content was instructed, the achievement test was applied. When the term and the final exam were over, the OLR post-test was employed. Twenty-three students with low attendance or who missed the post-test were excluded from the study.

**Data Analysis and Interpretation**

Before the determination of analysis methods, the data were tested for normal distribution. First, the sample size was reviewed. According to Pallant (2001), the sample size should be at least 15 for each group that would be compared. The sample was larger than 15. Furthermore, skewness and kurtosis should be between -2 and +2 (George, 2011). It was observed this requirement was established for all dataset variables. Also, more than one method should be employed to determine the normal distribution (Çokluk, Şekercioğlu, & Büyüköztürk, 2010). These methods include histograms and quantiles. The normal distribution was also confirmed by these methods. Therefore, parametric tests were employed in the study. The research problems and the analyzes adopted in the study are given in Table 1.

**Table 1.** Research Problems and Associated Analyses

| | Research Problems | Type of Analysis |
|---|---|---|
| 1. | Overall OLR and sub-dimension scores differ across pre-test and post-test results? | Paired Samples t-test |
| 2. | Overall OLR, OLR sub-dimension scores and achievement score based on pre-test and post-test differ across gender? | Independent Samples t-test |
| 3. | Overall OLR, OLR sub-dimension scores, ease of use and achievement scores based on pre-test and post-test differ across PC ownership? | Independent Samples t-test |
| 4. | Is there a correlation between ease of use, OLR pre-test, OLR post-pest, and achievement scores? | Pearson Correlation |

The study data were analyzed with statistics software at .05 significance level and reported.

**Limitations**

The current study has several limitations. The selected research design, the data collection instruments, the study participants, and the collected data are among these limitations.

**RESULTS**

The findings obtained with the analyses are presented under four main topics. Initially, pre-test and post-test OLR total and sub-dimension scores were compared. Then, OLR and academic achievement variables were analyzed based on gender. In the third section, the variations in OLR, ease of use, and achievement scores across PC ownership are presented. Finally, the correlations between the ease of use, OLR pre-test, OLR post-test and achievement scores are discussed.

**Findings on Total OLR and Sub-Dimension Data**

To determine the pre-test and post-test scores of the learners based on overall OLR score and sub-dimension scores, paired samples t-Test was used. The results are as given in Table 2.

**Table 2.** Paired Samples t-Test Results

| | $\bar{x}$ | Std. Deviation | t | df | p |
|---|---|---|---|---|---|
| Computer self-efficacy pre-test – post-test | -4.618 | 5.205 | -9.840 | 122 | .000 |
| Internet self-efficacy pre-test – post-test | -.707 | 3.594 | -2.183 | 122 | .031 |
| Online communication self-efficacy pre-test – post-test | -.902 | 5.165 | -1.938 | 122 | .055 |
| Self-directed learning pre-test – post-test | .317 | 6.374 | .552 | 122 | .582 |
| Learner control pre-test – post-test | -.341 | 4.349 | -.871 | 122 | .386 |
| Motivation towards e-learning pre-test – post-test | -5.065 | 8.741 | -6.426 | 122 | .000 |
| OLR pre-test – post-test | -11.317 | 21.909 | -5.729 | 122 | .000 |

Based on the results presented in Table 2, it was found that there were significant differences across overall OLR pre-test and post-test scores of all participants ($t_{(122)} = -5.729$, $p < .05$). There were differences between the sub-dimension scores as well. For example, there were significant differences across pre-test and post-test computer self-efficacy ($t_{(122)} = -9.840$, $p < .05$), internet self-efficacy ($t_{(122)} = -2.183$, $p < .05$), and e-learning motivation ($t_{(122)} = -6.426$, $p < .05$) scores. There were no significant differences between online communication self-efficacy, self-directed learning and learner control sub-dimension scores. Based on the mean scores, it was revealed that the post-test score was higher when compared to the pre-test score ($\bar{x}$post-test>$\bar{x}$pre-test). Thus, it could be suggested that the Information Technologies Course where ICT skills are instructed significantly contributed to OLR.

**Differences between OLR and Achievement Scores Based on Gender**

Independent samples t-test was employed to investigate the differences across the pre-test and post-test overall OLR, OLR sub-dimension and achievement scores of the participants. The t-test results are given in Table 3.

**Table 3.** Independent Samples t-test results

| | Group | n | $\bar{x}$ | Std. Deviation | df | t | p |
|---|---|---|---|---|---|---|---|
| Computer self-efficacy pre-test | Female | 86 | 21.40 | 6.598 | 121 | -3.505 | .001 |
| | Male | 37 | 25.70 | 5.338 | | | |
| Internet self-efficacy pre-test | Female | 86 | 24.51 | 3.760 | 97.276 | -2.765 | .007 |
| | Male | 37 | 26.14 | 2.584 | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Online communication self-efficacy pre-test | Female | 86 | 25.92 | 6.532 | 121 | -2.432 | .017 |
| | Male | 37 | 28.95 | 5.835 | | | |
| Self-directed learning pre-test | Female | 86 | 47.41 | 5.781 | 121 | 1.248 | .214 |
| | Male | 37 | 46.05 | 4.819 | | | |
| Learner control pre-test | Female | 86 | 24.02 | 3.865 | 121 | -.804 | .423 |
| | Male | 37 | 24.59 | 2.929 | | | |
| Motivation towards e-learning pre-test | Female | 86 | 22.55 | 8.535 | 121 | .870 | .386 |
| | Male | 37 | 21.03 | 9.648 | | | |
| OLR pre-test | Female | 86 | 165.80 | 24.730 | 121 | -.1.427 | .156 |
| | Male | 37 | 172.46 | 21.197 | | | |
| Computer self-efficacy post-test | Female | 86 | 27.07 | 4.453 | 121 | -.899 | .370 |
| | Male | 37 | 27.86 | 4.596 | | | |
| Internet self-efficacy post-test | Female | 86 | 25.77 | 2.651 | 121 | .355 | .723 |
| | Male | 37 | 25.57 | 3.304 | | | |
| Online communication self-efficacy post-test | Female | 86 | 27.21 | 5.785 | 121 | -1.584 | .116 |
| | Male | 37 | 28.95 | 5.049 | | | |
| Self-directed learning post-test | Female | 86 | 47.19 | 6.277 | 121 | 1.313 | .192 |
| | Male | 37 | 45.51 | 6.939 | | | |
| Learner control post-test | Female | 86 | 24.58 | 3.380 | 121 | .217 | .828 |
| | Male | 37 | 24.43 | 3.731 | | | |
| Motivation towards e-learning post-test | Female | 86 | 27.60 | 10.944 | 121 | .707 | .481 |
| | Male | 37 | 26.11 | 10.319 | | | |
| OLR post-test | Female | 86 | 179.42 | 24.947 | 121 | .205 | .838 |
| | Male | 37 | 178.43 | 23.339 | | | |
| Achievement score | Female | 86 | 93.58 | 7.578 | 52.839 | 2.513 | .015 |
| | Male | 37 | 88.78 | 10.494 | | | |

As given in Table 3, there was no significant difference across the pre-test and post-test overall OLR and OLR sub-dimension scores based on the gender variable. On the other hand, the fact that the difference that favored the males in the pre-test favored the females in the post-test was an interesting finding. This could be due to the higher impact of the course and learning environment on females. Furthermore, there were no differences based on overall OLR pre-test and ease of use scores. In the sub dimensions, there were differences across certain variables. There were significant differences between the computer self-efficacy ($t_{(121)} = -3.505$, $p < .05$), internet self-efficacy ($t_{(97.926)} = -2.765$, $p < .05$), and online communication self-efficacy ($t_{(121)} = -2.432$, $p < .05$) pre-test scores based on gender. This difference favored male participants ($\bar{x}$ male> $\bar{x}$ female). These differences could be due to personal experiences. Furthermore, a significant difference was determined that favored females across achievement scores ($t_{(52.839)} = 2.513$, $p < .05$). This also could be due to women's interest in the distance learning environment.

**Differences between, Ease of Use, and Achievement Scores Based on PC Ownership**

The independent-samples t-test was used to investigate the differences across the pre-test and post-test overall OLR and OLR sub-dimension scores based on PC ownership, are presented in Table 4.

**Table 4.** Independent Samples t-test results

| | Group | n | $\bar{x}$ | Std. Deviation | df | t | p |
|---|---|---|---|---|---|---|---|
| Ease of use | Nonowner | 29 | 5.97 | 2.442 | 39.625 | -3.523 | .001 |
| | Owner | 94 | 7.71 | 1.949 | | | |
| Computer self-efficacy pre-test | Nonowner | 29 | 19.31 | 6.990 | 121 | -3.316 | .001 |
| | Owner | 94 | 23.73 | 6.050 | | | |
| Internet self-efficacy pre-test | Nonowner | 29 | 23.55 | 3.960 | 121 | -2.595 | .011 |
| | Owner | 94 | 25.45 | 3.265 | | | |
| Online communication self-efficacy pre-test | Nonowner | 29 | 25.93 | 6.943 | 121 | -.856 | .394 |
| | Owner | 94 | 27.11 | 6.315 | | | |
| Self-directed learning pre-test | Nonowner | 29 | 46.76 | 6.139 | 121 | -.268 | .789 |
| | Owner | 94 | 47.07 | 5.355 | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Learner control pre-test | Nonowner | 29 | 22.55 | 4.634 | 121 | -2.890 | .005 |
| | Owner | 94 | 24.70 | 3.082 | | | |
| Motivation towards e-learning pre-test | Nonowner | 29 | 20.93 | 7.704 | 121 | -.803 | .423 |
| | Owner | 94 | 22.45 | 9.210 | | | |
| OLR pre-test | Nonowner | 29 | 159.03 | 27.100 | 121 | -2.307 | .023 |
| | Owner | 94 | 170.51 | 22.197 | | | |
| Computer self-efficacy post-test | Nonowner | 29 | 26.59 | 5.628 | 37.564 | -.839 | .407 |
| | Owner | 94 | 27.53 | 4.090 | | | |
| Internet self-efficacy post-test | Nonowner | 29 | 25.21 | 3.087 | 121 | -1.082 | .281 |
| | Owner | 94 | 25.86 | 2.773 | | | |
| Online communication self-efficacy post-test | Nonowner | 29 | 27.83 | 6.487 | 40.448 | .095 | .925 |
| | Owner | 94 | 27.70 | 5.350 | | | |
| Self-directed learning post-test | Nonowner | 29 | 47.86 | 6.105 | 121 | 1.119 | .266 |
| | Owner | 94 | 46.32 | 6.606 | | | |
| Learner control post-test | Nonowner | 29 | 24.59 | 3.428 | 121 | .088 | .930 |
| | Owner | 94 | 24.52 | 3.506 | | | |
| Motivation towards e-learning post-test | Nonowner | 29 | 27.59 | 12.673 | 39.694 | .219 | .827 |
| | Owner | 94 | 27.02 | 10.143 | | | |
| OLR post-test | Nonowner | 29 | 179.66 | 28.240 | 121 | .893 | .698 |
| | Owner | 94 | 178.96 | 23.232 | | | |
| Achievement score | Nonowner | 29 | 91.24 | 7.642 | 121 | -.626 | .532 |
| | Owner | 94 | 92.41 | 9.143 | | | |

Based on the data presented in Table 4, computer owners' ease of use scores were higher ($t_{(39.625)} = -3.423$, $p < .05$). It was determined that this was reflected in the OLR levels and PC ownership led to a difference between overall OLR pre-test scores ($t_{(121)} = -2.307$, $p < .05$). Also, there were significant differences between computer self-efficacy ($t_{(121)} = -3.316$, $p < .05$), internet self-efficacy ($t_{(121)} = -2.585$, $p < .05$) and learner control ($t_{(121)} = -2.890$, $p < .05$) sub-dimensions scores based on PC ownership. Besides, there was no significant difference across the post-test overall OLR and OLR sub-dimension scores. Achievement scores did not differ across PC ownership as well.

**Correlation between the Ease of Use, OLR Pre-Test and Post-Test and Achievement Scores**

Pearson Correlation coefficient was employed to examine the correlation across the ease of use, OLR pre-test, OLR post-test and achievement scores of the participants. The conducted analysis is given in Table 5.

**Table 5.** Correlation between the Ease of Use, OLR Pre-Test, OLR Post-Test and Achievement Score

| | OLR pre-test | OLR post-test | Achievement score |
|---|---|---|---|
| Ease of use | .467** | .333** | -.075 |
| OLR pre-test | - | .587** | -.095 |
| OLR post-test | | - | -.162 |

**Correlation is significant at the 0.01 level (2-tailed).

As seen in Table 5, it was found that there were significant and positive correlations between all variables except achievement score ($p < .05$). This could be due to the fact that ICT is a significant factor in distance education environments. According to Cohen (1977), the correlation across OLR pre-test and OLR post-test scores was moderate ($p < .01$, $r = .587$). Furthermore, as ease of use perception increased, both OLR pre-test and post-test scores increased. Ease of use correlated with OLR pre-test ($p < .01$, $r = .467$) and OLR post-test ($p < .01$, $r = .333$). Thus, it could be suggested that ease of use was a significant variable both at the beginning and at the end of the term. Also, although there was no significant correlation across achievement score and the other variables, the negative correlation was an interesting finding.

**DISCUSSION**

The present study aimed to examine the effect of ICT-based instruction in a completely online learning environment on OLR of the learners. Thus, the readiness of 123 pre-service teachers was analyzed. It could be suggested that the present study findings could be fruitful for the comprehension of readiness, one of the most important factors in distance education. Furthermore, it was also considered that the understanding of the online learning environment, which became compulsory during the pandemic, could contribute to future designs.

The study findings showed that the overall OLR of pre-service teachers improved. This finding was consistent with the literature (Chung et al., 2020; Hung et al., 2010; İlic, 2021b; Yurdugül & Demir, 2017). It could be suggested that ICT skills improved due to the required online learning environment and the Information Technologies Course. The increase in these skills lead to a more active online learning (de Bruyn, 2004; Keramati et al., 2011; Selim, 2007; Tang & Lim, 2013). Computer self-efficacy, internet self-efficacy, and e-learning scores of the participants also increased significantly. This finding was completely consistent with the reports by Hung et al. (2010). Furthermore, the fact that computer self-efficacy and internet self-efficacy skills would increase with computer education (Decker, 2002; Torkzadeh & Koufteros, 1994) confirmed the above-mentioned finding. The findings on motivation were inconsistent with the literature (Yurdugül & Demir, 2017; Yurdugül & Sarikaya, 2013). It is known that this factor yielded lower scores when compared to the others. It could be suggested that the scores were low due to the pandemic-induced obligations at the beginning of the term; however, they increased as the individuals adapted to the online environment (Smith, 2005; Smith et al., 2003) and due to the ICT instruction in the Information Technologies Course. It was determined that the improvement of overall scores was observed in the sub-dimensions as well. This could be due to the impact of the ICT instruction in the Information Technologies Course. Since it was reported that the course was effective in the acquisition of ICT skills (Haseski, 2019), this was an expected finding.

In the study, it was determined that OLR did not differ based on gender. This finding was in line with the findings reported in several studies (Atkinson & Blankenship, 2009; Chung et al., 2020; İlic, 2021b; Masters & Oberpriles, 2004). At the beginning of the term, the OLR of males was better; however, OLR scores of the females were higher at the end of the semester. This finding was parallel with those reported by Chung et al. (2020). It could be suggested that the Information Technologies Course and the learning environment could have contributed more to women. Only the computer self-efficacy, internet self-efficacy, and online communication self-efficacy pre-test scores of the male pre-service teachers were higher. Since certain studies considered computer self-efficacy and internet self-efficacy skills as a single factor (Yurdugül & Sarikaya, 2013), this finding could be expected. On the other hand, the findings that favored male participants could be due to their prior experiences in ICT. The reports that the above-mentioned skills could be improved by ICT experiences were consistent with this inference (Decker, 2002; Torkzadeh & Koufteros, 1994). The finding on the online communication self-efficacy contrasted with the literature that reported no difference (Chu, 2010). Thus, it could be suggested that further research is required. Besides, the achievement scores of females were higher than males. This finding was consistent with the literature, indicating that females focused more on online learning processes (González-Gómez, Guardiola, Rodríguez, & Alonso, 2012). Furthermore, the finding was also in contrast with the studies which reported that males were more successful due to their interest in e-learning systems (Xu & Wang, 2006).

The study findings demonstrated that PC ownership contributed to the ease of use perception of the individuals. This was positively reflected in OLR scores. The facilities available for the individuals are important for the ease of use perceptions (Sánchez-Prieto et al., 2019). The technical infrastructure is required for course access. Thus, the ease of use scores of computer owners were higher. This finding was consistent with the literature (Akgün & Topal, 2015; Harvey & Wilson, 1985; İlic, 2021a; Rahimi, 2011; Roussos, 2007). Considering that active ICT employment led to a more efficient and active process (de Bruyn, 2004), it could be expected that ease of use perception had a positive impact on OLR. It was revealed that there was a significant difference across computer self-efficacy, internet self-efficacy, and learner control sub-dimension scores favoring the computer owners. The finding on computer self-efficacy was in line with the previous study findings that these skills of computer owners were higher (Selwyn, 1998; Teo et al., 2002). Thus, individuals with various skills due to PC ownership were in a better position before the course. Similarly, better internet skills among these individuals were also expected. Furthermore, those who learn online know how to access information (Lawless & Brown, 1997). Learner control of individuals with more personal freedom would also be higher (Lin & Hsieh, 2001). Thus, the higher learner control scores of computer owners were another expected finding in the study. In the last variable analyzed based on PC ownership, it was found that there were no differences across the post-test OLR scores of the participants. PC ownership had no effect on achievement scores. This was unexpected since the participants attended the Information Technologies Course, which contributed to their ICT skills (Haseski, 2019). Furthermore, the study findings were in contrast with the reports that PC ownership had a positive impact on computer self-efficacy and ICT skills (Selwyn, 1998; Teo et al., 2002). The unavailability of the differences observed at the beginning of the term based on PC ownership at the end of the term could be due to the possibility that those who did not own a computer at the beginning could have shared a common computer at home by improving their time management skills. This deduction was verified by previous studies which reported that OLR was associated with adaptation to the online environment and time management (Smith, 2005; Smith et al., 2003) and even the time spent in online environments had contributions (Firat & Bozkurt, 2020; Vonderwell & Savery, 2004).

In the study, a positive and significant correlation was determined between ease of use and OLR. The resources play a key role in educational technology use (Sánchez-Prieto et al., 2019). These resources also affect the ease of use perceptions. Ease of use is one of the key factors in technology acceptance (Venkatesh & Davis, 2000). Furthermore, ICT improves efficiency in online environments (de Bruyn, 2004). The above-mentioned correlation was expected due to these factors. On the other hand, it could also be suggested that the insignificant correlation between the achievement score and ease of use also contradicted with the literature. The correlation across the achievement score and OLR was not significant. Furthermore, it was determined that all correlations with achievement score were surprisingly negative. This finding was consistent with the reports by Hung (2012) that OLR was not an important factor in academic achievement. On the other hand, it was found that this finding was in contrast with the studies, which reported a positive correlation across OLR and learning outputs (Artino, 2009; Bernard et al., 2004; Demir Kaymak & Horzum 2013; Dray et al., 2011; Galy, Downey, & Johnson, 2011; Horzum et al., 2014; Joosten & Cusatis, 2020; Kerr et al., 2006; Kruger-Ross & Waters, 2013). Furthermore, this finding was contrast with the studies which reported that attendance

in ICT courses would improve academic achievement (Yeboah & Smith, 2016; Yu, 2018). Thus, it could be suggested that further research should be carried on the correlation between OLR and learner achievement (Hung et al., 2010; Joosten & Cusatis, 2020).

## CONCLUSION AND RECOMMENDATIONS

In conclusion, it was determined that the OLR levels of the learners were higher after they attended the Information Technologies Course. It was also revealed that the overall increase in OLR score was also observed in the sub-dimensions. On the other hand, it was found that OLR score did not differ based on gender. However, the academic achievements of the female participants were better than males. Based on the findings associated with PC ownership, it was determined that this variable led to a significant difference in ease of use, OLR, computer self-efficacy, internet self-efficacy and learner control scores at the beginning of the term. By the end of the term, it was found that there were no differences between the overall OLR, and sub-dimension scores based on PC ownership. It was also determined that the academic achievements did not differ across PC ownership. The findings on ease of use revealed that the variable was correlated with OLR both before and after the instruction unlike PC ownership. Also, quite interestingly, there were no correlations between academic achievement and ease of use and OLR. It could be suggested that the findings of the present study, which was conducted completely online, were significant for the analysis of the impact of ICT courses on OLR of the individuals. Thus, it could also be suggested that future research on the below-listed topics could contribute to the literature:

- Online satisfaction could be investigated in addition to academic achievements.
- Qualitative research that investigates the reasons behind the variables analyzed in the present study could be designed.
- Further longitudinal studies could investigate future variations in OLR.
- Future modeling studies that would combine focused variables and various concepts associated with these variables could be conducted.

Based on the results some practical implications were given as below:

- In online environments, OLR of students should be taken into account. Thus, institutions should employ actions to improve the OLR levels.
- ICT courses could be a key factor in online learning settings. Therefore, these lessons should be considered in detail.
- Attention should be paid to improve the ease of use situations of learners that will affect OLR levels positively.

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