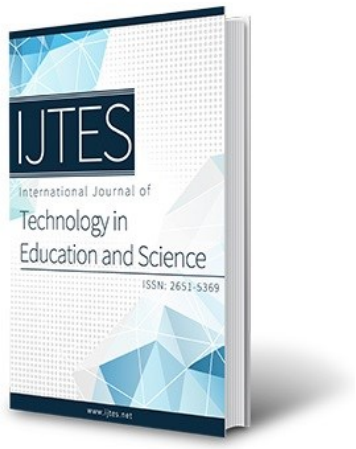


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# Analysis of Students' e-Learning Styles and their Attitudes and Self-Efficacy Perceptions towards Distance Education

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# Analysis of Students' e-Learning Styles and their Attitudes and Self-Efficacy Perceptions towards Distance Education

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## Abstract

In this study, the effects of different variables such as age, gender, department and learning style on students' e-learning styles, their attitudes towards e-learning and e-learning self-efficacy were investigated. In addition, the relationship between students' e-learning styles, their attitudes towards e-learning and self-efficacy has been examined. In this context, the data were collected from 104 both distance education and formal education students. Results show that e-learning styles vary according to gender, age, type of education and department. The e-learning self-efficacy differs in department, age and type of education, but not in gender. The results also show that students' attitudes towards e-learning differ in the way of learning, but not in age, gender and department. The results revealed that there was a positive relationship between students' e-learning styles and self-efficacy while there was no relationship between e-learning and attitudes. Additionally, a strong relationship was found between students' e-learning self-efficacy and their attitudes towards e-learning.

## Introduction

Change is a frequently mentioned concept in the field of education as mentioned in every period and in every field. This change in education has manifested itself in the field of distance education as well as traditional education and has created a cycle that constantly renews itself. The process of change has emerged in the field of distance education primarily with the aim of creating an education opportunity for individuals who cannot attend or do not want to participate in the classroom environment due to their social, professional or family status (Holmberg, 2005; Holmberg et al., 2005). For this reason, in distance education, individuals must have the ability to learn on their own and certain self-efficacy skills (Holmberg, 2005). Distance education is a form of teaching through newspapers, radio and other teaching tools as well as online education. The starting date of e-learning-based education was documented especially in the 20th century (Sumner, 2000; Bayram et al., 2009) and the 1840s formed its first period in terms of technology (Rumble, 2001); thereafter, it continued to change both technologically and expanding worldwide.

It has been determined that participation in distance education in higher education institutions in the US has grown every year and more than 6 million students took at least one online course in distance education program

in 2015. According to this study, 29.7% of higher education students in the US take at least one distance education course while 14.3% of them study only via distance education (Allen & Seaman, 2017). In Turkey, the number of distance education students enrolled at universities in the 2018-2019 academic year was 82,457. In the same year, the number of formal education students was 3.777.114 while the number of open education students was 3.880.931 (Higher Education Information Management System, 2020). As it is seen, the number of distance education students has been almost equal to the number of formal education students.

Although e-learning has emerged in formal education with the aim of creating equal opportunities for disadvantaged individuals, it seems that today it is an alternative teaching method to traditional education. Kimiloglu et al., (2017) state that one of the advantages of distance education is self-teaching and personified teaching. Verduin and Clark (1991) stated that distance education designers should take individual learning styles into account. In this process, students' self-efficacy, learning styles and attitudes are important. If students are motivated to learn by understanding their learning styles, an important step will be taken in lifelong learning (Coffield et al., 2004). Considering that the students in the distance education environment are generally between the ages of 25-50 (Moore, & Kearsley, 1996), the importance of learning styles becomes evident to ensure that individuals participate in the lifelong learning process. Self-efficacy in people has a positive effect on the use of self-regulated learning strategies (Artino, & Stephens, 2006; Bradley et al., 2017; Whipp, & Chiarelli, 2004). Therefore, self-efficacy is an important component in a distance education environment where self-regulation is important due to individual learning.

Self-efficacy is defined as “beliefs in one’s capabilities to organize and execute the courses of action required to produce given attainments” (Bandura, 1997). Self-efficacy reflects the student's belief in himself to succeed in any course (Shen et al., 2013). Zimmerman (1995) emphasizes that self-efficacy includes the individual’s thoughts about the ability to perform the task and succeed. It is clear how important self-efficacy is in a traditional learning environment. It has been studied for many years at various stages of the educational process, at various student levels and in various learning areas. In some research studies conducted in formal education context, self-efficacy is seen as a crucial determinant in the success of students (Alivernini, & Lucidi, 2011; Bandura, 1993). Similarly, high self-efficacy level in the online learning context has been found to affect students' success in online courses (Ergül, 2004; McGhee, 2010; Zimmerman, & Kulikowich, 2016). In meta-analysis studies about self-efficacy, it was revealed that self-efficacy has an important effect on academic achievement (Honicke, & Broadbent, 2016; Richardson et al., 2012, Robbins et al., 2004). However, it is known that the research results of self-efficacy in the distance education environment are more limited than the formal education environment (Prior et al., 2016). In a study examining the studies conducted between the years 1997 and 2015, it is seen that the studies on online self-efficacy are divided up into three main categories: “Computer self-efficacy, internet and information-seeking self-efficacy and learning management system (LMS) self-efficacy” (Alqurashi, 2016). Zimmerman and Kulikowich (2016) point out that most of the studies on self-efficacy are technology related, but self-efficacy cannot be limited to technology only; therefore, they have categorized self-efficacy into three sub-titles: “learning in the online environment, time management and technology use.” In the same way, Shen et al., (2013) also state that the concept of online self-efficacy should be examined in at least three dimensions: technology, learning and social interaction; however, they assert that

generally only the technology dimension is examined. In the previous studies, it is emphasized that there are very few studies focusing on online self-efficacy other than the technology competence (Alqurashi, 2016). However, it is thought that self-efficacy is extremely important in the distance education environment to overcome the isolation effect in the online environment where individuals' learning effort is a very important component (Chu, & Chu, 2010). Moore and Kearsley (2005) claim that individuals who do not believe they possess the skills to succeed in online courses are much more likely not to enroll in or continue online courses. Thus, self-efficacy is seen as extremely crucial especially in terms of overcoming the feeling of loneliness in the distance education environment where individuals need to learn independently and creatively (Chu, & Chu, 2010). Consequently, it is highly important to conduct studies on other dimensions of self-efficacy in online learning without being only limited to the technology dimension of it.

Students' attitudes towards e-learning systems are also important factors for the effectiveness of e-learning. Attitude is defined as individuals' forming a mentality or a tendency to act in a certain way as a result of their experiences or personalities (Ajzen, 2002). The concept of attitude with cognitive, affective and behavioral dimensions (Middlebrook, 1974) generally changes from positive to negative. In attitude researches, evaluating a theme and researching the underlying causes of it are at the forefront (Petty et al., 1997). Therefore, examining the attitudes of individuals in the research studies on distance education is vital in terms of efficiency of education.

Another factor that affects students' learning levels is learning styles (Felder, & Silverman, 1998). With the learning style, individuals' preferences and priorities are determined in the learning process (Dewar, & Whittington, 2000). Learning styles should be taken into account in order to know how individuals approach learning during education (Cercone, 2008). As a result of the desire of researchers and educators to know how students learn in the most efficient way, the subject of learning styles emerged (Coffield et al., 2004). As in the traditional environment, learning styles are very important in the distance education environment. As the role of students in the distance education environment is taken into consideration, it is clear that education and training can be based on learning styles (Coggins, 1998). In the previous studies, the students' preferences in the process of receiving, keeping in mind and processing the information are expressed as learning style. It is a known fact that the learning styles of students are different in both distance education and face to face education. It is seen that learning styles are grouped in different dimensions in various research studies (Kolb, 1984; Felder-Silverman, 1988; Grasha, 1996). For example, Kolb (1984) states that there are four different learning styles: accommodative, assimilative, divergent, and convergent. The convergent learners are more successful in problem solving. It has been determined that individuals with divergent learning style take their own emotions and thoughts into account in the process of formatting information. The assimilative learning style enables individuals to be extremely successful in creating conceptual models. It has been observed that accommodative learners are pleased with planning, doing and seeking new experiences (Aşkar, & Akkoyunlu, 1993). Gülbahar and Alper (2014) carried out a study on the learning styles of students in an online environment and categorized their learning styles into seven groups. The results of their study revealed that students with independent learning style prefer to work individually through guidance, and those with social learning style prefer to work in a group. In the aforementioned study, it is also stated that seeing and hearing in audio-visual learning; doing

in active learning; reading in verbal learning; overthinking in logical learning; and establishing relationships with emotions in intuitive learning are at the forefront. In spite of different categorization, it is seen that the individual characteristics of the students are taken into consideration today and the educational process is arranged according to the student characteristics (Ekici, 2003).

Understanding users' attitudes towards learning technology makes learning more effective, efficient and attractive (Liaw et al., 2007). In addition, learning styles that reflect students' self-efficacy which include their opinions about themselves and learning preferences are considered as important components. It has been demonstrated in various studies that students tend to choose lessons, courses or educational activities that are compatible with their attitudes and learning styles in both distance education and face-to-face environments; otherwise, they fail in distance education (Sankaran et al., 2000). Thus, it can be claimed that making arrangements that are appropriate to students' learning styles in e-learning environments has a positive effect on motivation and success (Hamada et al., 2011; Offir et al., 2007). On the other hand, distance education environment is a learning environment with heterogeneous groups of students in terms of previous experience, skill and attitude (Jolliffe et al., 2001). For this reason, in this study, it is aimed to investigate the distance education students' attitudes, e-learning styles and perceived self-efficacy of distance education.

There are different studies on students' attitudes towards distance education, learning styles and self-efficacy. For example; Brinkerhoff and Koroghlanian (2005) analyzed the attitudes of 512 students from six universities in the US towards online classes. They examined whether student attitudes varied according to geographic region, demographic feature, computer experience, computer skill and lesson experience prior to the Internet, and change status of their attitudes over time. Kaban (2021) examined his attitudes towards distance education, who studied with distance education during the pandemic period. In the study in which 764 students participated, the questionnaire attitude questionnaire was applied and examined in terms of different variables. Doğru (2020) examined pre-service visual arts teachers' perceptions of computer self-efficacy and their attitudes towards web-based teaching. It was determined that the students participating in the study have high attitudes towards web-based education and differ according to gender and academic year. Rhema and Miliszewska (2014) analyzed students' attitudes towards e-learning in terms of demographic features, access to technology, uses of technology in learning, and technology skills. Dick et al., (2001) determined the attitudes of undergraduate and postgraduate students towards distance education in the USA and Australia.

While analyzing students' attitudes towards flexible online learning, Drennan et al. (2005) made connections with students' perceptions of technology and autonomous and innovative learning styles. In their study, Ateş and Altun (2008a) conducted a study with 129 Computer and Instructional Technology students who are familiar with Web-based educational technologies and examined their attitudes in terms of variables such as gender, classroom level, distance learning, experience of using computers, perceived computer skills and Kolb's learning styles. Yenilmez et al., (2017) investigated the attitudes of prospective teachers studying in different departments towards distance education. Yıldız (2016) aimed to determine the attitudes of the students who obtained Pedagogical formation education via distance education towards distance education environment. On the other hand, in their study, Suanpang et al., (2004) used two different methods, traditional learning and online

learning, within the scope of statistics lesson. The results of the study showed that online learning has positive effect on students' attitudes towards the lesson.

Valenta et al., (2001) conducted a study with undergraduate and postgraduate students who had not previously taken online courses. They determined the factors affecting attitude and examined the connection between student views and learning styles in their study. There are also studies examining the relationship between the attitudes of students studying via distance education and their computer skills and their self-efficacy perceptions (Horzum, 2013; Öztürk & Kert, 2017). In addition, there are research studies conducted in different years regarding student attitudes towards distance education (Hussain, 2019; Inman et al., 1999; Li et al., 2017; Smidt et al., 2016; Smith, & McNelis, 1993). In various studies, the effect of the students' learning styles on the attitude towards the learning environment was examined and it was found that the learning style could affect the attitude (Federico, 2000; Gee, 1990). Besides, it is possible to mention the studies that indicate a positive effect between student attitude and self-efficacy (Prior et al., 2016). Ekici (2003) found out the effect of the students' learning styles on their views on the arrangement of distance education. Prior et al., (2016) investigated the effect of attitudes affecting self-efficacy and digital literacy affecting self-efficacy in an online environment and they also examined the relationship between peer involvement, interaction via LMS and self-efficacy. It has been observed that there are studies examining the learning styles of distance education students in terms of Kolb's learning styles (Bayrak et al., 2017; Özgür, 2013). In addition, it is found out that there are studies on the relationship between learning styles, academic achievement and learning outcomes (Dibartola et al., 2001; Ergün & Kurnaz, 2019; Khan, & Iqbal, 2016; Terrell, & Dringus, 2000); the e-learning styles of the students studying in the classroom teaching department (Kuru, 2018); and determining e-learning styles of classroom teachers (Şentürk & Ciğerci, 2018).

There are many different studies in the literature. In these studies, self-efficacy was generally limited to technology. In the evaluations made in terms of learning styles, it was noticed that Kolb's learning styles were generally preferred and studies related to learning styles in e-learning environment were not included. Although there are a lot of studies on attitude, it has been determined that the number of studies related with attitude, e-learning style and self-efficacy is quite limited. This present study aims to determine the attitudes, e-learning styles and self-efficacy of e-learning in general of the distance education students who take all their courses in a distance education environment and the formal education students who take only one course via distance education. It is thought that the present study will contribute to the literature, since any study examining the relationship between the three components mentioned above has not been carried out yet. In this study, the students' self-efficacy was not only limited to the technology dimension, but their self-efficacy towards the online environment was also examined. In this respect, a contribution has been made to a study area limited in the literature. In line with this purpose, answers to the following research questions were sought:

1. Do the learning styles, attitudes and self-efficacy perceptions of students differ by
    - the type of education?
    - gender?
    - department?
    - age range?

2. Is there a relationship between students' self-efficacy perceptions and attitudes towards distance education?
3. Is there a relationship between students' attitudes towards distance education and their learning styles?
4. Is there a relationship between students' self-efficacy perceptions of distance education and their e-learning styles?

## Method

### Research Design

In this current study, the attitudes, e-learning styles and self-efficacy perceptions of the distance learning students of associate degree programs and the formal education students studying for a bachelor's degree and taking the same compulsory course through online learning were examined. In this study, in which variables related to the specified situation were defined, the correlation model was used as a research method (Karasar, 2015). The survey model is also named in different ways such as survey research, field scanning or examination method, and data collection is carried out by answering written or verbal questions directed to the participants in the data collection process (Sevinç, 2009).

### Participants

E-learning styles, self-efficacy and attitude scales towards e-learning were applied to students of different faculties and vocational schools of Isparta University of Applied Sciences in the 2019-2020 academic year by paying attention to the accessibility factor during the sampling process. Additionally, personal information form including gender, department, education type and age was applied. The demographic information of 104 students who participated in the study are presented in Table 1.

Table 1. Distribution of the Participants by Demographic Characteristics (N=104)

| Demographic Characteristics | Category | Frequency | % |
|---|---|---|---|
| Gender | Male | 68 | 65.4 |
| | Female | 36 | 35.6 |
| Department | Computer Programming | 31 | 29.8 |
| | Medical Documentation and Secretarial | 29 | 27.9 |
| | Faculty of Engineering | 20 | 19.2 |
| | Aircraft Technology | 24 | 23.1 |
| Education Type | Formal Education | 44 | 42.3 |
| | Distance Education | 60 | 57.7 |
| Age Range | 18-20 | 52 | 50 |
| | 21-25 | 29 | 27.9 |
| | 26 and over | 23 | 22.1 |

As Table 1 shows, 65% (n = 68) of the students participating in the study are male and 35% of them are female.

The highest number of the students who participated in the study was from the Computer Programming Department with 31 students while the lowest participation rate (n=20) belonged to the Faculty of Engineering. While 29 students from the Medical Documentation and Secretarial Department participated in the study, the number of students studying in the Aircraft Technologies Department was 24. While 57% of the students participating in the research are distance education students, 42% of them are formal education students. Participants were categorized into 3 groups as 18-20, 21-25 and 26 and over.

**Data Tools**

In the present study, "Attitude Scale towards Distance Education", "e-Learning Styles Scale" and "Online Learning Self-Efficacy Scale" were used for data collection. The scale designed by Kışla (2016), "The Distance Education Attitude Scale", was used in order to determine students' attitudes towards the distance education environment. The scale consisting of one factor has 35 items, and it is 5-point Likert type scale. Cronbach Alpha internal consistency coefficient of the scale is reported as 0.89. As a result of the confirmatory factor analysis, it was determined that the fit indices were ($\chi 2$ / df) = 2.54, RMSEA = 0.021, GFI = 0.90, CFI = 0.93. Validity and reliability tests showed that this scale could be used to determine students' attitudes towards distance education (Kışla, 2016).

In order to determine the learning styles of students in the distance education environment, the "e-Learning Styles Scale" developed by Gülbahar and Alper (2014) was used in the study. This scale consists of 38 items and seven sub-factors. These factors are independent learning, social learning, audio-visual learning, active learning, verbal learning, logical learning and intuitive learning. It was determined that the Cronbach α values for seven factors of the scale varied between 0.72 and 0.87, and the reliability coefficient for the entire scale was 0.94. As a result of confirmatory factor analysis ($X^2$ (632, N=2344) = 5195.95, p<.000, RMSEA= 0.056, S-RMR= 0.047, GFI= 0.90, AGFI= 0.88, CFI= 0.98, NNFI= 0.97, IFI= 0.98) has been found to be a good fit (Gülbahar & Alper, 2014).

Another data collection tool used in the study was the "The Online Learning Self-Efficacy Scale" developed by Zimmerman and Kulikowich (2016) and adapted in Turkish by Yavuzalp and Bahçivan (2020). The original form of the scale consists of three sub-factors including learning in the online environment, time management and technology use and 22 items in total. As a result of the study, it was transformed into a single-dimension structure consisting of 21 items. The scale with a Cronbach α reliability coefficient of 0.987 was determined to be valid and reliable (Yavuzalp and Bahçivan, 2020).

## Findings

In this section, the findings obtained from the data analysis regarding the purposes of the current research study were presented in tables with explanations. T-test analysis was used for independent samples in order to find out whether gender played a role in the e-Learning Styles of the students and the results are shown in Table 2.

Table 2. t-test Results of Students' Learning Styles by Gender

| Learning style | Mean ($\bar{X}$) Male (N=68) | Mean ($\bar{X}$) Female (N=36) | t | p |
|---|---|---|---|---|
| Audio-visual | 32.09 | 33.47 | -1.59 | .115 |
| Verbal Learning | 22.56 | 24.86 | -2.42 | .017* |
| Active Learning | 18.60 | 21.72 | -3.74 | .000*** |
| Social Learning | 21.62 | 23.06 | 1.35 | .180 |
| Independent Learning | 15.81 | 16.25 | -.73 | .468 |
| Logical Learning | 11.18 | 10.06 | 1.65 | .103 |
| Intuitive Learning | 13.71 | 15.06 | -2.35 | .021* |

*:0.05 level of significance, **:0.01 level of significance, ***:0.001 level of significance

According to the data presented in Table 2, it is seen that there is a significant difference in favor of female students in the sub-scale mean scores of e-learning styles of the verbal learning, active learning and intuitive learning. No statistically significant difference was found regarding other sub-scale scores.

According to the results of the t-test analysis in order to examine whether the students' self-efficacy mean scores for e-learning differ according to gender, there was no significant difference between female and male students [t(104)=.62), $\bar{X}$Female:36=88.17, $\bar{X}$Male:68= 83.06, p> 0.05). Similarly, there was not a significant difference between the attitude scores of the students between female and male students [t(104)=-.132), $\bar{X}$Female:36=121.53, $\bar{X}$Male:68= 120.88, p> 0.05). The results of t-test analysis regarding whether the mean scores of the students' e-learning styles differ according to their way of learning are presented in Table 3.

Table 3. t-test Results of Students' Learning Styles by Education Type

| Learning style | Mean ($\bar{X}$) Formal Education (N=44) | Mean ($\bar{X}$) Distance Education(N=60) | t | p |
|---|---|---|---|---|
| Audio-visual | 31.93 | 33.03 | -1.31 | .194 |
| Verbal Learning | 22.00 | 24.35 | -2.57 | .011* |
| Active Learning | 19.20 | 20.03 | -.97 | .334 |
| Social Learning | 20.61 | 23.22 | -2.60 | .011* |
| Independent Learning | 16.14 | 15.83 | .52 | .605 |
| Logical Learning | 11.70 | 10.12 | 2.46 | .016* |
| Intuitive Learning | 13.82 | 14.43 | -1.09 | .278 |

*:0.05 level of significance

The data presented in Table 3 shows that there was a statistically significant difference in students' learning styles in terms of verbal learning, social learning and logical learning while there was no significant difference in terms of other sub-factors. Table 4 shows the results of the t-test analysis regarding whether the students' self-efficacy scores and attitude scores for e-learning differ according to the education type.

Table 4. t-test Result of Students' Self-efficacy by Education Type

| | Mean ( $\bar{X}$ ) | | t | p |
|---|---|---|---|---|
| | Formal Education (N=44) | Distance Education(N=60) | | |
| Self-efficacy | 78.36 | 89.57 | -3.86 | .000*** |
| Attitude | 115.00 | 125.22 | -2.11 | .037* |

*: 0.05 level of significance, **: 0.01 level of significance, ***: 0.001 level of significance

The t-test results in Table 4 indicates there was a statistically significant difference in the total score averages of the distance education students which were obtained from the self-efficacy scale for e-learning ($p < .001$). Similarly, the attitude scores were found to be significantly different in favor of distance education students ($p < .05$). ANOVA analysis results regarding whether students' e-learning styles differ according to departments are shown in Table 5.

According to the results of ANOVA test in Table 5, there were significant difference in students' verbal learning, social learning and independent learning subscale scores which were subscale scores of students' e-learning styles. Bonferroni test and Post Hoc comparison results are presented in Table 6.

Table 5. ANOVA Test Results of Students' Learning Styles by Department

| Learning Style | N | $\bar{\bar{X}}$ | SS | df | F | p |
|---|---|---|---|---|---|---|
| Audio-visual | 104 | 32.57 | 4.26 | 3 | 2.63 | .054 |
| Verbal Learning | 104 | 23.36 | 4.72 | 3 | 5.37 | .002** |
| Active Learning | 104 | 19.68 | 4.30 | 3 | 1.12 | .344 |
| Social Learning | 104 | 22.12 | 5.18 | 3 | 3.10 | .030* |
| Independent Learning | 104 | 15.96 | 2.93 | 3 | 3.19 | .027* |
| Logical Learning | 104 | 10.79 | 3.33 | 3 | 2.67 | .051 |
| Intuitive Learning | 104 | 14.1731 | 2.84 | 3 | 1.27 | .289 |

*: 0.05 level of significance, **: 0.01 level of significance, ***: 0.001 level of significance

Table 6**.** Posthoc Comparison Results of Students' Learning Styles by Departments

| Learning Style | Department | n | $\bar{X}$ | Sd | F | p | Difference |
|---|---|---|---|---|---|---|---|
| Verbal Learning | TD | 29 | 25.90 | 5.25 | 5.37 | 0.001*** | MD-FE |
| | MF | 20 | 20.90 | 5.18 | | | |
| Social Learning | TD | 29 | 24.28 | 5.00 | 3.10 | 0.030* | MD-AT |
| | UT | 24 | 20.50 | 4.93 | | | |
| Independent Learning | BP | 31 | 15.13 | 2.74 | 3.19 | 0.027* | CP-AT |
| | UT | 24 | 17.04 | 2.72 | | | |
| | MF | 20 | 16.05 | 2.73 | | | AT-FE |

*: 0.05 level of significance, **: 0.01 level of significance, ***: 0.001 level of significance

MD: Medical Documentation and Secretarial, FE: Faculty of Engineering, AT: Aircraft Technology

As seen in Table 6, there was a statistically significant difference in the verbal learning subscale mean scores of the Medical Documentation and Secretarial Department students compared to the students of the Faculty of Engineering. In terms of social learning subscale mean scores, the scores of the Medical Documentation and Secretarial Department students were significantly higher than that of the Aircraft Technologies department students. In addition, the independent learning subscale mean scores of the Aircraft Technologies department students were significantly higher than that of both the Computer Programming and the Engineering Faculty students. However, no significant difference was found in other subscale mean scores regarding the department.

There was not statistically significant difference in students' attitude scores towards e-learning in terms of their departments *[F(3, 104)=2.25, p>.05]*. On the other hand, students' self-efficacy scores differ according to their departments *[F(3, 104)=6.75, p<.001]*. When the results of Bonferroni test and PostHoc were compared, Medical Documentation and Secretarial Department students' self-efficacy scores were significantly higher than both Engineering Faculty students ($p < .01$) and Aircraft Technology students ($p < .05$). The analysis results of ANOVA test for whether students' mean scores on e-learning scale differ according to age range are shown in Table 7.

Table 7. ANOVA Test Results of Students' Learning Styles by Age Range

| **Learning style** | **N** | $\bar{X}$ | **SS** | **df** | **F** | **p** |
|---|---|---|---|---|---|---|
| Audio-visual | 104 | 32.57 | 4.26 | 2 | .19 | .825 |
| Verbal Learning | 104 | 23.36 | 4.72 | 2 | .61 | .548 |
| Active Learning | 104 | 19.68 | 4.30 | 2 | 2.7 | .073 |
| Social Learning | 104 | 22.12 | 5.18 | 2 | .61 | .543 |
| Independent Learning | 104 | 15.96 | 2.93 | 2 | 6.4 | .002** |
| Logical Learning | 104 | 10.79 | 3.33 | 2 | .93 | .398 |
| Intuitive Learning | 104 | 14.18 | 2.84 | 2 | 3.42 | .037* |

*: 0.05 level of significance, **: 0.01 level of significance, ***: 0.001 level of significance

According to the results of ANOVA in Table 8, a significant difference was found in students' e-learning styles subscale mean scores in terms of independent learning and intuitive learning subscale mean scores. Bonferroni test and PostHoc comparison results are given in Table 8.

Table 8. PostHoc Results of Students' Learning Styles by Age Range

| Learning style | Age | N | $\bar{X}$ | Sd | F | p | Difference |
|---|---|---|---|---|---|---|---|
| Independent Learning | 18-20 | 52 | 16.94 | 2.88 | 6.43 | .002** | 18-20 & 21-25 |
| | 21-25 | 29 | 15.00 | 2.69 | | .016* | 18-20 & 26 or older |
| | 26 or older | 23 | 14.96 | 2.70 | | | |
| Intuitive Learning | 18-20 | 52 | 14.85 | 2.63 | 3.42 | .037* | 18-20 & 21-25 |
| | 21-25 | 29 | 13.21 | 2.73 | | | |

*: 0.05 level of significance, **: 0.01 level of significance, ***: 0.001 level of significance

The PostHoc analysis results presented in Table 8 indicated that students' independent learning style subscale mean scores there was a statistically significant difference between the students in the age range of 18-20 and 21-25 and 26 or older. Additionally, the intuitive learning subscale mean scores of students between the ages of 18-20 differ significantly from those between the ages of 21-25.

There was no significant difference in students' attitude scores towards e-learning according to their age range *[F(2, 104)=1.794, p>.05]*. On the other hand, students' self-efficacy mean scores differ by age range *[F(2, 104)=3.34, p<.05]*. When the results of Benferonni and Posthoc were compared, it was found out that there was a statistically significant difference between the mean scores of the students between the ages of 18-20 and the students aged 26 and over ($p < .05$).

The results of the present study showed that there was a statistically significant and positive relationship between students' self-efficacy mean scores and attitude mean scores ($e = .400$; $p < 0.01$). Nevertheless, the results of the bilateral correlations related to the students' mean scores that they obtained from the e-learning styles scale, and the self-efficacy scale and the attitude scale are shown in Table 9.

Table 9. The Relationship between Sub-factors of Learning Styles Scale and Self-efficacy and Attitude towards e-Learning (Pearson-r)

| | **Self-efficacy** | **Attitude** |
|---|---|---|
| Audio-visual | .481** | -.06 |
| Verbal Learning | .513** | .03 |
| Active Learning | .240* | -.09 |
| Social Learning | .461** | .112 |
| Independent Learning | .391** | .014 |
| Logical Learning | .083 | .050 |
| Intuitive Learning | .160 | -.13 |

*: 0.05 level of significance, **: 0.01 level of significance, ***: 0.001 level of significance

When the binary correlations of the variables in Table 9 were analyzed, no relationship was found between students' e-learning styles and e-learning attitude scores ($p > .05$). On the other hand, there was a significantly strong and positive relationship between students' e-learning styles and self-efficacy scores regarding learning styles except for logical learning and intuitive learning styles. It was revealed that the highest meaningful relationship with self-efficacy scores was between verbal learning style and independent learning style.

## Discussion

In the study, it was found that verbal, active and intuitive learning styles mean scores of female students were higher than male students. There were no gender differences in other learning styles. Similarly, in the study conducted by Kuru (2018), it is indicated that female students have higher learning styles in active learning.

Although there are limitations in the studies on e-learning styles, it is possible to reach different findings related to learning styles in formal education. In their study, Sır at al., (2015) found that the intuitive learning style was more common among female students while in some studies it was determined that gender did not affect the learning styles (Ateş, & Altun, 20008b; Can, 2010; Yeşilyurt, 2014). The discrepancies in the various studies on learning styles according to gender suggest that different components such as the environment in which the researches are carried out, the age and parts of the participants may have an effect.

In the study, no significant difference was found between females and males in the self-efficacy mean scores averages of them. Ergül (2004) found no significant difference between students' online self-efficacy and gender. A similar result has been confirmed by different researchers (Yavuzalp, &Bahçivan, 2020). However, there are research studies showing that there is a gender difference in terms of factors accepted as e-learning sub-dimension such as computer self-efficacy, internet self-efficacy and online communication. Shen et al., (2013) asserted that female students' online self-efficacy rate was higher than males. Another study revealed that the scores of male students were higher in terms of internet self-efficacy (Chang et al., 2014). Thus, it can be said that this finding in the present study is compatible with the literature. It is thought that the results may have been different from the results of self-efficacy in only one domain, since the study carried out examined general self-efficacy in e-learning and was not limited to only one dimension.

In the current study, no statically significant difference was found between the female and male students' attitude scores towards e-learning. While there are some attitude and gender related studies showing that the attitude towards e-learning does not differ according to gender (Ateş, & Altun, 2008a; Barış, 2015; Rhema, & Miliszewska, 2014; Yıldız, 2016), there are also studies showing that male students' attitudes towards online learning are more positive than female students. (Fidan, 2016; Kaban, 2021; Liaw, & Huang, 2011; Yenilmez et al., 2017). Even though male students' higher attitudes towards e-learning in some studies have been linked to their susceptibility to technology (Fidan, 2016), no difference was found regarding gender in parallel with self-efficacy perceived by the students in this study. It is thought that the similarity of self-efficacy perceptions of female and male students towards e-learning has an effect on their attitudes being similar.

In the study, the rate of verbal, social and logical learning styles of distance education students were found higher than formal education students. Similarly, attitude scores of distance education students were higher than formal education students. The fact that distance education students participate in distance education willingly is accepted as a reason for their higher attitude. The formal education students, on the other hand, are likely to have lower attitude scores due to the fact that they have to choose the distance education course because it is compulsory.

In the current research study, it was found that the verbal, social and independent learning styles of the students differ in the departments. Verbal learning style mean scores of the Medical Documentation and Secretarial department students are higher than the students of the Faculty of Engineering while their social learning style mean scores are higher than the students of the Aircraft Technologies department. These findings may result from the fact that Medical Documentation and Secretarial department students can be verbally and socially

dominant; are likely to use their verbal competence frequently after graduation; and are more dominant in terms of verbal and social aspects. On the other hand, independent learning style mean scores of Aircraft Technologies department students are higher than those of both Computer Programming and Engineering Faculty. In terms of the other learning style mean scores, there is no difference according to the departments.

According to the results of the study, students' attitude towards e-learning did not differ in departments. The self-efficacy mean scores of the Medical Documentation and Secretarial department students are higher than both the students of the Faculty of Engineering and the students of the Aircraft Technology department. It can be said that being a distance education student may have a positive effect on the attitudes of the Documentation and Secretarial department students. In the literature, there are discrepant findings showing the level of student attitudes in distance education is moderate (Ateş, & Altun, 2008a; Dick et al. 2001; Kışla, 2005; Yıldız, 2016), high (Brinkerhoff, & Koroghlanian, 2005; Rhema, & Miliszewska, 2014; Yenilmez et al., 2017) and low (Barış, 2015). Therefore, it can be said that attitude scores may differ in departments. As a matter of fact, Yenilmez et al., (2017) found that the attitudes of students being enrolled in science teacher education program towards distance education were more positive than those of being enrolled in social sciences teacher education program. It can be inferred that the need for more internet-based research in science lessons may be an effective reason for this fact. For this reason, it can be concluded that the number of courses taken via distance education and experience has an effect on attitude. In the study conducted by Fidan (2016), it was determined that the attitudes of the students who took compulsory courses via distance education was lower correspondingly. In the aforementioned study, formal education students also took compulsory courses via distance education. The reason for this, as Fidan (2016) stated, may be the technology use skill of formal education students or distance education acceptance level because, as stated earlier, formal education students participating in the study cannot choose the learning environment for the compulsory course they have to choose.

In the study, independent learning style mean scores of students between the ages of 18-20 were found higher than students aged 21-25 and 26 and over. The intuitive learning mean scores of students between the ages of 18-20 were higher than those between the ages of 21-25. In some studies, it has been determined that learning styles do not change according to age (Özgür, 2013). Ergün and Kurnaz (2019), on the other hand, examined the difference in learning styles according to professional seniority and determined that there was a difference between the learning style of young and older participants and other participants.

In this research study, the attitude scores of the students towards e-learning do not vary across age groups. The self-efficacy mean score of the students between the ages of 18-20 are higher than the students aged 26 and over. It has been revealed in different research studies that age does not have a significant effect on attitude (Edwards, 2018; Rhema, & Miliszewska, 2014). However, Brinkerhoff and Koroghlanian (2005) determined that older students' attitudes were more negative. Similarly, Yıldız (2016) found that in terms of the benefits students obtained and general attitudes of them in the young group perceived distance education to be more positive.

A strong positive correlation was found between students' self-efficacy scores and attitude scores. No correlation was found between students' e-learning styles and e-learning attitude scores. Prior et al. (2016), in their study, it was revealed that students' attitudes had a positive effect on self-efficacy. In another study, it was found that there was a positive and low level relationship between students' self-efficacy perceptions of online technologies and their attitudes towards web-based teaching (Akgün, 2015). It was stated that students with high perceived computer skills had more positive attitudes towards distance education than those with moderate computer use skills (Ateş, & Altun, 2008a). Reading self-efficacy has been determined to have an impact on students' attitudes towards online learning (Edwards, 2018). On the other hand, it has been revealed in different studies that the perceived benefit and ease of use has an effect on the attitude towards the use of a system (Al-Azawei, et al (2017); Ibili et al., 2019; Ong, & Lai, 2006). Also, self-efficacy has a significant impact on perceived benefit and perceived ease of use. For this reason, it can be said that there is a strong relationship between self-efficacy and attitude. The results of this research show that there is a strong relationship between attitude and self-efficacy.

The results indicate that there is a strong positive relationship between e-learning styles and self-efficacy scores with other learning styles except logical learning and intuitive learning styles. The most significant relationship with self-efficacy scores was found to be between verbal learning style and audio-visual learning style. Similarly, Hawa and Tılfarlıoğlu (2019) found that there was a strong relationship between learning styles and self-efficacy, and that the highest relationship was between verbal learning styles and self-efficacy. Kashefi and Shomali (2016) assert that individuals' inner styles are related to cognitive, affective, motivational, physical characteristics, as well as experience and successful performance indicators, and that learning styles are among the cognitive characteristics, so there is a strong relationship between learning styles and self-efficacy.

In this research study, no difference was found between attitudes towards e-learning and learning styles. On the other hand, Ateş and Altun (2008b) found that students' learning styles differ significantly in their attitudes towards distance education in their research study in which they used the Kolb Learning Styles Scale. However, Pruet, et al., (2014) stated that content design as well as inappropriate teaching methods and techniques for students' learning styles increase students' anxiety level and has a negative effect on these attitudes. The personal characteristics of students should be taken into account while preparing the content design correspondingly. However, it was interpreted that there was no difference between attitudes towards e-learning and learning styles due to the fact that the majority of students participating in this study were distance education students and they had high level of technological self-efficacy prevented students from high levels of anxiety.

## Conclusion

In this study, the effects of different variables such as age, gender, department and learning style on students' e-learning styles, their attitudes towards e-learning and e-learning self-efficacy were investigated. It has been observed that e-learning styles differ according to age, gender, department and learning style. The verbal, active and intuitive learning styles mean scores of female students were found to be higher than that of male. It has

been determined that the verbal, social and logical learning styles of distance education students are higher than those of formal education students. Students' verbal, social and independent learning styles differ according to departments. In this difference, the students of the Medical Documentation and Secretariat Department of Verbal Learning Style score averages are higher than the Faculty of Engineering students, and the Social Learning Style score averages are higher than the students of the Aircraft Technologies Department. The average score of independent learning style of the students between the ages of 18-20 was found to be higher than the students aged 21-25 and 26 and over.

Self-efficacy differs by department, age and type of education, but not by gender. The self-efficacy score averages of the Medical Documentation and Secretariat students are higher than both the Engineering Faculty students and the Aircraft Technology students. Mean self-efficacy scores of students aged 18-20 are higher than students aged 26 and over. It is seen that the self-efficacy scores of the students studying by distance education are higher than the formal education students.

While attitudes towards e-learning differ only according to learning style, it is seen that they do not differ according to age, gender and department. Attitude scores of students studying by distance education are higher than formal education students. In addition, the relationship between students' learning styles and their self-efficacy and attitudes was examined in this study. While the research results reveal that there is a relationship between e-learning styles and self-efficacy, it shows that there is no direct relationship between e-learning styles and attitude. In addition, a strong relationship was found between self-efficacy and attitude. Researchers are suggested to examine the effect of different variables on these three variables, to include other departments in the study, to collect qualitative data before examining the results of the research.

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