Elçiçek, M. (2021). An investigation into the technology integration levels of pre-service teachers in compulsory distance education (covid-19 pandemic). *International Online Journal of Education and Teaching (IOJET), 8*(3). 2060-2080.

Received : 26.04.2021
Revised version received : 10.06.2021
Accepted : 11.06.2021

AN INVESTIGATION INTO THE TECHNOLOGY INTEGRATION LEVELS OF PRE-SERVICE TEACHERS IN COMPULSORY DISTANCE EDUCATION (COVID-19 PANDEMIC)

Research article

Mithat Elçiçek https://orcid.org/0000-0003-1845-7271

Siirt University

mithat_elcicek@siirt.edu.tr

Biodata:

Mithat Elçiçek is an Assistant Professor in the Department of Graphic Design at University of Siirt. He is currently supervising and teaching undergraduate studies. His research areas are teacher education, educational technology, distance education.

AN INVESTIGATION INTO THE TECHNOLOGY INTEGRATION LEVELS OF PRE-SERVICE TEACHERS IN COMPULSORY DISTANCE EDUCATION (COVID-19 PANDEMIC)

Mithat Elçiçek

mithat_elcicek@siirt.edu.tr

Abstract

It is thought that the compulsory distance education (Covid-19 pandemic) process may have some advantages as well as some disadvantages for learners and teachers. From this point of view, the present study is designed to investigate the technology integration levels of the pre-service teachers and the effect of the compulsory distance education process on the technology integration levels. The explanatory design, which is one of the mixed method research types in which quantitative and qualitative data are used together, was used in the study. The quantitative dimension of the research is an example of the survey study, which was planned and conducted by the single survey model. In the qualitative dimension, the views of pre-service teachers about the effect of the compulsory distance education process on technology integration levels were analysed through the interview technique. A total of 414 students of the Faculty of Education were included in the study through convenience sampling. In the study, “Indicators for Teachers' Technology Integration (TEG) Scale", "Personal Information Form", and "Semi-Structured Interview Form" were used as data collection tools. The data were analysed by the SPSS program and the level of significance was accepted as 0.05. According to the results of the research, the technology integration levels of the pre-service teachers in the compulsory distance education process were found to be high. Furthermore, it was found that the compulsory distance education process has a catalytic effect on pre-service teachers' technology integration levels.

Keywords: technology integration, covid-19, pandemic, compulsory distance education

1. Introduction

People have witnessed many crises and disasters throughout history. The Covid-19 outbreak, which started to take effect over the world in early 2020, is one of these consequential crises. The Covid-19 outbreak was declared as a pandemic by WHO (World Health Organization) on March 11, 2020, as the easy and continuous spread of the Covid pandemic among people caused an unprecedented and unexposed disease for the population. WHO defined the name of Covid-19 as "CO" for "corona", "V" for "virus", and "D" for "disease" (Türkiye Bilimler Akademisi, 2020). The Covid-19 pandemic has led to significant worldwide changes in many areas such as health, finance, education, and social life. Education is undoubtedly one of these areas directly affected by the pandemic process (Upoalkpajor & Upoalkpajor, 2020). It is reported that more than 91 percent of the students in the world are affected by the pandemic process (Miks & Mcllwaine, 2020). Naturally, like all other countries, Turkey has also been affected by this pandemic. Considering the number of formal and non-formal education activities in Turkey, education appears to be the largest public area affected by the pandemic (Akbulut, Şahin & Esen, 2020; Balci & Çetin, 2020). In this context, emergency scenarios that will highlight the use of digital technologies have been employed with a decision to conduct educational activities through distance education. As it is known, distance education is one of the most practical ways to ensure equal opportunity in education in cases where appropriate space, time, and conditions do not exist (Mason, 2000; Veletsianos, 2010). For these reasons, distance education has been seen as a necessity (Rovai

& Downey, 2010; Şen, Atasoy, & Aydın, 2010) and all learners and teachers with or without distance education experience suddenly fell into the distance education activities.

Initially described as a distance education rehearsal, the pandemic has turned into a compulsory distance education process. In this context, authorities of primary, secondary, and higher education levels have sought ways of how to use various digital tools to continue the compulsory distance education process (Bozkurt, 2020; Sarıtaş & Barutçu, 2020). Studies show that the vast majority of learners and teachers have not participated in any distance education activities before (Demir & Kale, 2020) and their level of knowledge on this subject is limited (Keskin & Özer Kaya, 2020). It should not be forgotten that distance education is a discipline with theoretical dynamics and the successful and effective results of distance education activities depend on these dynamics (Shattuck et al., 2011). Therefore, it is important that learners and teachers, as the two important pillars of the education ecosystem, be aware of the dynamics of distance education and gain experience in this field (Shattuck et al., 2011). However, being a period of crisis, the pandemic process does not make such preliminary studies possible. For this reason, the education community mostly focused on how to use distance education tools and preferred to carry out compulsory distance education activities with certain individual measures (Bakioğlu & Çevik, 2020; Durak et al., 2020; Keskin & Özer Kaya, 2020).

In the wake of the compulsory distance education process, learners and teachers have had to follow the digital technologies used in usual times more closely and to be more engaged with these technologies (Bakioğlu & Çevik, 2020; Keskin & Özer Kaya, 2020). Teachers are pursuing preparing digital content and developing new methods to teach such content, while learners have sought to access and understand such content. The literature review propounds that learners' access to information and effective use of obtained information is closely related to technology integration (Hew & Brush, 2007; Taşdemir, 2018). Although the use of technology in educational activities is described as technology integration, these two concepts do not mean the same. Technology integration refers to a systematic and comprehensive adaptation process in which information and communication technologies are tools to achieve learning goals (Usluel, Mumcu, & Demiraslan, 2007). It covers a process starting from the stage of deciding on the technology to be used and continuing to the evaluation of its inputs and outputs. What really matters in technology integration, which focuses on program goals and learning, is not the type or quantity of technology, but how and why it is used (Earle, 2002; Ramorola, 2013).

In this context, when the literature is reviewed, it is possible to find many models that offer frameworks for the technology integration process. Technological pedagogical content knowledge (TPACK), technological pedagogical field knowledge (TPAB), technology integration matrix (TIM), technology integration planning model, five-stage computer technology integration model, activity system model, 5W 1H model, situated technology integration model, and technology literacy are just some of them. It is observed that the starting point of all of them is to find solutions to internal and external problems caused by learning, teaching, and technological components (Tosuntaş, Çubukçu, & İnci, 2019). In this context, technology integration concerns all segments of society (Hsu & Sharma, 2006; Reigeluth & Joseph, 2002). However, it is influenced by the economic, social, and cultural crises of society (Günüç, 2017). The Covid-19 pandemic, which has an impact all over the world, is one of these important crises. It is believed that determination of the tendency of the technology integration process in times of global crisis such as the pandemic and examination of the effects of the pandemic process on technology integration is expected to provide important clues to educators, researchers, and policymakers. However, it is essential to examine the technology integration levels of today's pre-service teachers participating in the

compulsory distance education process, as this group is considered to be the new generation who has access to information and is expected to effectively use the accessed information. For, it is believed that the compulsory distance education (Covid-19 pandemic) process may have advantages as well as disadvantages for learners and teachers. Based on these considerations, in the present study, the technology integration levels of pre-service teachers in the compulsory distance education (Covid-19 pandemic) process and the effect of the compulsory distance education process on the technology integration levels were investigated.

1.1. Research Objective

The research objective is to examine the technology integration levels of pre-service teachers in compulsory distance education (the Covid-19 pandemic) and the effect of compulsory distance education on technology integration levels. Based on the objective, the following research questions were asked:

1. What are the technology integration levels of pre-service teachers in the compulsory distance education process?

2. Do technology integration levels vary according to gender, department, and level of information technology use?

3. What are the views on the effect of the compulsory distance education process on technology integration levels?

2. Method

The mixed-method was used in the study. The mixed method refers to the analysis of data collected using quantitative and qualitative methods as a whole (Terrell, 2012). The data collected through the quantitative method allow many participants to be reached, while the data collected using qualitative methods allow the research subject to be examined in more depth. For this reason, an explanatory design, one of the mixed methods in which quantitative and qualitative data are used together, was used in the present study. The reason why the descriptive design was preferred was to support quantitative data and strengthen research findings. The quantitative dimension of the research is an example of the survey study, which was planned and conducted by the single survey model. The single survey model is aimed at describing the formation of each variable as a type or quantity (Tomas, 2003). In this framework, the study is aimed at identifying the current status of pre-service teachers as the subject of the research based on their technology integration levels. In the qualitative dimension of the study, the views of the pre-service teacher about the effect of the compulsory distance education process on the technology integration levels were examined through the interview technique.

2.1. Participants

A total of 414 students of the Faculty of Education at a public university in Turkey were included in the study as participants. Convenience sampling was employed to reach a sufficient number of students to determine the participants of the study in the quantitative dimension (Büyüköztürk et al., 2010). For the qualitative analysis, a total of 14 pre-service teachers, 2 from each department of the faculty, were selected via the maximum variation sampling to include different views and reflect different perspectives. Demographic information about the pre-service teachers participating in the study is shown in Table 1.

Table 1. *Demographic information about pre-service teachers*

Variables	Characteristics	f	%
Gender	Male	152	36.7
	Female	262	63.3
Department	Science Teaching	56	3.1
	English Teaching	23	7.2
	Mathematics Teaching	72	19.1
	Classroom Teaching	82	22.7
	Psychological Counselling and Guidance	21	9.2
	Social Sciences Teaching	76	18.4
	Turkish Teaching	84	20.3
Level of information technology use	Beginner	166	37.7
	Basic	180	44.2
	Advanced	68	18.1
Total		414	100

The demographic characteristics of the participants highlight that the majority of them (63.3%) are female, 22.7% of them are enrolled in the department of classroom teaching, and the level of information technology use (computer, software, internet, e-mail, etc.), is basic by 44.2%.

2.2. Data Collection Tools

In the study, “Indicators for Teachers' Technology Integration (TEG) Scale", "Personal Information Form", and "Semi-Structured Interview Form" were used as data collection tools. The scale used in the study was developed by Çakıroğlu, Gökoğlu, and Çebi (2015). Scale items are designed in 5-point Likert type. Scale items range between "Strongly disagree (1)" and "Strongly agree (5)" levels. Each of the reliability coefficients of the factors of the TEG scale ranges between 0.83 and 0.87. The Cronbach’s Alpha value for the whole scale is 0.86. Within the scope of the present study, the reliability coefficients of the scale factors ranged between 0.74 and 0.90, while the Cronbach’s Alpha value for the whole scale was calculated as 0.81. Being above the critical value of 0.70, these measurement results show that the scale items are reliable (Nunnally & Bernstein, 1994). This implies that the scale items serve to measure the desired characteristics. The "Personal Information Form" prepared by the researcher was used to determine the gender, department, and the pre-service teachers’ level of information technology use.

The "Semi-Structured Interview Form", developed by the researcher based on the sub-factors of “Indicators for Teachers' Technology Integration (TEG) Scale", was used to determine the views of teacher candidates on the effect of distance education process on technology integration levels within the scope of the qualitative dimension of the research. Semi-structured focus group interview is a partially structured flexible group interview technique to reveal the knowledge and ideas of pre-selected participants within the framework of a specific topic (Cokluk, Yılmaz, & Oğuz, 2011). The strategies suggested by Harris et al. (1993) were used to minimize the factors affecting validity and reliability in the qualitative analysis of the study. To ensure the internal validity of the questions used in the interview form, opinions of three experts were received and then a pilot study was carried out on eight pre-service teachers. The results of the pilot study were also examined by two field experts to determine whether the questions were clear and understandable, and whether the responses reflected the responses to the questions. As another precaution taken within the scope of internal validity (credibility), a long-term interaction was provided without time limitation to create an atmosphere of trust and obtain more sincere responses during the

interview. To increase the internal reliability (consistency) of the study, the responses given by the pre-service teachers to the open-ended questions in the interview form were examined separately by the researcher and an expert, and the issues with "agreement" and "disagreement" were discussed and the necessary arrangements were made. In this context, the agreement was calculated as 0.88 as a result of the calculation made using the formula of Agreement/ (Agreement + Disagreement) X 100 suggested by Miles & Huberman (1994). This has been deemed reliable for the research. The following questions are included in the semi-structured interview form consisting of a total of five open-ended questions.

1. What do you think about the effect of the compulsory distance education process on your level of technology literacy (communication over the internet, basic functions of office programs, use of information technologies, the function of basic hardware parts, etc.)?
2. What can you say about the effect of the compulsory distance education process on your technology-supported teaching skills (using e-learning tools, designing teaching materials with software development tools, presenting assignments/tasks on the internet, etc.)?
3. What can you say about the contribution of the compulsory distance education process to your professional development (participating in information sharing communities, discussing teaching methods, attending online courses related to your field, etc.)?
4. What do you think about the effects of the compulsory distance education process on issues such as the safe use of technology, legal issues, copyrights, ethics, etc.?
5. What can you say about the effects of the compulsory distance education process on supporting or organizing your teaching activities (being able to choose and use multimedia materials, websites or instructional technologies)?

2.3. Data Collection Process and Analysis

The scale items were applied to the participants online, as the courses were conducted through distance education at the university in question during the fall semester of the 2020-2021 academic year due to the Covid-19 pandemic. First, the necessary permissions and approvals were obtained from the Ethics Committee of the University, where the study was conducted, for the decision of the ethics committee dated 24.12.2020 and numbered 103. Then, the Distance Education Research and Application Centre was contacted and the link address containing the scale items was sent to the students' e-mail addresses. The required instructions were included in the link address and the scale was filled in by the students. Before analysing the data collected in a digital environment, the reliability of the data was checked. In this context, 42 pieces of data were excluded from the data collected from 456 students due to reasons such as marking the same items, marking incompletely and incorrectly, etc.. The number of data, which was 456 at the beginning, was determined as 414 after the elimination. For the items on the TEG scale that did not contain any negative items, calculations were made without any inversion.

To interpret the scale and its dimensions, an evaluation was made on average scores. For ease of interpretation, low, moderate, and high were used as evaluation ranges. In the calculation of the score range, the formula (Highest Value - Lowest Value) / Evaluation Range Number formula was used. The evaluation ranges and criteria accepted in the study are presented in Table 2.

Table 2. *Evaluation ranges and criteria*

Evaluation Range	Evaluation Criteria
Low	1.00 - 2.33
Moderate	2.33 - 3.66
High	3.66 - 5.00

Descriptive statistics were used to determine the technology integration levels of pre-service teachers studying through distance education. As it is known, the characteristics of the data used in determining the appropriate analysis method are seen among the important criteria. Parametric or nonparametric analysis methods are used according to the characteristics of the data. To use parametric tests, the number of subjects in the sample groups should be over 30 and have a normal distribution and homogeneous variances. Normality can be checked visually as well as with numerical data. Numerically, the skewness and kurtosis values between -1.96 and +1.96 indicate that the data show a normal distribution (Tabachnick et al., 2007). If the group variances are equal after the variance analysis, it means that they have homogeneous variances. When analysing the research data, the independent sample t-test was used for paired comparisons providing parametric test assumptions, one-way analysis of variance (ANOVA) for more than two comparisons, and the Kruskal Wallis-H test for more than two comparisons failing to provide parametric test assumptions. The Scheffe test, which is a Post Hoc test, was employed to determine the difference among groups.

3. Findings

The findings regarding the technology integration levels of pre-service teachers studying through distance education are presented under sub-headings.

Pre-service Teachers' Technology Integration Levels

Descriptive statistics values regarding the pre-service teachers' technology integration levels are given in Table 3. The descriptive statistics table includes arithmetic mean and standard deviation values.

Table 3. *Arithmetic mean and standard deviation values for pre-service teachers' technology integration levels*

Scales and dimensions	Male (N=152)		Female (N=262)		General (N=414)	
	$\bar{x}$	Ss	$\bar{x}$	Ss	$\bar{x}$	Ss
Technology Integration	4.17	.56	4.07	.58	4.10	.57
Technology Literacy	4.16	.68	4.05	.74	4.09	.72
Teaching with Technology	4.10	.67	4.01	.66	4.04	.66
Professional Development	4.04	.74	3.91	.76	3.96	.76
Ethics and Policies	4.07	.64	4.02	.60	4.04	.61
Organization and Management	4.19	.57	4.10	.52	4.14	.54

Table 3 highlights that the participants believe that they have a high level of technology integration ($\bar{x}$=4.17). ıt is also observed that dimensions including "technology literacy" ($\bar{x}$=4.16), "teaching with technology" ($\bar{x}$=4.10), "Professional development" ($\bar{x}$=4.04), "ethics and policies" ($\bar{x}$=4.07) and "organization and management" ($\bar{x}$=4.19) are all at a high level.

Pre-service Teachers' Technology Integration Levels Depending on Gender

Table 3 highlights that there are differences in the average scores of the pre-service teachers in technology integration and its dimensions. However, an independent sample t-test analysis was performed to determine whether the relevant differences are statistically significant or not and Table 4 includes the results.

Table 4. *Independent sample t-test analysis results for the gender variable*

Scales and dimensions	Group (Gender)	N	$\bar{x}$	Ss	sd	t	p
Technology Integration	Male	152	4.17	.56	412	1.74	.08
	Female	262	4.07	.58			
Technology Literacy	Male	152	4.16	.68	412	1.53	.12
	Female	262	4.05	.74			
Teaching with Technology	Male	152	4.10	.67	412	1.33	.18
	Female	262	4.01	.66			
Professional Development	Male	152	4.04	.74	412	1.72	.08
	Female	262	3.91	.76			
Ethics and Policies	Male	152	4.07	.64	412	.67	.50
	Female	262	4.02	.60			
Organization and Management	Male	152	4.19	.57	412	1.63	.10
	Female	262	4.10	.52			

As seen in Table 4, pre-service teachers' technology integration levels do not differ according to gender [$t_{(412)=}1.74$, $p>.05$]. In this respect, it is seen that both male ($\bar{x}=4.17$) and female ($\bar{x}=4.07$) pre-service teachers tend to integrate technology at the same level. When examined in terms of dimensions, the gender variable is not a significant factor in dimensions including "technology literacy" [$t_{(412)=}1.53$, $p>.05$], "teaching with technology" [$t_{(412)=}1.33$, $p>.05$], "professional development" [$t_{(412)=}1.72$, $p>.05$], "ethics and policies" [$t_{(412)=}$ .67; $p>.05$], and "organization and management" [$t_{(412)=}1.63$, $p>.05$].

Pre-service Teachers' Technology Integration Levels Depending on the Department

The Kruskal Wallis-H test analysis was conducted to determine the technology integration levels of pre-service teachers according to the department variable. Kruskal Wallis test analysis results are given in Table 5.

Table 5. *Kruskal Wallis-H test analysis results for the department variable*

Scales and Dimensions	Group (Department)	N	Mean Rank	Sd	X^2	p
Technology Integration	Science Teaching	13	219.42	6	5.29	.50
	English Teaching	30	212.47			
	Mathematics Teaching	79	199.18			
	Classroom Teaching	94	215.70			
	Psychological Counselling and Guidance	38	241.14			
	Social Sciences Teaching	76	196.13			
	Turkish Teaching	84	197.60			
Technology Literacy	Science Teaching	13	225.96	6	4.14	.65
	English Teaching	30	212.80			
	Mathematics Teaching	79	207.39			
	Classroom Teaching	94	215.20			
	Psychological Counselling and Guidance	38	222.32			
	Social Sciences Teaching	76	184.79			
	Turkish Teaching	84	208.08			
Teaching with Technology	Science Teaching	13	210.96	6	2.74	.84
	English Teaching	30	190.93			
	Mathematics Teaching	79	207.52			
	Classroom Teaching	94	216.34			
	Psychological Counselling and Guidance	38	226.97			
	Social Sciences Teaching	76	198.05			
	Turkish Teaching	84	202.71			
Professional Development	Science Teaching	13	207.19	6	14.61	.07
	English Teaching	30	213.70			
	Mathematics Teaching	79	192.61			
	Classroom Teaching	94	217.40			
	Psychological Counselling and Guidance	38	263.08			
	Social Sciences Teaching	76	179.03			
	Turkish Teaching	84	208.87			
Ethics and Policies	Science Teaching	13	226.04	6	2.87	.82
	English Teaching	30	212.57			
	Mathematics Teaching	79	196.28			
	Classroom Teaching	94	203.79			
	Psychological Counselling and Guidance	38	218.95			
	Social Sciences Teaching	76	221.32			
	Turkish Teaching	84	199.83			
Organization and Management	Science Teaching	13	235.31	6	14.12	.08
	English Teaching	30	206.73			
	Mathematics Teaching	79	212.81			
	Classroom Teaching	94	206.44			
	Psychological Counselling and Guidance	38	213.92			
	Social Sciences Teaching	76	237.25			
	Turkish Teaching	84	169.85			

Table 5 highlights that the department does not cause any significant difference in the pre-service teachers' technology integration levels (X^2 (sd=6, n=414)=5.29, p>.05). Thus, it is observed that the pre-services of all departments tend to have the same technology integration level. The department is not a significant factor in all of the dimensions including "technology literacy" (X^2 (sd=6, n=414)=4.14, p>.05) "teaching with technology" (X^2 (sd=6, n=414)=2.74, p>.05); "Professional development" (X^2 (sd=6, n=414)=14.64, p>.05); "ethics and policies" (X^2 (sd=6, n=414)=2.87, p>.05) and "organization and management" (X^2 (sd=6, n=414)=14.12, p>.05).

Pre-service Teachers' Technology Integration Levels Depending on the Level of Information Technology Use

One-way analysis of variance (ANOVA) was performed to determine the technology integration level of pre-service teachers depending on the level of information technology use. The results of the one-way analysis of variance are given in Table 6.

Table 6. *One-way analysis of variance results regarding the level of information technology use*

Scales and Dimensions	Group	f	$\bar{x}$	Ss	Source of Variance	Sum of squares	sd	Mean Square	F	p	Significant difference
Technology Integration	A*	156	4.00	.56	In-group	9.48	2	4.47	15.05	.00	C
	B*	183	4.07	.59	Intergroup	129.42	411	.31			
	C*	75	4.42	.44	Total	138.90	413				
Technology Literacy	A	156	3.99	.72	In-group	9.34	2	4.67	9.29	.00	C
	B	183	4.05	.75	Intergroup	206.53	411	.50			
	C	75	4.41	.53	Total	215.87	413				
Teaching with technology	A	156	3.91	.63	In-group	10.63	2	5.31	12.65	.00	C
	B	183	4.02	.71	Intergroup	172.63	411	.42			
	C	75	4.36	.49	Total	183.27	413				
Professional Development	A	156	3.87	.80	In-group	9.75	2	4.87	8.67	.00	C
	B	183	3.90	.75	Intergroup	231.22	411	.56			
	C	75	4.28	.60	Total	240.98	413				
Ethics and Policies	A	156	3.94	.64	In-group	7.93	2	3.96	10.82	.00	C
	B	183	4.01	.62	Intergroup	150.55	411	.36			
	C	75	4.33	.47	Total	158.48	413				
Organization and Management	A	156	4.05	.54	In-group	7.80	2	3.90	13.87	.00	C
	B	183	4.09	.56	Intergroup	115.64	411	.28			
	C	75	4.43	.41	Total	123.45	413				

*A: Beginner *B: Basic *C: Advanced

Table 6 reveals that the level of information technology use ($F_{[2-411]}$=15.05, p<.05) does not cause a difference in pre-service teachers' technology integration levels. The technology integration tendencies of the pre-service teachers who have different levels of information technology use are also different. The information technology use is a significant factor in all dimensions including "technology literacy" ($F_{[2-411]}$=9.29, p<.05), "teaching with technology" ($F_{[2-411]}$=12.65, p<.05), "professional development" ($F_{[2-411]}$=8.67, p<.05), "ethics and policies" ($F_{[2-411]}$=10.82, p<.05), and "organization and management" ($F_{[2-411]}$=13.87, p<.05). When the source of the difference is examined, it is seen that the pre-service teachers who have advanced information and communication technology skills have higher technology integration levels and this difference is significant.

The Pre-service Teachers' Views on the Effect of Compulsory Distance Education on Technology Integration Levels

The first question asked to the pre-service teachers during the interview was "What do you think about the effect of the compulsory distance education process on your level of technology literacy (communication over the internet, basic functions of office programs, use of information technologies, the function of basic hardware parts, etc.)?". All interviewees

reported that compulsory distance education has increased their level of technology literacy. They also reported that they have made significant progress in using internet communication, the functions of basic hardware parts and the basic functions of office programs with the compulsory distance education process, adding that they have gained experience in using information Technologies and accessing and sharing information through these technologies. Below are sample views of the participants.

> **PT5:** *I am using the internet more actively and to communicate with friends and colleagues after distance education but I used to call them on the phone... In the past, our midterm-final exam questions were open-ended or in the form of a test, but project assignments are given during the distance education process, so I started using Word and PowerPoint more....*
>
> **PT11:** *Of course the compulsory distance education process increased my level of technology literacy. I used to keep away from computer parts or computer programs. Now I can control all of the microphones, cameras, headphones in live classes… I can control the settings in case of internet disconnection… I can transfer my assignments to my mobile phone, connect to the university's ALMS (the platform used by the university staff for distance education) from my phone when necessary, and organize them easily.*
>
> **PT8:** *The compulsory distance education process showed me how easy it is to learn via computer/internet… Now I have many new sources of information that I can access on the internet when I want to do research… I can quickly share with our friend groups any information that I have just learned.*

The second question was "What can you say about the effect of the compulsory distance education process on your technology-supported teaching skills (using e-learning tools, designing teaching materials with software development tools, presenting assignments/tasks on the internet, etc.)?. All interviewees had positive views regarding teaching with technology skills. All of the pre-service teachers stated that the compulsory distance education process improved their teaching material design skills and gained them new skills in terms of submitting assignments online and performing the tasks given as part of the course. Below are sample views of the participants.

> **PT14:** *… In this process, all course procedures are done through the internet, and thus, we inevitably prepare digital materials. I can say that our lectures including homework and projects during face-to-face education have now been replaced by computer and internet technologies. Now I can easily submit my assignments over the internet.*
>
> **PT9:** *I used to make preparations for the class using paper and pencil or textbooks, but now I never use them… Nowadays, I make all preparations completely through the computer and the internet. Naturally, this has made significant contributions to me in designing the teaching process with technology. I can design all materials through such programs.*
>
> **PT1:** *Obviously, the compulsory distance education process has completely put me into a digital world, especially in lectures, because now I definitely use technology in almost all assignments and projects…*

The third question was "What can you say about the contribution of the compulsory distance education process to your professional development (participating in information-sharing communities, discussing teaching methods, attending online courses related to your field, etc.)?". And, as reported by the participants, compulsory distance education has had positive effects. They also added that compulsory distance education has contributed to their ability to participate in information communities related to their field and encouraged them to participate in new online lectures or courses. Below are sample views of the participants.

PT7: *Our teachers sometimes give research assignments on certain subjects, we cannot find anyone to ask anything during the pandemic process and this has led me to find new ways or solutions ... Recently, I have attended a course on the internet to learn a new subject, frankly, I would never believe that I could do this without this compulsory distance education process.*

PT6: *... Eventually we will all become teachers, but I am now sure that it is not possible to become a good teacher only with the education we received from the university. In this process, I met many new people on the internet and exchanged a lot of information with them. I can say that the distance education process has changed my views on the teaching profession, and this process has opened up new horizons for me regarding my profession.*

The fourth question was "What do you think about the effects of the compulsory distance education process on issues such as the safe use of technology, legal issues, copyrights, ethics, etc.?". The interviewees stated that the compulsory distance education process raises their awareness about the safe use of technology, adding that the compulsory distance education process has contributed to them in learning the legal dimensions of technology and that they did not know or take care of the issues of copyright and ethics before and have started to take care of them after compulsory distance education. Below are sample views of the participants.

PT3: *... we are supposed to browse many web pages related to our courses, and actually I have never paid attention to the security of the web pages and especially the issue of copyright, I use it so extensively now that I realized how important every step I take on the internet is for us in this process.*

PT4: *In the simplest term, in this process, I have learned that it is not legal to use the images, videos or information notes we use in our presentations without the permission of their owners. However, I've also seen how vulnerable our personal computers are. Now I pay attention to all these issues by taking measures.*

PT12: *We share all the prepared contents on the distance education system platform or from our own information communities, but this was not the case before. Therefore, this process lets us know that everything we share on our behalf is actually something that is binding for us.*

The fifth and the last question was "What can you say about the effects of the compulsory distance education process on supporting or organizing your teaching activities (being able to choose and use multimedia materials, websites or instructional technologies)?".

All the interviewees reported that the compulsory distance education process supports their teaching activities, adding that they have made significant progress in choosing and using instructional technologies with the compulsory distance education process. However, they also reported that they have gained experience in selecting the web pages and accessing and sharing information through these pages. Below are sample views of the participants.

> **PT2:** *It used to be necessary to keep the presentations, videos or other multimedia materials as we needed them for subsequent uses. Obviously, I have learned about the concept of cloud computing and its applications and thus I easily organize contents now. Besides, I know about some programs and websites that facilitate instructional activities.*

> **PT10:** *... we had to learn the applications of learning management systems in this process because some of our professors often use these platforms… Actually, we will be able to manage our lessons very easily through these platforms, which will be very useful for us in the future…*

4. Discussion, Conclusion, and Recommendations

The results regarding the pre-service teachers' technology integration levels are shown below based on the sub-goals of the research.

According to the results of the research, it was concluded that pre-service teachers in the process of compulsory distance education (Covid-19 pandemic) have a high level of technology integration. This means that pre-service teachers feel highly competent in terms of technology integration. When the literature is examined, it is possible to come across research results that support the result of this research (Hew & Brush, 2007; Özdamlı, 2017; Ünal, 2013; Turgut & Başarmak, 2019). Many factors such as learning experiences in the higher education process, rapid developments in internet technology, the information abundance of today's world, and the increase in the use of mobile technologies may have been had an influence on high levels of technology integration. Studies indicate the effect of interest and tendency towards technology on the level of technology integration (Chai, Koh, & Tsai, 2010; Doering et al., 2009; Kabakçı-Yurdakul, 2011; Lee & Tsai, 2010; Polly, 2011).

From this point of view, it is suggested that in the wake of the pandemic process, pre-service teachers' skills in choosing and using online teaching technologies may have had a catalytic effect. The views of the pre-service teachers in the qualitative part of the study support this idea. According to the qualitative results, the compulsory distance education process provides pre-service teachers with a new set of experiences in using information technologies, accessing safe information through these technologies, and sharing information. Therefore, it is recommended to continue distance education even activities after the pandemic process. In this context, as suggested by Orban, Teeling-Smith, Smith, and Porter (2018), online and face-to-face courses can be given through blended learning.

On the other hand, while gender and department factors do not cause a significant difference at the level of technology integration and its dimensions, the level of use of information technology causes a significant difference. While this result of the research coincides with some research results (Koh & Chai, 2011; Çoklar, 2014; Kula, 2015; Özdamlı, 2017), it differs from some research results (Turgut & Başarmak, 2019; Karataş, 2014; Sweeney & Drummond, 2012; Şimşek & Yazar, 2018). This is thought to be due to the characteristics of the sample group. According to these results, the technology integration levels of male and female pre-service teachers were found to be similar. No significant difference was found between the technology integration levels of pre-service teachers studying in different departments. Considering this situation, it is recommended to properly

determine the characteristics of the sample group and to reconsider the variable of the department. Thus, it can be said that the results obtained in terms of technology integration levels can be better discussed in terms of the department variable.

The technology integration levels of pre-service teachers with different levels in using information technologies differentiate. The technology integration levels of the pre-service teachers with a high level of use of information technologies (computer, software, internet, e-mail, etc.) were found to be higher than those with low and moderate use. It can be argued that this is an expected result as it is possible to come across a plethora of studies indicating the effect of technology interest and tendency on the level of technology integration (Avcı & Ateş, 2017; Dikmen & Demirer, 2016; Gönen & Kocakaya, 2015; Koçoğlu, 2009; Kuşkaya Mumcu, 2011, Küpeli & Kır, 2015; Orhan & Tekin, 2019; Şahin & Namlı, 2019; Şimşek & Yazar, 2015). Therefore, it is recommended that the data to be obtained regarding the level of using information technologies in future studies should be taken into consideration based on different parameters.

The results on the dimensions of the technology integration scale reveal that technology integration is high in all dimensions. Pre-service teachers feel highly competent in "technology literacy". This means that their ability to use up-to-date information and communication technologies is also at a high level. It is known that the relationship of technology with society has changed in parallel with the rapid developments in technology (Kemal & Yolcuoğlu, 2020). With the rapid developments, society's perceptions, tendencies, and needs towards technology change significantly (Karabulut, 2015). From this perspective, it is thought that high technology literacy levels of pre-service teachers have emerged as pre-service teachers recognize the relationship between the individual and technology and are aware of the importance of technology and its widespread use, especially after the pandemic process. The qualitative results of the research support this fact. In this respect, the pre-service teachers report an increase and improvements in communication over the internet, the functions of basic hardware parts, and the use of the basic functions of office programs after the distance education process and in their technology literacy levels. This result is supported by the study conducted by Dikmen & Bahçeci (2020). Similarly, it overlaps with some research results (Aldemir & Avşar, 2020; Sözen, 2020; Tuncer, 2020). In future studies, it is suggested that the data to be obtained from the sample should be analysed together with different variables (such as technological access, technological infrastructure, and technical support).

The participating pre-service teachers feel highly competent in "teaching with technology". This is thought to be related to pre-service teachers' interests and tendencies towards new technologies as well as their use of these technologies in the learning and teaching process. According to the qualitative results of the study, the compulsory distance education process that started with the pandemic increased the knowledge and skill levels of pre-service teachers in using e-learning tools, designing teaching materials with software development tools, and performing assignments/tasks over the internet. The literature review shows that teachers/ pre-service teachers who use instructional technologies commonly have high technology integration levels (Farjon et al., 2019; Lee & Lee, 2014; Özgen & Obay, 2008; Uyangör & Ece, 2010). The result is supported by the study conducted by Gönen & Kocakaya (2015), which revealed that the techno-pedagogic education competencies of the teachers who attended any technological training course were statistically significantly higher than those who did not. Likewise, Kuşkaya Mumcu (2011) determined that computer-aided lessons create a positive and significant change in pre-service teachers' technology integration levels. In this context, in future studies, comparative analysis of the data obtained from

different sample groups is recommended in future research and for future researchers to interpret the results obtained more accurately.

According to the results of the research, the participating pre-service teachers feel highly competent in "professional development". This means that pre-service teachers have a high interest and tendency to join communities related to the teaching profession, discuss online teaching methods and techniques, and attend relevant online courses. It was also observed that the compulsory distance education process contributes to their ability to participate in the knowledge communities related to their field and encourages them to participate in new online courses or courses. Regarding this issue, UNESCO (2020) has also prepared a guide for teachers regarding communication technologies they can use in distance education with students. In this context, when the literature is examined, it is possible to come across research results that support this research result (Mulenga & Marban, 2020; UNESCO, 2020). In the studies conducted by Bakioğlu & Çevik (2020) on science teachers, it was determined that the pandemic process mostly positively affected the use of educational technologies and professional development. Considering this situation, it is recommended that distance education activities should be taken into consideration in improving the professional development levels of pre-service teachers along with tools to be developed for this purpose.

Finally, it was concluded that the participating pre-service teachers feel highly competent in terms of "ethics and policies" and "organization and management". This means that they have high knowledge levels on ethical, safe use and property rights, which should be considered while using information and communication technologies, and high skill levels in the management and organization of the technologies they use. This is supported by the qualitative results of the research, which revealed that the compulsory distance education process contributes to learning the legal dimensions of technology and making significant progress in choosing and using instructional technologies. This result of the research coincides with the results of the research conducted by Akcil & Bastaş (2020). Some recommendations based on the findings are as follows:

- According to the results of the research, the compulsory distance education (Covid-19 pandemic) process has provided learners and teachers with some advantages as well as some disadvantages. From this point of view, distance education activities can be continued after the pandemic or lessons can be conducted with a blended learning model.
- According to the results of the research, the interest in and tendency towards technology had a positive effect on the level of technology integration. In future studies, different parameters can be used in the data to be obtained regarding the use of information technologies.
- In future studies, the data to be obtained from the sample can be handled together with different variables (e.g. technological access, technological infrastructure, technical support situations).
- Data to be obtained from different sample groups can be analyzed comparatively.
- Distance education activities for the professional development of pre-service teachers can be taken into consideration and related tools can be developed.
- In the distance education activities to be carried out, some innovative practices can be included to improve the ethical and policy levels of pre-service teachers.

References

Akbulut, M., Sahin, U., & Esen, A. C. (2020). More than a virus: How COVID 19 ınfected education in Turkey?. *Journal of Social Science Education, 19,* 30-42. https://eric.ed.gov/?id=EJ1260561

Akcil, U., & Bastas, M. (2020). Examination of university students' attitudes towards e-learning during the COVID-19 pandemic process and the relationship of digital citizenship. *Contemporary Educational Technology, 13*(1), 291-304. https://doi.org/10.30935/cedtech/9341

Aldemir, C., & Avşar, M. N. (2020). Pandemi döneminde dijital vatandaşlık uygulamaları. *Avrasya Sosyal ve Ekonomi Araştırmaları Dergisi, 7*(5), 148-169. https://dergipark.org.tr/en/pub/asead/issue/54658/738205

Avcı, T., & Ateş, Ö., 2017, Fen bilimleri öğretmenlerinin teknolojik pedagojik alan bilgilerine yönelik algıları üzerine bir araştırma, *Uludağ Üniversitesi Eğitim Fakültesi Dergisi*, 30 (1), 19-42. https://doi.org/10.19171/uefad.323375

Bakioğlu, B., & Çevik, M. (2020). COVID-19 Pandemisi sürecinde fen bilimleri öğretmenlerinin uzaktan eğitime ilişkin görüşleri. *Electronic Turkish Studies, 15*(4), 109-129. https://dx.doi.org/10.7827/TurkishStudies.43502

Balci, Y., & Çetin, G. (2020). Covıd-19 pandemi sürecinin Türkiye'de istihdama etkileri ve kamu açısından alınması gereken tedbirler. *İstanbul Ticaret Üniversitesi Sosyal Bilimler Dergisi, 19*(37), 40-58. https://dergipark.org.tr/en/pub/iticusbe/issue/55168/752714

Bozkurt, A. (2020). Koronavirüs (Covid-19) pandemi süreci ve pandemi sonrası dünyada eğitime yönelik değerlendirmeler: Yeni normal ve yeni eğitim paradigması. *Açıköğretim Uygulamaları ve Araştırmaları Dergisi, 6*(3), 112-142. https://dergipark.org.tr/en/pub/auad/issue/56247/773769

Büyüköztürk, Ş., Kılıç-Çakmak, E., Akgün, Ö.E., Karadeniz, Ş., & Demirel, F. (2010). *Bilimsel araştırma yöntemleri* (6. Baskı). Ankara: Pegem yayıncılık.

Çakıroğlu, Ü., Çebi, A., & Gökoğlu, S. (2015). Öğretmenlerin teknoloji entegrasyonlarına yönelik temel göstergeler: Bir ölçek geliştirme çalışması. *Gazi Üniversitesi Gazi Eğitim Fakültesi Dergisi, 35*(3), 507-522. http://www.gefad.gazi.edu.tr/en/download/article-file/312824

Chai, C. S., Koh, J. H. L., & Tsai, C.-C. (2010). Facilitating preservice teachers' development of technological, pedagogical, and content knowledge (TPACK). *Educational Technology & Society, 13* (4), 63–73. https://www.jstor.org/stable/pdf/jeductechsoci.13.4.63.pdf

Çoklar, A. N. (2014). Primary school preservice teachers' technolgical pedagogical content knowledge competency in terms of gender and ICT use phase. *Education and Science, 39*(175), 319-330. http://dx.doi.org/10.15390/EB.2014.3464

Çokluk, Ö., Yılmaz, K., & Oğuz, E. (2011). Nitel bir görüşme yöntemi: Odak grup görüşmesi. *Kuramsal Eğitimbilim Dergisi,* 4(1), 95-107. https://dergipark.org.tr /en/pub/akukeg /issue/29342/313994

Demir, S., & Kale, M. (2020). Öğretmen görüşlerine göre, covid-19 küresel salgını döneminde gerçekleştirilen uzaktan eğitim sürecinin değerlendirilmesi. *Electronic Turkish Studies, 15*(8), 3445-3470. https://dx.doi.org/10.7827/TurkishStudies.44492

Dikmen, C. H. & Demirer, V. (2016). Öğretmenlerin teknoloji entegrasyonuna yönelik davranışlarını etkileyen değişkenlerin incelenmesi, *İnönü Üniversitesi Eğitim Fakültesi Dergisi, 17*(3), 153-167. https://dergipark.org.tr/en/pub/inuefd/issue /27125/285363

Dikmen, S., & Bahçeci, F. (2020). Covid-19 pandemisi sürecinde yükseköğretim kurumlarının uzaktan eğitime yönelik stratejileri: Fırat Üniversitesi örneği. *Turkish Journal of Educational Studies, 7*(2), 78-98. https://doi.org/10.33907/turkjes.721685

Doering, A., Veletsianos, G., Scharber, C. & Miller, C. (2009). Using the technological, pedagogical, and content knowledge framework to design online learning environments and professional development. *Journal of Educational Computing Research, 41* (3), 319-346. https://doi.org/10.2190/EC.41.3.d

Durak, G., Çankaya, S., & İzmirli, S. (2020). COVID-19 pandemi döneminde Türkiye'deki üniversitelerin uzaktan eğitim sistemlerinin incelenmesi. *Necatibey Eğitim Fakültesi Elektronik Fen ve Matematik Eğitimi Dergisi, 14*(1), 787-809. https://doi.org/ 10.17522/balikesirnef.743080

Earle, R. S. (2002). The ıntegration of ınstructional technology into public education: Promises and challenges. *Educational Technology, 42*(1), 5-13. https://www.jstor.org/ stable/44428716?seq=1#metadata_info_tab_contents

Farjon, D., Smits, A., & Voogt, J. (2019). Technology integration of pre-service teachers explained by attitudes and beliefs, competency, access, and experience. *Computers & Education, 130,* 81-93. https://doi.org/10.1016/j.compedu.2018.11.010

Gönen, S., & Kocakaya, F. (2015). Pedagojik formasyon programına katılan öğrencilerinin teknopedagojik eğitim yeterliklerinin çeşitli değişkenlere göre incelenmesi. *Eğitim ve Öğretim Araştırmaları Dergisi, 4*(4), 82-90. http://www.jret.org/FileUpload/ ks281142/File/09.gonen.pdf

Günüç, S. (2017). *Eğitimde teknoloji entegrasyonunun kuramsal temelleri*. *Ankara, Anı Yayıncılık.*

Hew, K. F., & Brush, T. (2007). Integrating technology ınto K–12 teaching and learning: current knowledge gaps and recommendations for future research. *Educational*

Technology Research and Development, *55*(3), 223–252. https://doi.org/10.1007/s11423-006-9022-5

Hsu, P. S., & Sharma, P. (2006). A systemic plan of technology integration. *Journal of Educational Technology & Society*, *9*(4), 173-184. https://www.jstor.org/stable/pdf/jeductechsoci.9.4.173.pdf

Kabakçı-Yurdakul, I. (2011). Öğretmen Adaylarının teknopedagojik eğitim yeterliklerinin bilgi ve iletişim teknolojilerini kullanımları açısından incelenmesi. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 40*(1) 397-408. https://dergipark.org.tr/en/pub/hunefd/issue/7796/102086

Karabulut, B. (2015). Bilgi toplumu çağında dijital yerliler, göçmenler ve melezler. *Pamukkale Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, *1*(21), 11-23. https://dergipark.org.tr/en/pub/pausbed/issue/34743/384200

Karataş, F. İ. (2014). *Ortaöğretim matematik öğretmenlerinin teknolojik pedagojik alan bilgilerinin ve teknolojiyi entegretme etme öz yeterliliklerinin incelenmesi.* (Yayın No: 371784). [Yüksek Lisans, Ortadoğu Teknik Üniversitesi] YÖK Ulusal Tez Merkezi. https://tez.yok.gov.tr/UlusalTezMerkezi/

Kemal, E. R., & Yolcuoğlu, İ. G. (2020). Toplumsal teknolojik gelişmeler açısından sosyal bilimlerin işlevi ve toplumla etkileşimi. *Bilişim Teknolojileri Online Dergisi*, *11*(42), 55-86. https://doi.org/10.5824/ajite.2020.03.002.x

Keskin, M., & Özer Kaya, D. (2020). COVID-19 sürecinde öğrencilerin web tabanlı uzaktan eğitime yönelik geri bildirimlerinin değerlendirilmesi. *İzmir Katip Çelebi Üniversitesi Sağlık Bilimleri Fakültesi Dergisi*, *5*(2), 59-67. https://dergipark.org.tr/en/pub/ikcusbfd/issue/55773/754174

Koh, J. H. L., & Chai, C. S. (2011). Modeling pre-service teachers' technological pedagogical content knowledge (TPACK) perceptions: The influence of demographic factors and TPACK constructs. *Changing Demands, Changing Directions*. Proceedings ascilite Hobart 2011 (pp. 735-746). http://hdl.handle.net/10497/14126

Kula, A. (2015). Öğretmen adaylarının teknolojik pedagojik alan bilgisi (TPAB) yeterliliklerinin incelenmesi: Bartın Üniversitesi örneği. *Akademik Sosyal Araştırmalar Dergisi, 3*(12), 395-412. http://dx.doi.org/10.16992/ASOS.615

Kuşkaya Mumcu, F. (2011). *Bir ağsal öğrenme ortamında öğretmen adaylarına verilen bit entegrasyonu eğitiminin etkililiği*. (Yayın No: 284628). [Doktora Tezi, Hacettepe Üniversitesi] YÖK Ulusal Tez Merkezi. https://tez.yok.gov.tr/UlusalTezMerkezi/

Lee, M.H. & Tsai, C.-C. (2010). Exploring teachers' perceived self efficacy and technological pedagogical content knowledge with respect to educational use of the world wide web. *Instructional Science*, 38, 1–21. https://doi.org/10.1007/s11251-008-9075-4

Lee, Y., & Lee, J. (2014). Enhancing pre-service teachers' self-efficacy beliefs for technology integration through lesson planning practice. *Computers & Education, 73*, 121-128. https://doi.org/10.1016/j.compedu.2014.01.001

Mason, R. (2000). From distance education to online education. *The Internet and higher education, 3*(1-2), 63-74. https://doi.org/10.1016/S1096-7516(00)00033-6

Miks, J., & McIlwaine, J. (2020). *Keeping the world's children learning through COVID-19*. Research report, UNICEF. https://www.un_cef.org/coronav_rus/keep_ng-worlds-ch_ldren-learn_ng-through-cov_d-19

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. Sage.

Mulenga, E. M.,& Marbán, J. M. (2020). Is COVID-19 the gateway for digital learning in mathematics education? *Contemporary Educational Technology,* 12(2), 269-280. https://doi.org/10.30935/cedtech/7949

Nunnally J, Bernstein I. (1994). *Psychometric theory*. McGraw Hill, New York.

Orban, C. M., Teeling-Smith, R. M., Smith, J. R., & Porter, C. D. (2018). A hybrid approach for using programming exercises in introductory physics. *American Journal of Physics, 86*(11), 831-838. https://doi.org/10.1119/1.5058449

Orhan, A. & Tekin, İ. (2019). İngilizce okutmanlarının teknoloji yeterliliklerinin ve derste teknoloji kullanımına ilişkin tutumlarının incelenmesi, *Mehmet Akif Ersoy Üniversitesi Eğitim Fakültesi Dergisi,* 49, 81-101. https://dergipark.org.tr/en/pub/maeuefd/issue/42791/376334

Özdamlı, F. (2017). Attitudes and opinions of special education candidate teachers regarding digital technology, *World Journal on Educational Technology*, 9(4), 191-200. https://eric.ed.gov/?id=EJ1161616

Polly, D. (2011). Teachers' learning while constructing technology-based ınstructional resources. *British Journal of Educational Technology, 42 (6),* 950-961. https://doi.org/10.1111/j.1467-8535.2010.01161.x

Ramorola, M. Z. (2013). Challenge of effective technology integration. *Africa Education Review, 10*(4), 654-670. https://doi.org/10.1080/18146627.2013.853559

Reigeluth, C. M., & Joseph, R. (2002). Beyond technology integration: The case for technology transformation. *Educational Technology, 42*(4), 9-13. https://www.jstor.org/stable/44428759?seq=1#metadata_info_tab_contents

Rovai, A. P., & Downey, J. R. (2010). Why some distance education programs fail while others succeed in a global environment. *The Internet and Higher Education*, 13(3), 141-147. https://doi.org/10.1016/j.iheduc.2009.07.001

Şahin, M. C., & Namlı, N. A. (2019). Öğretmen adaylarının eğitimde teknoloji kullanma tutumlarının incelenmesi, *Türkiye Sosyal Araştırmalar Dergisi*, *1* (23), 95-112. https://dergipark.org.tr/en/pub/tsadergisi/issue/44605/432280

Sarıtaş, E., & Barutçu, S. (2020). Öğretimde dijital dönüşüm ve öğrencilerin çevrimiçi öğrenmeye hazır bulunuşluğu: Pandemi döneminde Pamukkale Üniversitesi öğrencileri üzerinde bir araştırma. *İnternet Uygulamaları ve Yönetimi Dergisi*, *11*(1), 5-22. https://doi.org/10.34231/iuyd.706397

Shattuck, J., Dubins, B., & Zilberman, D. (2011). MarylandOnline's inter-institutional project to train higher education adjunct faculty to teach online. *International Review of Research in Open and Distance Learning*, *12*(2), 40-61. https://doi.org/10.19173/irrodl.v12i2.933

Şimşek, Ö., & Yazar, T. (2018). Öğretmen adaylarının eğitimde teknoloji entegrasyon öz-yeterliklerinin incelenmesi: Türkiye örneği. *Electronic Journal of Social Sciences*, *17*(66), 744-765. https://doi.org/10.17755/esosder.357330

Sözen, N. (2020). Covıd 19 sürecinde uzaktan eğitim uygulamaları üzerine bir inceleme. *Avrasya Sosyal ve Ekonomi Araştırmaları Dergisi*, *7*(12), 302-319. https://dergipark.org.tr/en/pub/asead/issue/58844/821764

Tabachnick, B. G., Fidell, L. S., & Ullman, J. B. (2007). *Using multivariate statistics* . Boston, MA: Pearson.

Taşdemir, S. (2018). FATİH projesi ile eğitimde teknoloji entegrasyonu sağlanan okullarda teknoloji liderinin belirlenmesi. *Ihlara Eğitim Araştırmaları Dergisi*, *3*(1), 1-14. https://dergipark.org.tr/en/pub/ihead/issue/36890/358752

Terrell, S. R. (2012). Mixed-methods research methodologies. *Qualitative Report*, *17*(1), 254-280. https://eric.ed.gov/?id=EJ973044

Tosuntaş, Ş. B., Çubukçu, Z., & İnci, T. (2019). A holistic view to barriers to technology ıntegration in education. *Turkish Online Journal of Qualitative Inquiry (TOJQI), 10*(4), 439-461. https://doi.org/10.17569/tojqi.613969

TÜBA, (2020). *COVID-19 pandemi değerlendirme raporu.* Türkiye Bilimler Akademisi. http://www.tuba.gov.tr/tr/yayinlar/suresiz-yayinlar/raporlar

Tuncer, A. (2020). Coronavirüs döneminde dijital devlet uygulamaları. *Kamu Yönetimi ve Teknoloji Dergisi*, *2*(2), 9-26. https://dergipark.org.tr/en/pub/kaytek/issue/59786/801343

Turgut, G., & Başarmak, U. (2019). Ortaokul öğretmenlerinin teknoloji entegrasyonu yeterliklerinin farklı değişkenlere göre incelenmesi. *Türk Akademik Yayınlar Dergisi, 3*(2), 51-66. https://dergipark.org.tr/en/pub/tayjournal/issue/57153/806574

Ünal, E. (2013). *Öğretmen adaylarının teknoloji entegrasyonu öz-yeterlik algıları ve teknolojik pedagojik içerik bilgisi yeterlikleri arasındaki ilişkinin incelenmesi*. (Yayın No: 342457) [Yüksek lisans tezi, Ankara Üniversitesi.] YÖK Ulusal Tez Merkezi. https://tez.yok.gov.tr/UlusalTezMerkezi/ adresinden 1.01.2021 tarihinde erişilmiştir.

UNESCO, (2020*). How to keep engaged remotely with your students in the context of the covıd-19 crisis: tips for teachers. United Nations Educational, Scientific and Cultural*

Organization. https://en.unesco.org/news/resources-parents-and-teachers-motivating-supporting-children-during-remote-learning

Upoalkpajor, J. L. N., & Upoalkpajor, C. B. (2020). The impact of COVID-19 on education in Ghana. *Asian journal of Education And Social Studies, 9*(1), 23-33. https://doi.org/10.9734/ajess/2020/v9i130238 01.01.2021

Usluel, Y. K., Mumcu, F. K., & Demiraslan, Y. (2007). Öğrenme-öğretme sürecinde bilgi ve iletişim teknolojileri: Öğretmenlerin entegrasyon süreci ve engelleriyle ilgili görüşleri. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, *32*(32), 164-178. https://dergipark.org.tr/en/pub/hunefd/issue/7804/102321

Veletsianos, G. (Ed.). (2010). *Emerging technologies in distance education*. Athabasca University Press.