Online Fen Eğitimi Dergisi
Online Science Education Journal
http://dergipark.gov.tr/ofed

2019; 4(2): 104-116.

Investigation of Pre-service Teachers Related to Information and Communication Technologies Skills[1]

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To cite this article: Ormancı, Ü. (2019). Investigation of pre-service teachers related to information and communication technologies skills. *Online Fen Eğitimi Dergisi, 4*(2): 104-116

ABSTRCT
In parallel with the improvement of technology, the use of information and communication technologies (ICT) at schools and related skills have come into the fore. It can be stated that pre-service teachers to become the teachers of the future have significant roles in terms of the use of information and communication technologies and the integration of these skills with the lectures. The aim of this study is to understand the levels of the pre-service science teachers regarding the ICT skills. The study was survey study and involved 171 pre-service science teachers studying at a middle size state university located in the north part of Turkey. The questionnaire for data collection includes demographic characteristics, open-ended questions, and Likert scale concerning ICT skills. The quantitative data from the research were analyzed in SPSS program while the qualitative data were analyzed through descriptive analysis. As a result of the data, it was determined that ICT skills of the pre-service teachers were at medium-high level and there was a significant difference on behalf of male pre-service teachers. Suggestions were made in parallel with the results of the research.
Keywords: Science, information and communication technology, skill, pre-service teacher

Fen Bilimleri Öğretmen Adaylarının Bilgi ve İletişim Teknolojileri Becerilerinin İncelenmesi

ÖZET
Teknolojinin gelişmesine paralel olarak, okullarda bilgi ve iletişim teknolojilerinin kullanımı ile buna ilişkin bilgi ve beceriler ön plana çıkmaya başlamıştır. Bilgi ve iletişim teknolojilerinin kullanımında ve bu becerilerin derslere entegrasyonunda geleceğin öğretmenleri olan öğretmen adaylarının önemli bir yere sahip olduğu ifade edilebilir. Yapılan çalışmada fen bilimleri öğretmen adaylarının bilgi ve iletişim teknolojileri becerilerine ilişkin düzeylerinin belirlenmesi amaçlanmıştır. Betimsel araştırmalardan tarama çalışması şeklinde gerçekleştirilen çalışma, Türkiye'nin kuzeyinde orta büyüklükte bir üniversitede öğrenim gören 171 fen bilimleri öğretmen adayı ile gerçekleştirilmiştir. Veri toplama aracı olarak geliştirilen ankette; demografik özellikler, açık uçlu sorular ile bilgi ve iletişim teknolojileri becerilerine yönelik likert tipi ölçek yer almaktadır. Elde edilen nicel veriler SPSS programında, nitel veriler ise betimsel analiz yöntemiyle analiz edilmiştir. Elde edilen bulgular sonucunda öğretmen adaylarının BİT becerilerinin orta-yüksek düzeyde olduğu ve erkek öğretmen adayları lehine anlamlı bir farklılık olduğu belirlenmiştir. Çalışmadan elde edilen sonuçlara paralel olarak önerilerde bulunulmuştur.
Anahtar Kelimeler: Fen, bilgi ve iletişim teknolojileri, beceri, öğretmen adayı

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Başvuru Tarihi / Received 09.05.2019
Kabul Tarihi / Accepted 30.09.2019

INTRODUCTION

In accordance with the development of technology and increase of information, ICTs have come into our lives. Due to the fact that ICTs have already penetrated into daily lifes of people, their demand has become inevitably desirable (Kaynak & Karaca, 2012). Accordingly, it can be said that ICT has been among the concepts which are frequently encountered and are significantly affecting people's life, so this concept is an important phenomenon in emphasizing the developmental levels of the societies (Ozel, 2013). At this point, in order to identify the concept; ICT can be stated as any kind of visual, audial, verbal technological tools enabling the rapid flow of information and ideas regardless of space and time (Kurtoglu, 2009). In other words; information technology includes the tools used for creating, collecting, accumulating, processing, retrieving, spreading, keeping the information, while communication technology includes the tools such as telephone and television for enabling the communication between individuals (Haznedar, 2012).

In parallel with the development of ICT, technology –computers being in the first place- can be said to make a rapid move in the educational environment. With the computers, in time, projections, the internet, interactive whiteboard, and other educational applications have been brought into the classroom and become integrated. ICT can be told to have a significant place in the educational environment. As Cuhadar & Yucel (2010) stated in their study, using ICT for the purpose of education has become a necessity for training individuals who would compose the society. Accordingly, projects for the integration of ICT have started to be made in the curriculum of the countries. Through the projects performed in Turkey, technology can be said to become integrated with the contents and applications of the lessons.

ICT tools enables information to be created, collected, accumulated, processed, stored, and transferred from one place to another through the nets (Bektas, 2011). In this concept, ICT has a crucial role in the process, storage, reproduction, and sharing of information (Goktas, Yildirim & Yildirim, 2010). Especially with the help of information and communication technologies, individuals have access to a lot of information in a short time, they can review, evaluate, instantly correct, cooperate with others and brainstorm (Erol, 2011). In this context, ICT tools may increase the persistency of learning and help lectures flourish by providing students with the visual-effective data (Demirhan, 2012).

ICT has become an important factor in the construction of science lessons in terms of providing teachers and students with interactive environments (Demirhan, 2012). However, in order to use ICT tools in the educational environments, teachers should use these technologies in the class activities and should integrate the information technology tools with the activities they organize (Bektas, 2011). Thus, the use of ICT at schools and the knowledge and skills related to it have come to the fore at schools. In other words, as stated by Ananiadou & Claro (2009), the increase in knowledge through ICT requires new skills such as reaching, evaluating and organizing the information in digital environment. Anyway, considering the fact that ICT includes the use of computers and other electronical devices for data processing (Ibelegbu, 2013), ICT skills can be defined as the ability to use the technology, communication devices, and nets in order to compose, evaluate, and reach the information. Chu, Tavares, Chu, Ho, Chow, Siu & Wong (2012) define ICT skills as the ability to use digital technology, communicational devices and nets in order to reach, direct, integrate, evaluate, and compose the information. In this context, a student having information and communication skills will reach the desired information through a systematical preparation period by using all opportunities of technologies necessary for any issue and will interpret and present this information after processing in the most effective way (MEB, 2011; Cepni, Ozmen & Ayvaci, 2015). As it is understood; students, teachers and pre-service teachers - the

teachers of future - who have improved ICT skills have significant roles during the integration of ICT in the class environment.

As the literature is observed, it has been observed that Wilkinson, Roberts &While (2010) and Siddiq, Scherer & Tondeur (2016) developed devices aiming at measuring the ICT skills. Besides, Aesaert, Van Nijlen, Vanderlinde & vanBraak (2014) developed an assessment instrument providing a direct measurement to evaluate the information and communication skills. In their studies on defining condition/level; Heimler, Denaro, Cartisano, Brachio & Morote, (2009) tried to determine the perception levels of undergraduate students regarding the ICT skills and Amedeker & Yidana (2010) worked around that of pre-service science teachers. Haznedar (2012), on the other hand, examined the attitude of undergraduate students concerning the ICT skills in terms of different variables. Moreover, Demirhan (2012) researched the self-efficiency perceptions regarding ICT and status of ICT use of science and technology teachers, and whether these variables affect each other. As it is seen, the studies of ICT have started to be made recently and researches to be made in this issue are thought to be of significance in terms of literature. Similarly, Berkyurek (2008) stated that opinions of teachers towards ICT have gained importance thanks to the use of ICT in education. Furthermore, considering the important role of ICT skills in order to use ICT, it can be stated that studies devoted to pre-service teachers having a significant place in the integration of these tools/applications have become efficient. In this context, it is considered that it is important to measure the ICT skills of pre-service teachers in our country. However, it is thought that collecting qualitative data besides the scale will contribute to the field in terms of determining the skills of the participants. In this study, the aim was to determine the levels/status of pre-service science teachers in relation to the ICT skills. The research questions of the study are as follows:

- What are the level of ICT skills of pre-service science teachers?
- What is the relationship between ICT skills and gender of pre-service science teacher?
- What is the relationship between ICT skills and grade levels of pre-service science teacher?
- What are the instruments/applications that come to mind when pre-service science teacher are called ICT?

METHOD

Research Methods

In this study, survey method which is one of the descriptive methods was used defining the ICT skills of pre-service science teachers. Descriptive method includes the studies executed to enlighten a given case, make evaluations in accordance with the standards, and reveal the possible relations between the events (Cepni, 2018). The main purpose of the research is to determine the levels concerning ICT skills and to state the possible relations, survey method is thought to be appropriate.

Research Group

The research was carried out with the pre-service science teachers educated at a middle size state university located in the north part of Turkey in the educational year of 2016-2017. In the study, totally 171 pre-service teachers from the first, second, third, and fourth grades attended. Of these pre-service teachers, 49 of them were first grade, 50 are second, 46 are third, and 26 were fourth grade students.142 of the pre-service teachers were females and 29 were males. Besides, the ages of the pre-service teachers range between 17 and 32.

Data Collection Tools

"ICT Questionnaire Form" was used as a data collection tool in the study. The questionnaire includes demographical characteristics, open-ended questions and likert scale aiming at ICT skills. In the demographical characteristics part; features such as gender, age, grade were focused. Five questions were asked in the open-ended questions, one of which is the three tools-applications that come to mind. The other four questions are; these are questions that aim to measure the ICT skills of prospective teachers and include a case. One of these questions was as such: "Suppose that your mobile phone at hand is three-four years old. You would like to download a program/application on your mobile phone, however download process takes a long time and causes the device to freeze. What kind of a path would you follow without changing your mobile phone? Why?" After preparing open-ended questions, they were submitted for expertise and sent to two experts. According to the feedback from the experts, the last revisions were made on questions. Likert scale in the research intended for ICT skills was developed by Haznedar (2012). The researcher tried to develop a scale according to the conditions of Turkey by adapting the scale of ICT skills and experiences developed by Wilkinson, Roberts & While (2010). The researcher calculated the reliability coefficient of the scale as 0.933. ICT questionnaire form used as the data collection tool in the study was applied for each grade and the ones filled properly and correctly were selected. The applications lasted between 20-30 minutes on average.

Data Analysis

Likert scale used in the study aiming at the ICT skills was graded between 1-5. The open-ended questions were graded as primarily sufficient (2), partly sufficient (1) and insufficient (0). The quantitative data obtained were put into the SPSS program and analyzed. During this period, after their normality distributions were observed, it was observed that the data were normally distributed. Then; f, %, and mean values of the data were identified and the correlation between the likert scale and open-ended questions were examined. Furthermore, the open-ended questions were analyzed in accordance with the descriptive analysis and presented along with the examples.

RESULTS

What are the level of ICT Skills of Pre-service Science Teachers?

This part includes the findings from the research defining the ICT skills of the pre-service science teachers. General findings regarding the ICT skills of pre-service science teachers are in Table 1.

Table 1. *Findings regarding the ICT skills of pre-service science teachers*

	N	Mean	Standard Deviation
ICT scale	171	116.4	13.41
ICT open-ended questions	171	3.9	1.71
ICT skills	171	120.4	14.14

As seen in the Table 1, regarding ICT skills, while the pre-service teachers had 116.4 score from the scale; they got the score of 3.9 from the open-ended questions. The score of ICT skills for the pre-service teachers in total is 120.4. Accordingly, it can be stated that skill levels of the pre-service science teachers concerning ICT are high. Findings regarding the ICT skill scale scores of the pre-service teachers are demonstrated in Table 2.

Table 2. *Findings from the scale regarding the ICT skills of pre-service science teachers*

	N	Mean	Standard Deviation
Information Technologies	171	55.8	10.54
Communication Technologies	171	36.1	3.80
Mobile Technologies	171	24.6	1.17
ICT Skills	171	116.4	13.41

Pre-service science teachers had the scores as such: 55.8 from the information technologies which is the first dimension of the scale regarding ICT skills, 36.1 from the communication technologies dimension, 24.6 from the mobile technologies dimension. Pre-service teachers got the score of 116.4 from the whole scale in total. Considering that the possible maximum score is 140, it has been concluded that the ICT skills of the pre-service teachers can be considered as high. Findings regarding the points of pre-service teachers from the open-ended questions concerning ICT skills are found in Table 3.

Table 3. *Findings from the open-ended questions regarding the ICT skills of pre-service teachers*

	N	Mean	Standard Deviation
Question1	171	.8	.75
Question 2	171	1.2	.55
Question 3	171	.9	.61
Question 4	171	1.1	.60
Total	171	3.9	1.71

Pre-service teachers got the following scores from each of the four open-ended questions related to ICT skills: 0.8 from the first one, 1.2 point from the second, 0.9 from the third, and 1.1 from the forth one. Lastly, they scored 3.9 in total from the questions regarding ICT skills. Considering that the maximum total score likely to be gained from the open ended questions is 8, it is concluded that pre-service teachers' ICT skills can be regarded as medium level. First open-ended question is related to the actions to be taken in case of an error during the printing process of a word document. Examples from the pre-service teachers' answers having the highest scores are as follows:

"*I would check what kind of error the computer gives and apply the methods I have already known. If it doesn't work, I would search the Internet for a solution and open subjects in forums."* (Pre-service Teacher 3)

"*I would go to the printer section from the connected devices settings and control the printing status. If there isn't any problem, I would control the printer. I would observe whether there is any paper jam or check the cables connecting the printer and the computer*." (Pre-service Teacher 4)

"*I would send the document by e-mail and try to re-print at an internet café. Alternatively, there might be a problem with the format, pdf or non-pdf, etc. If so, I would use converters for this case*." (Pre-service Teacher 9)

"*I would turn off and on the printer. I would check whether there is a paper in the tray. I would ensure that there is enough in in the cartridge. I would cancel the printing duty from the PC and try to print again*." (Pre-service Teacher 50)

Second open-ended question is related to the presentation preparation process. Examples from the pre-service teachers' answers having the highest scores are as follows:

"*First of all, I would prepare a draft. I would try to make the subject remarkable by obtaining interesting information and supporting through visual and audial materials. I*

would use a background page and music in accordance with the presentation." (Pre-service Teacher 4)

"*I would search the internet for presentation samples in the given subject. I would synthesis the information in compliance with the age group of the audience and would support the presentation with related pictures, videos, etc. to make the subject catchy.*" (Pre-service Teacher 12)

"*It should appeal to both eye and ear. Thus, I would attach appropriate and remarkable visuals and support with some files. I would make it more noticeable with suitable effects and texts*." (Pre-service Teacher 83)

"*I may use plenty of visuals, suitable colors, suitable font size, mind maps, maybe videos. After making related researches, I would process my data in the powerpoint application in an appropriate and remarkable way*." (Pre-service Teacher 128)

Third open-ended question is related to a research process regarding a subject/homework. Examples from the pre-service teachers' answers with the highest scores are as follows:

"*I would search at Google and at all web-sites. I would review the articles in Google academics on subjects such as use of animation, science teaching, science teaching animation, etc*." (Pre-service Teacher 105)

"*I would search for the articles in Turkish and other languages at Google academic; e.g. "Animation in Science*". (Pre-service Teacher 149)

"*Apart from the thesis in Uludag University Library, I would research Google academic for the subject in question. I would define the sub-branches of science and subjects supported with animations and focus on them*." (Pre-service Teacher 153)

Fourth of the open-ended questions is about what to do for the problem of phone freeze when we want to download a program/application to the smartphone. Examples from the pre-service teachers' answers with the highest scores are as follows:

"*I would copy all the data in my smartphone into my computer so that I would make a room in my smartphone memory. Alternatively, I would delete the useless data in my smartphone. Or I may buy a memory card to upload the data*." (Pre-service Teacher 1)

"*The memory is full. I would delete the unnecessary applications and photos, otherwise I would reset. I would search the internet. If these don't work, I would have the device fixed."* (Pre-service Teacher 20)

"*First of all I would delete the unnecessary videos, photos, etc., and then I would copy the rest on the memory card. After trying to clean via an antivirus program, I would download the application. If it doesn't work, I would control the software updating and if not updated, I would do the updates*." (Pre-service Teacher 23)

"*I would clear the cache, delete the unnecessary files… In case of a wi-fi problem, I would delete my wi-fi user name and re-connect*." (Pre-service Teacher 50)

Findings concerning the ICT skills were classified in two groups as quantitative and qualitative. The correlation values regarding these data are found in Table 4.

Table 4. *Relationship between the scale and open-ended questions related to ICT skills*

Variable	N	r	p
Question 1 and 2: Information Technologies	171	0.355	.000
Question 3: Communication Technologies	171	0.292	.000
Question 4: Mobile Technologies	171	.169	.028
Open-ended questions: Likert scale	171	.375	.000

As it is understood from the table, a statistically positively poor significant relationship among the scores was determined as p<.05 according to the Pearson Product Moment Correlation analysis made in order to define the relation between information technologies points - which is a sub-dimension of ICT skills and related two open-ended questions and (r=.355; p<.05). Similarly, a statistically positively poor significant relationship was identified as p<.05 level between the communication technologies – which is a sub-dimension of ICT skills- and related open-ended question scores(r=.292; p<.05). However, a statistically positively very poor significant relationship was determined as p<.05 between the mobile technologies and related open-ended question scores (r=.169; p<.05). As the correlation between total scores are concerned, a statistically positively poor significant relationship was determined as p<.05 level (r=.375; p<.05).

What is the Relationship between ICT Skills and Gender of Pre-Service Science Teacher?

Independent t test results related to the relationship between the ICT skills and genders of pre-service science teachers are found in Table 5.

Table 5. *Relationship between the ICT skills and genders of pre-service science teachers*

Score	Groups	N	Mean.	Sd.	t test		
					t	Sd	p
Scale	Female	142	115.9	12.6	1.163	169	.027
	Male	29	119.1	16.8			
Open-ended questions	Female	142	3.9	1.7	.377	169	.153
	Male	29	4.1	1.9			
Total	Female	142	119.9	13.2	1.149	169	.018
	Male	29	123.2	18.0			

Pre-service science teachers' ICT skills are of significant difference according to the gender; t(169)=1.163, p<.05. In the scale scores for ICT skills, male pre-service teachers' scores (119.1) are more positive than female pre-service students' points (115.9). In this context, it can be stated that there is a significant difference between the points of female students and that of male students. Furthermore, in terms of total scores, the scores of ICT skills are of significant difference according to gender; t(169)=1.149, p<.05. In ICT skills scale scores, the scores of male pre-service students (123.2) are more positive as compared with those of female pre-service students (119.9). Accordingly, it can be stated that there is a significant difference between the scores of female students and those of male students.

What is the Relationship between ICT Skills and Grade Levels of Pre-Service Science Teacher?

Descriptive statistics results of pre-service science teachers according to their grade are demonstrated in Table 6 and ANAVO results are shown in Table 7.

Table 6. *Descriptive analysis results of pre-service science teachers by their grades*

Level	N	Mean	Standard deviation
First Grade	49	112.4	12.5
Second Grade	50	119.4	14.6
Third Grade	46	123.9	12.4
Fourth Grade	26	131.4	9.6
Total	171	120.4	14.1

As it is seen in Table 6 and 7, there is a significant difference between the ICT skill levels and the scores of pre-service teachers; $F(3, 167)=14.03$, $p<.05$. In other words, ICT skills of teachers vary by grade significantly. As the results of Scheffe test - which was made in order to find out among which groups there was a difference- are observed, a significant difference was found between the first and third grade, first and fourth grade, and second and fourth grade respectively. Besides, it can be stated that as the grade level increases, ICT skill scores increase as well.

Table 7. *ANOVA results regarding the ICT skills and grades of pre-service science teachers*

Variance Source	Sum of Squares(SS)	Sd	Mean Squares(MS)	F	p	Significant difference
Between groups	6840.563	3	2280.188	14.033	.000	1-3, 1-4, 2-4
Within groups	27135.274	167	162.487			
Total	33975.836	170				

What are the Instruments/Applications That Come to Mind When Pre-service Science Teacher are Called ICT?

Findings related to the tools/applications coming into pre-service science teachers' minds in relation to ICT are found in Table 8.

Table 8. *Tools/applications coming into pre-service science teachers' minds in relation to ICT*

Tools/Applications	f	%	Tools/Applications	f	%
Telephone	153	30.9	E-state	1	0.2
Computer/ laptop	149	30.1	Wikipedia	1	0.2
TV	76	15.3	Google academy	1	0.2
Tablet pc	39	7.9	Interactive whiteboard	1	0.2
Internet/ wifi	20	4.0	Onedio	1	0.2
Whatsapp	11	2.2	Website	1	0.2
Google	8	1.6	Hard disk	1	0.2
Facebook	5	1.0	Skype	1	0.2
Instgram	5	1.0	RAM	1	0.2
Social media	5	1.0	Messenger	1	0.2
Twitter	3	0.6	Battery charger	1	0.2
Youtube	3	0.6	Windows	1	0.2
Radio	2	0.4	Bundle	1	0.2
Flipboard	1	0.2	Hardware	1	0.2
EBA	1	0.2	Music applications	1	0.2
Total	496	100.0			

As observed in the table, mostly stated ICT tool/application by the pre-service science teachers is telephone (%30.9). Following this, computer/laptop with 30.1% frequency, TV with 15.3% frequency, tablet pc with 7.9% frequency, and the internet/wi-fi with 4.0%. The reason why pre-service science teachers prefer ICT tools/applications is that they mostly use these tools or these are the most common and popular ones

DISCUSSION, CONCLUSION and SUGGESTION

According to the findings from the research, it was concluded that pre-service science teachers' ICT skills were on a high level in the scale, on a medium level in terms of open-ended questions, and on a high level in the whole. Similarly, Haznedar (2012) came to the conclusion that ICT skill levels of university students were high. In another study; teachers working at primary schools were on a good level in terms of hardware, operating system, word processor, presentation, and the internet abilities, yet they were found to be on a medium level in terms of spreadsheet abilities (Kara, 2011). As a result of their study, Eti & Guler (2009) determined that instructors working at universities had quite positive opinions towards using ICT. In this respect, the fact that instructors working at universities have a positive opinion on using ICT lead them to ICT integrations in their lectures and cause pre-service teachers to be more correlated with ICT as well. Besides, it is an expected fact that pre-service teachers living in this century of technology and being continuously familiar with technology will have ICT skills on a high level. However it is also thought that ICT skills of the pre-service teachers may vary in parallel with the faculty infrastructures and ICT usage status. As Goktas, Yildirim & Yildirim (2010) defined, although there are differences between faculties in accordance with the opinions of deans, the sources are insufficient, in general. Therefore, ICT skill levels of pre-service teachers may change depending on the ICT usage.

In the study, it can be reported that pre-service science teachers were on a medium level in terms of information technologies related to the scale of ICT skills, and on a high level in terms of communication technologies and mobile technologies. This case can be said to be in parallel with the daily lifes of pre-service teachers; because in the information technologies aspect, there is a possibility to face with any program (such as word, excel, powerpoint) on computer, while in the case of communication technologies; the internet applications, e-mail networking, social networking sites come to the fore. Accordingly, with both mobile technologies and communication technologies, e-mailing, the internet and application uses via smart phones are at the forefront. As the youth of technological age are considered, it is seen that communication and mobile technologies are more dominant and are highly common in daily life. In parallel with this case, it is usual that they have higher scores for the questions in relation to these skills.

It is possible to come to the conclusion that pre-service teachers were on a medium level for the first and third open-ended questions, whereas they were on a medium-high level for the second and fourth open-ended questions. In general, it can be stated that ICT skills of the pre-service teachers are on a medium level. In this respect, when we consider the results obtained from both scale data and open-ended questions, there are differences between them. Although this case is similar when we consider the correlation between the two data collection tools, there is a poorly significant relation between them. Accordingly, there are two important points here. The first one is that there is usually a case or a problem in open-ended questions for measuring ICT skills, and what the students will do to explain or solve this issue has been questioned. In this respect, considering that the open-ended questions are more appealing to measuring skills, it is clear that the ICT skills of pre-service teachers are not on a high level as stated in likert type questions but on a medium one. The second point is that the measurements to be made only by qualitative and quantitative data collection tools can have more errors. Hence, in order to avoid this, it is likely that both qualitative and quantitative data collection tools should be included in terms of making more contribution to literature.

As a result of the study made, there was a significant difference between the scale scores of ICT skills for pre-service science teachers in favor of males. Similar results were obtained form the studies in literature as well (Celik & Keskin, 2009; Haznedar, 2012; Kara,

2011). Though in literature, the gender variable is not considered as important in many studies; there are differences in gender variable in the studies of technology. It is thought that this situation is related to the fact that males are more interested in technology than females. The other finding obtained as a result of the study was that there was a significant difference between the grades and level of ICT skills of the pre-service teachers, and as their grades advanced, their scores of ICT skills increased as well. Likewise, Haznedar (2012) obtained the same result in his study. On the other hand, in the study including first, second and third grade students conducted by Amedeker & Yidana (2010), it was found out that the second grade students has the most positive perception regarding ICT information. However, in parallel with our study, it is a desired result that the ICT skills of the students should increase according to their educational years. Since in the faculties of education, each year the integration of information and communication technologies is emphasized in lectures, and thereby the students are able to use ICTs during their educational periods. Therefore, their ICT skills have been improved and affected positively in parallel with their educational years.

At the end of this study, the ICT skills of the pre-service science teachers were researched. However, it is thought that this study should be carried out again in different institutions by using different scales in order to make a generalization. Moreover, it is also believed that extensive studies should be made for determining the ICT skills of the teachers, pre-service teachers and students, because the date obtained from the qualitative and quantitative data collection tools may vary just as they were in the case of our study. Accordingly, in order to obtain more extensive data related to ICT skills, it is thought that another tool like observation, which can directly find out the skill should be include and used together with the other data collection tools such as qualitative (open-ended question) and quantitative (likert type scale). It was also inferred from the study that the ICT skills of male students were higher compared to females, and the studies in literature supported this result. It is believed that researching the reason for this result in the further studies to be made will have a great contribution to literature.

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GENİŞLETİLMİŞ ÖZET

Amaç ve Önem

Teknolojinin gelişimi ve bilginin artışına paralel olarak bilgi ve iletişim teknolojileri (BİT) hayatımıza girmeye başlamıştır. Bilgi ve iletişim teknolojilerinde gelişime paralel olarak eğitim-öğretim ortamlarına bilgisayar başta olmak üzere teknolojinin hızlı bir giriş yaptığı söylenebilir. Bilgisayarla birlikte zamanla projeksiyon, internet, akıllı tahta, eğitsel uygulamalar da sınıf ortamına taşınmış ve derslere entegrasyonları yapılmaya başlanmıştır. Bu duruma paralel olarak ülkelerin de eğitim-öğretim programlarında bilgi ve iletişim teknolojilerinin entegrasyonuna yönelik projeler yapılmaya başlanmıştır. Türkiye'de gerçekleşen projelerle birlikte, teknolojinin ders içeriklerine ve uygulamalara entegre edilmeye başlandığı söylenebilir. Bu süreçte, yani bilgi ve iletişim teknolojilerinin sınıf ortamına entegrasyonunda, BİT becerileri gelişmiş öğrenci, öğretmen ve geleceğin öğretmenleri olan öğretmen adaylarına önemli roller düşmektedir.

Alanyazın incelendiğinde BİT becerilerine yönelik araştırmalar yeni yapılmaya başlanmış ve bu konuda yapılacak araştırmaların alanyazın açısından önemli olacağı düşünülmektedir. Bunun yanı sıra bilgi ve iletişim teknolojilerini kullanabilmek için BİT becerilerinin önemli bir yere sahip olduğu düşünüldüğünde, bu araç/uygulamaların entegrasyonunda önemli bir yere sahip olan öğretmen adaylarına yönelik yapılacak çalışmalar önem kazandığı söylenebilir. Yapılan çalışmada fen bilimleri öğretmen adaylarının bilgi ve iletişim teknolojileri becerilerine ilişkin düzeylerinin/durumlarının belirlenmesi amaçlanmıştır.

Yöntem

Fen bilimleri öğretmen adaylarının bilgi ve iletişim teknolojileri becerilerinin belirlendiği çalışmada betimsel yöntemlerden tarama çalışması tercih edilmiştir. Yapılan çalışmanın temel amacın; bilgi ve iletişim teknolojileri becerilerine ilişkin durumun belirlenmesi ve olası ilişkilerin ifade edilmesi olduğundan tarama çalışmasının uygun olduğu düşünülmektedir. Çalışma; 2016-2017 eğitim-öğretim yılında, Türkiye'nin kuzeyinde orta büyüklükte bir üniversitede öğrenim gören fen bilimleri öğretmen adayları ile gerçekleştirilmiştir. Çalışmaya birinci, ikinci, üçüncü ve dördüncü sınıftan toplam 171 öğretmen adayı katılmıştır. Veri toplama aracı olarak "Bilgi ve İletişim Teknolojileri Becerileri Anket Formu" kullanılmıştır. Geliştirilen ankette; demografik özellikler, açık uçlu sorular ve bilgi ve iletişim teknolojileri becerilerine yönelik likert tipi ölçek yer almaktadır. Demografik özellikler kısmında cinsiye, yaş sınıf gibi genel özellikler üzerine odaklanılmıştır. Açık uçlu sorular kısmında beş soru sorulmuş, bunlardan biri BİT akla gelen üç alet-uygulamanın ne olduğudur. Diğer dört soru ise; öğretmen adaylarının BİT becerilerini ölçmeyi amaçlayan ve içinde bir vaka içeren sorulardır. Ankette yer alan bilgi ve iletişim teknolojileri becerilerine yönelik likert tipi ölçek ise Haznedar (2012) tarafından geliştirilmiştir. Çalışmada kullanılan bilgi ve iletişim teknolojileri becerilerine yönelik likert tipi ölçek 1-5 şeklinde puanlanmıştır. Açık uçlu sorular ise; öncelikle yeterli (2), kısmen yeterli (1) ve yetersiz-boş (0) şeklinde puanlandırılmıştır. Elde edilen nicel veriler SPSS programına girilmiş ve analiz edilmiştir. Ardından verilerin f, %, ortalama değerleri tanımlanmış ve likert tipi ölçek ile açık uçlu sorular arasındaki korelasyon incelenmiştir. Ayrıca açık uçlu sorular betimsel analize uygun olarak analiz edilmiş, örneklerle birlikte sunulmuştur.

Bulgular

Çalışmadan elde edilen bulgulara göre; öğretmen adayları bilgi ve iletişim teknolojileri becerilerine ilişkin ölçekten 116.4 puan alırken, bilgi ve iletişim teknolojileri

becerilerine ilişkin açık uçlu sorulardan 3.9 puan almışlardır. Toplamda ise öğretmen adaylarının bilgi ve iletişim teknolojileri becerileri puanları 120.4 şeklindedir Bu bağlamda fen bilimleri öğretmen adaylarının bilgi ve iletişim teknolojileri beceri düzeylerinin yüksek olduğu söylenebilir. Bununla birlikte fen bilimleri öğretmen adayları; BİT becerilerine ilişkin ölçeğin birinci boyutu olan bilgi teknolojileri boyutundan 55.8, iletişim teknolojileri boyutundan 36.1 ve mobil teknolojiler boyutundan 24.6 puan almışlardır.

Öğretmen adayları BİT becerilerine ilişkin birinci açık uçlu sorudan 0.8, ikinci açık uçlu sorudan 1.2, üçüncü açık uçlu sorudan 0.9 ve dördüncü açık uçlu sorudan 1.1 puan almışlardır. Fen bilimleri öğretmen adayları BİT becerilerine ilişkin sorulardan toplamda 3.9 puan almışlardır. Açık uçlu sorulardan alınabilecek toplam puan 8 olduğu düşünüldüğünde öğretmen adaylarının BİT becerilerinin orta düzeyde olduğu söylenebilir.

Çalışmadan elde edilen verilere göre; öğretmen adaylarının BİT becerileri düzeyleri ile sınıf düzeyleri arasında anlamlı bir farklılık bulunmaktadır, $F(3, 167)=14.03$, $p<.05$). Başka bir ifadeyle öğretmen adaylarının BİT becerileri, sınıf düzeyine göre anlamlı düzeyde değişmektedir. Sınıf düzeyleri arasındaki farkın hangi gruplar arasında olduğunu bulmak amacıyla yapılan Scheffe testinin sonuçlarına bakıldığında; birinci sınıf ile üçüncü sınıf, birinci sınıf ile dördüncü sınıf ve ikinci sınıf ile dördüncü sınıf arasında anlamlı bir farklılık bulunmuştur.

Çalışma sonucunda fen bilimleri öğretmen adaylarının en fazla ifade ettiği BİT aracı/ uygulaması telefondur (%30.9). Daha sonra öğretmen adayları tarafından %30.1 sıklıkla bilgisayar/laptop, %15.3 sıklıkla televizyon, %7.9 sıklıkla tablet ve %4.0 sıklıkla internet/wifi ifade edilmiştir.

Tartışma, Sonuç ve Öneriler

Yapılan çalışmadan elde edilen bulgulara göre; fen bilimleri öğretmen adaylarının bilgi ve iletişim teknolojileri becerilerinin ölçekte yüksek düzeyde, açık uçlu sorularda orta düzeyde ve toplamda yüksek düzeyde olduğu anlaşılmıştır. Bu durumun temel nedenlerinden biri; üniversite çalışan öğretim elemanlarının BİT kullanımı konusunda olumlu görüşe sahip olması, onların derslerine BİT entegrasyonuna yönlendirmekte ve öğretmen adaylarının da BİT ile daha ilişkili olmalarına neden olmaktadır. Bununla birlikte teknoloji çağında olan ve devamlı teknoloji ile iç içe olan öğretmen adaylarının BİT becerilerin yüksek düzeyde olması beklenen bir sonuçtur.

Öğretmen adaylarının BİT becerilerine ilişkin açık uçlu sorularda orta düzeyde olduğu söylenebilir. Bu bağlamda ölçek verilerinden elde edilen sonuçlarla açık uçlu sorulardan elde edilen sonuçlara baktığımızda arada farklılıklar oluşmaktadır. Bu durumda iki önemli nokta bulunmaktadır. Birincisi açık uçlu sorularda genelde BİT becerilerini ölçmek amacıyla bir durum veya problem yer almakta ve öğrencilerin bunu açıklama veya çözmek için ne yapacakları sorgulanmaktadır. Bu bağlamda açık uçlu soruların daha fazla beceri ölçmeye hitap ettiği düşünüldüğünde öğretmen adaylarının BİT becerilerini likert tipi sorularda ifade ettiği gibi yüksek düzeyde değil, orta düzeyde olduğudur. İkinci önemli nokta ise; sadece nicel veya nitel veri toplama araçları ile yapılacak ölçümlerin daha fazla hata içerebileceğidir. Bu bağlamda bu durumu ortadan kaldırabilmek için nitel ve nicel veri toplama araçlarına beraber yer verilmesinin alana daha fazla katkı sağlayacağıdır.

Yapılan çalışma sonucunda fen bilimleri öğretmen adaylarının BİT becerileri araştırılmıştır. Ancak bu çalışmanın genellenebilmesi için farklı kurumlarda farklı ölçeklerle tekrarlanması gerektiği düşünülmektedir. Ayrıca öğretmen, öğretmen adayı ve öğrencilerin BİT becerilerinin belirlenmesi için daha kapsamlı çalışmaların yapılması düşünülmektedir.

[1]This study was presented at 7th World Conference on Learning, Teaching Andeducational Leadership, Budapeşte.