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Analysis of self-efficacy perception of the science teacher candidates intended for information technology: Example of Sakarya University faculty of education

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Abstract

The purpose of this research is to identify science teachers' self-efficacy perceptions towards information technology. In the study survey methodology was used. Population of the study is formed by the Sakarya University Faculty of Education-Science teacher candidates of at the 1st, 2nd, 3rd and 4th grades. In the study, "easily accessible sampling method" was used. The sample is constituted by the 179 science teacher candidates of the spring term in 2013-2014 academic years in Sakarya University, Faculty of Education. In this study, "ICT for Teachers Self-efficacy Perception Scale" was used. Scale is one-dimensional and consists of 27 items. The Cronbach's alpha internal reliability coefficient was reported as 0.97. Data from 176 science teachers is collected on a voluntary basis. In the analysis of the data obtained from the scale is done by Statistical Package for the Social Sciences. The internal consistency for the total score that means Cronbach's alpha internal consistency coefficient is found as 0.937 in the current study. In the analysis, science teacher candidates' "ICT self-efficacy" depending on the gender, grade, success, economic income, daily internet usage time, condition of having social networks, computers and other information technology tools, number of computer courses taken and the condition of showing participation shows, significant differences; depending on the duration of daily computer use, the condition of having internet and annual expenditure for the information technology does not show a significant difference.

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1. Introduction

As technology is advancing rapidly and affects many areas, it affects the area of education and is being used by more and more people every day. From this viewpoint, individuals in the community, technical, economic and especially in social areas, communication and knowledge which was in use electronic machines in a systematic way through the processing of science (URL-1) is defined as information; with all facilities used in informatics systems composed of "(URL-2) is defined as the concept of education for the world of information technology has become one of the important concepts. Information Society Strategy of ICT in the educational system by integrating information technology will be one of the main tools in the educational process, and the aim will be that the students, and teachers will ensure the effective use of this technology (URL-3). In order to achieve these objectives, several projects are produced and significant resources are allocated from the state budget. As an example Fatih (Opportunities for Research and Technology Improvement Act) can be showed. With the Fatih project the condition of equal opportunities in education and training; in order to provide the users no difficulty, the information technology tools will appeal to more senses in the teaching process of the individual's; starting with preschool education and secondary education in all schools will be provided with "LCD Panel IWB and internet network infrastructure," and it has been decided to give all students and teachers tablet computers (URL-4).

In the course of the effective use of ICT tools, material failure, the failed experiments in crowded classrooms can be shown, due to circumstances such as abstract concepts can be formalized in terms of Science and is considered to be very important. In our country, the name of science and technology gradually implemented since the academic year 2013-2014 the program was changed to the Natural Sciences. The concept of Technology course has found serious even after removal of the name of the program in 2013. The aims of the Science Education Program were to make the students successful in science literacy as individuals and to make the individuals to understand the relationships between technological changes and the science, and to make the individuals to comprehend the relationship between science-technology-society-environment and to establish psychomotor skills (MEB, 2013). One of learning area of the Science-Technology-Society-Environment (PBS), which implement the program on the basis of the teachers, the school and the students that they have the technological equipment, taking into account the teaching-learning process of technology are described that integration can be provided. Furthermore, in the assessment and evaluation parts of the program, it has been mentioned that they are going to be benefited from the technology in order to monitor students' learning process and at the end of this process to evaluate the performance (MEB).

It is so important to be used these technologies by the teachers effectively for reaching the real objective of the projects and the programs of instruction which is designed to increase the quality of education. One of the issues that need to be investigated is the teachers' self-sufficiency belief. As Gawith (1995) mentioned, even if individuals have the ability of performing any action but not trusting themselves, they can't achieve it (cited in: Ekici, 2009). Bandura (1977) defines self-sufficiency belief as the belief of individuals about knowing what to do to cope with the situations they faced Zimmerman (1995) defines the term self-sufficiency as an individual personal judgement of the capability of completing a mission. Teacher self-sufficiency belief can be expressed as the capability of affecting students' performance and the belief of showing his reactions needed to show to complete his function properly. (Aston, 1984). It can be said that day by day, teachers encounter with the technology and have to use it so often, their self-sufficiency belief towards technology will affect their education programs (Tuncer & Tanaş, 2011). As Aşkar & Umay (2001) pointed out the people whose self-sufficiency perception is high make so much effort to achieve a goal and these people don't give up easily when they face with an unwanted situation, they are patient. Because of these reasons, this topic is one of the most crucial issues in education. So to determine the variables which affect individuals self-sufficiency perceptions in the field of science which is highly related with technology, contributes to understand the behaviours of teachers of future. In this context, this study aims to analyze the self-sufficiency perceptions of preservice science teachers studying in Faculty of Education in Sakarya University towards information technologies. The subgoal of the study is to examine the self-sufficiency perceptions of preservice science teachers studying in Faculty of Education in Sakarya University towards information technologies in terms of gender, grade levels, success, having a computer, daily duration of computer use, having computer courses, having internet connection, daily duration of internet use, having any kind of information technology tools, using social network, the annual expenditure that they spend for information.

1.1. The objectives of the study

The objective of the study is to find out the self-sufficiency perceptions of preservice science teachers towards information technologies. The sub-goals are;

Do the self-sufficiency perceptions of preservice science teachers studying in Faculty of Education towards information technologies change with;

- genders
- grade levels
- success
- having a computer
- daily duration of computer use
- having computer courses
- having internet connection
- daily duration of internet use
- having any kind of information technology tools
- using social network
- the annual expenditure that they spend for information technologies?

2. Methodology

Quantitative research was used in this study and survey methodology was applied. It aimed to determine the case with its real state and with this method, it was aimed to define the relation between two variables or more (Karasar, 2005).

2.1. Population and sampling

The population of this study constitutes of 1, 2, 3 and 4 grade preservice science teachers studying in Faculty of Education in Sakarya University. “Easily accessible sampling method” was used. The samples are 176 preservice science teachers studying in Faculty of Education in Sakarya University. The study was conducted in 2013-2014 spring term. The distributions of sampling according to gender and their grade levels are given below in Table1 and Table 2.

Table1. Distribution of samples according to gender

Gender	n	%
Male	35	19,9
Famale	141	80,1
Total	176	100,0

Table2. Distribution of samples according to their grades

Grade level	n	%
1	37	21,0
2	41	23,3
3	35	19,9
4	63	35,8
Total	176	100,0

2.2. Data collection

In this study, self-sufficiency perceptions towards information technologies scale for teachers developed by Ekici, Taşkın-Ekici and Kara (2011) was used. The scale includes 27 items and item titles ; “ Totally disagree”, “Disagree” , “Neutral”, “Agree”, “Totally Agree” , the scale is uni-dimensional, Likert type. Cronbach-Alpha reliability co-efficient was found out as 0,97 with regard to total score of the scale.

3. Results

Data was collected from 176 science preservice teachers voluntarily. While analyzing the data obtained from the scale, T-test ve ANOVA test was used and carried out analysis with the total score.

Table3. The ANOVA test results of preservice science teachers' self sufficiency perceptions towards information technologies depending on daily computer use.

	Sum of Squares	df	Mean	F	p*
Between Groups	4522,681	2	2261,3	8,314	.001
Within Groups	47052,500	173	2712,0		
Total	51575,182	175			

p* < .05

When Table 3 is analyzed there is significant difference of preservice science teachers' self sufficiency perceptions towards information Technologies depending on Daily computer use (F(2,173)=8,314, p=0,001).

Post Hoc analyze and Tukey test is applied to determine which group is in countenance.

Table4. Information about daily average computer use of preservice science teachers.

Daily average Computer use	n	%	\bar{X}	sd
0-4	147	83,5	100,27	16,59
5-9	19	10,81	10,95	17,43
10-14	10	5,71	18,10	12,49
Total	176	100	102,43	17,18

There is no preservice science teacher whose Daily avarage of computer use 15-19 and 20-24 hour (Table 4).

- Between 0-4 hours computer users (\bar{X} =100,27) and 5-9 hours computer user (\bar{X} =110,95), 5-9 computer users are in verdict.,
- Between 0-4 hours computer users (\bar{X} =100,27) and 10-14 hours computer users (\bar{X} =118,10) , 10-14 hours computer users are in verdict.

Tablo5. T test results of preservice science teachers' sufficiency perception toward information technologies depending on having the internet access.

Having the internet access	N	\bar{X}	sd	df	t	p*
Yes	123	104,59	17,71	173	2,398	.018
No	52	97,90	14,56			

p* < .05

When Table5 is analyzed, there is a significant difference of preservice science teachers' sufficiency perception toward information Technologies depending on having internet Access. (t(173)=2,398, p=0,018).It is observed that the preservice teachers who have internet access (\bar{X} =104, 59) have more sufficiency perception than preservice teachers who don't have internet access (\bar{X} =97, 90)

Table6. The results of ANOVA pre-service science teachers' self-efficacy perceptions for information technology depending on their annual expenditures for information technologies

	Sum of Squares	df	Mean of squares	F	p*
Between groups	4936,763	9	548,529	1,952	.048
Within groups	46638,419	166	280,954		
Total	51575,182	175			

p* < .05

When Table 6 was analysed, the self-efficacy perceptions of pre-service science teachers for information technologies did not show a significant difference depending on their annual expenditures for information technologies($F(9,166)=1,952$, $p=0,048$).

Table7. The frequency, mean and standard deviation values of pre-service science teachers for information technologies according to the annual expenditures for information technologies

Annual expenditure for IT	N	\bar{X}	sd
	(TL)		
0-200	59	103,92	15,27
201-400	28	99,39	20,55
401-600	37	98,16	15,13
601-800	17	105,82	14,37
801-1000	6	111,33	16,75
1001-1200	12	104,75	18,36
1201-1400	4	101,25	12,63
1401-1600	6	87,83	27,88
1801-2000	5	121,00	13,17
2401 +	2	110,50	,71
Total	176	102,43	17,17

As there was no pre-service science teacher who spend annually 1601-1800 TL and 2001-2200 TL for information technologies, they were not demonstrated in the table. There was a statistically significant difference between the ones who spend annually 1401-1600 TL for information technologies ($\bar{X}=87,83$) and the ones who spend annually 1801-2000 TL for information technologies ($\bar{X}=121,00$) in favour of the latter (Table7).

Other variables when was analyzed,

- there is no significant difference of preservice science teachers' self-sufficiency perceptions towards information technologies depending on gender ($p > 0.05$).
- there is no significant difference of preservice science teachers' self-sufficiency perceptions towards information technologies depending on their grade levels ($p > 0.05$).
- there is no significant difference of preservice science teachers' self-sufficiency perceptions towards information technologies depending on their families economic condition ($p > 0.05$).
- there is no significant difference of preservice science teachers' self-sufficiency perceptions towards information technologies depending on their success ($p > 0.05$).
- there is no significant difference of preservice science teachers' self sufficiency perception towards information Technologies depending on owning a personal Computer ($p > 0.05$).
- there is no significant difference of preservice science teachers' sufficiency perception toward information Technologies depending on yearly computer use duration ($p > 0.05$).
- there is no significant difference of preservice science teachers' sufficiency perception toward information Technologies depending on computer lessons they had taken ($p > 0.05$).
- here is no significant difference of preservice science teachers' sufficiency perception toward information Technologies depending on computer lessons they had taken ($p > 0.05$).

4. Discussion and conclusion

Self-efficacy of candidate science teachers' perceptions, who are studying in the faculty of education, towards information technology did not show a significant difference depending on the gender. There are a lot of self-efficacy studies conducted about computer which is one of the information technologies. While, just like in this study, the study conducted by Tuncer & Tanaş (2011), Kutluca & Ekici (2010), Öztürk (2013) did not show a significant difference in the self-efficacy of candidate teachers' perceptions depending on gender towards information technology, the studies conducted by Şahin & Göçer (2013), İpek & Acuner (2011) showed a significant difference in the self-efficacy perceptions of candidate teachers depending on gender towards information technology.

It was detected that science teachers' self-efficacy for information technology, depending on the grade level did not show a significant difference. Similarly, the studies conducted by Tuncer & Tanaş (2011), İpek & Acuner (2011) did not show a significant difference in science teachers' self-efficacy perceptions for information technology, depending on the grade level.

The self-efficacy perceptions of candidate science teachers for information technologies did not show a significant difference depending on the economic status of their family, their success rates, the status of having computer courses, daily average internet use time, the state of having another information technology tool and the status of using network.

It was determined that there was not a significant difference in science teachers' self-efficacy perceptions for information technology depending on whether they own a computer or not.

Kutluca & Ekici (2010) also have not found a significant difference in pre-service teachers' self-efficacy perceptions for information technologies depending on whether they have a computer or not; however, İpek & Acuner (2011) have found a significant difference in pre-service teachers' self-efficacy perceptions for information technologies depending on whether they have a computer or not.

It was determined that pre-service science teachers' self-efficacy perceptions for information technologies did not show a significant difference depending on their conditions that they took computer lessons. Furthermore, the same result was gained from the study conducted by Yılmaz (2006) about pre-service science teachers' self-efficacy perceptions for information technologies depending on their conditions of having taken computer lessons.

Significant differences were observed in pre-service science teachers' self-efficacy perceptions for information technologies depending on their daily computer usage time. Kutluca & Ekici (2010) have also determined that pre-service science teachers' self-efficacy perceptions for information technologies vary depending on their computer use time. It is assumed that the increase in the daily computer use motivates pre-service science teachers to use information technologies more, and so their self-efficacy perceptions for information technologies become higher. Gürçan (2005) also asserts that computer use can increase the level of students' use of application and memory strategies and so their self-efficacy of information technologies would increase as well.

It was determined that science teachers who have access to the internet have higher self-efficacy of information technologies than the ones who do not have. In this context, it is assumed that having the chance of accessing the information at any time they want increases pre-service science teachers' self-efficacy perceptions of information technologies.

When the annual expenditures for information technologies are compared, it was determined that science teachers who spend a large amount of money have higher self-efficacy perceptions of information technologies. Therefore, it is assumed that as a result of the use of owned information technology tools, pre-service science teachers' self-efficacy perceptions for information technologies increase.

4.1. Further suggestions

The main goal of the education provided by the teachers is to train qualified individuals in order to help them to adapt to both the society and themselves. However, it is necessary to improve the quality of the education so as to educate qualified individuals. One of the most basic factors of improving this quality is the integration of technology into the education. Although the education programs change, it can clearly be seen that technology and science is closely related. As technology has an expensive and continuously refreshing structure, financial support, which can

be spent on the expenses of information technologies to follow this advancing area and not to fall behind of this area, should be provided for the teachers. The access of the pre-service teachers and teachers to the internet in education faculties can be eased by providing them with a portable modem so as to reach the information via the internet at any time. As Science contains rather abstract concepts, Ministry of Education is recommended to prepare content-rich sites for teachers' own areas as well as the education with information technologies. Although such a study is conducted for various courses, it should be accelerated and expanded. As the results came out in favor of the science teachers who use the internet and computer for a longer time, new research should be conducted in order to analyze the nature of the use.

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