

# Relationship between Teacher Efficacy and Information and Communication Technology Competencies of Pre-Service Teachers

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## Abstract

The main purpose of this study was to determine the relationship between teacher efficacy levels, information and communication technology competencies, and demographic variables of pre-service teachers. In addition to the main problem, teacher efficacy levels and the technological competencies were also reviewed in terms of variables such as gender, grade, the status of choosing the teaching profession willingly, and if they were given the opportunity to select the teaching profession again. The study was designed in a correlational screening model, and the sample of the study consisted of pre-service teachers. Ohio State Teacher Efficacy Scale (OSTES) and Information and Communication Technology Competencies Scale (ICTCS) were used as the data collection tools. Multiple linear regression analysis was conducted to reveal how the variables of teacher efficacy, gender, grade level, willingly choosing to become a teacher, and re-choosing to become a teacher if having a chance predict ICTCS. As a result of correlational and regression significance tests, it was determined that only the teacher efficacy variable predicted ICTCS to a large extent in the established regression model.

Additionally, it was found that the teacher efficacy and the information communication technology competencies of pre-service teachers showed differences in terms of grade and the status of choosing the teaching profession willingly variables, while they did not differ in terms of gender and if they were given the opportunity to select the teaching profession again. Recent studies show that the most important conditions for attaining these skills are that teachers have general competencies for using information and communication technologies in their lessons. So, this study can contribute to the field by determining the positive relationship between teaching efficacy levels and information and communication technologies competencies of pre-service teachers, as well as presenting the results of some specific variables.

**Keywords:** Educational administration, ICT competency, multiple linear regression analysis, professional efficacy, teacher candidate.

## **Introduction**

Considering the concept of efficacy defined by Ashton (1984) as "the extent to which teachers believe that they have the capacity to affect student performance" (p.28), it is possible to assert that it is an essential component of a successful teaching profession. Baloglu & Karadag (2008) claimed that the concept of efficacy has evolved from Rotter's (1966) locus of control and Bandura's (1977) social cognitive theory, which are two distinct theoretical perspectives. While Rotter argues that locus of control can affect a person's decision to adopt healthy behavior, and the locus of control can either be internal or external (Rotter, 1966), Bandura (1977) states that "self-efficacy is people's beliefs in their capabilities to organize and execute the course of action required to produce given attainments "(p.3), and also in his study a person's own efficacy is stated to be a combination of self-efficacy and efficacy for goal attainment.

Self-efficacy affects whether a person starts an action or not and his/her performance during the action and its outcome (Pajares, 2006). Therefore, it is directly related to learning and teaching activities. Because individuals' high self-efficacy perception related to a particular task means that they will insist on achieving that task, be self-confident, and be less affected by the failures (Bandura, 1997). On the other hand, their low self-efficacy perception related to that task means that they will strive less for it, not be self-confident enough, and will easily give up in case of a failure (Bandura, 1997). One's self-efficacy perception related to a particular situation determines what they think about that situation, how they will behave, and how they motivate themselves (Akkoyunlu, Orhan & Umay, 2005). In conclusion, people's self-efficacy perceptions help them use their skills efficiently (Bandura, 1997).

Self-efficacy perceptions of individuals are influential on their meaningful learning efforts. However, for the teachers, these efforts are knowledge, skills, and attitudes they should have to do their job and responsibilities (Ustuner, Demirtas, Comert & Ozer, 2009). Self-efficacy perception of teachers is defined as their competence in behaviors that they need to have their students fulfill tasks and increase their performance (Ashton, 1984). In the literature, there are many studies on self-efficacy. In these studies, it is seen that there is a close relationship between teachers' self-efficacy and achievements of students (Goddard, Hoy & Woolfolk-Hoy, 2000; Tschannen-Moran & Woolfolk-Hoy, 2001; Caprara, Barbaranelli, Steca & Malone, 2006), students' self-esteem (Cheung & Cheng, 1997) and student motivation (Woolfolk & Hoy, 1990). Furthermore, the studies in the literature show that there is a relation between professional commitment (Caprara, Barbaranelli, Steca & Malone, 2006), having classroom management skills (Enochs, Sharmann & Riggs,

1995; Henson, 2001), and trying to implement innovations in teaching (Guskey, 1988).

Efficacy for goal attainment is another type of efficacy suggested by Bandura (1997). This type of efficacy is the ability of individuals to exercise control over the factors in their environment to attain a goal. By the same token, for the teachers, the sense of competency corresponds to the concept of self-competency, which is based on an internal perception. Perceived self-efficacy may be equal to the existing level of competency, and the same perception may also be either higher or lower than the actual level. On the other hand, for the teachers, the concept of efficacy refers to task commitment that is essentially based on external control and environmental factors, which is stated by Bandura (1997) as efficacy for goal attainment. In summary, it is seen that teachers' efficacy is either internal or external oriented. In this context, revealing the factors that are thought to be strongly related to the professional efficacy of teachers is very important for building up efficacy.

One of the crucial things for teachers is competency related to information and communication technology (ICT) use. ICT is defined as "...an umbrella term that includes any communication device or application encompassing: radio, television, cellular phones, computer, and network hardware and software, satellite system, and so on; as well as the various services and applications associated with them, such as videoconferencing and distance learning" (Kondra, 2020: p.280). In the simplest definition, ICT competence can be said to be the ability to use these tools effectively, efficiently and follow their purpose of creation. In educational activities, ICTs gained an important place both in and out of the classroom, and this situation made it necessary to attain the skills required for using information and communication technologies. Moreover, ICT competency and usage skills are crucial for competition and support economic development for societies (Kozma, 2011). Many activities have been conducted in Turkey under the framework of General Professional Competences of Teachers (MNE, 2017) set by the Ministry of National Education (MNE) and Turkish Framework for Higher Education Competences (TFHEC, n.d.) to increase the use of information technologies in education and to improve teachers and pre-service teachers' competences to use these technologies as many countries. There are also internationally proposed competences related to the use of information and communication technologies such as UNESCO ICT Competency Framework for Teachers, European Commission Teacher Competences, ISTE Educational Technology Standards for Teachers (Ilgaz & Usluel, 2011). These competences are expressed as competences that teachers should have as a requirement of the developing technology.

UNESCO ICT Competency Framework for Teachers (ICT-CFT) (UNESCO, 2018) is one of the best describing ICT competencies for teachers within these frameworks. ICT CFT is organized around six key aspects of teachers' professional practice in general. These aspects have been diversified according to the three levels of teachers' pedagogical use of ICT, and a framework has been created that includes 18 competencies in total (UNESCO, 2018). The six aspects of this framework are Understanding ICT in Education Policy, Curriculum and Assessment, Pedagogy, Application of Digital Skills, Organization and Administration, and Teacher Professional Learning. These six core aspects of ICT CFT are shaped over three phases that express a teacher's successive and pedagogical development of using ICT competencies: Knowledge Acquisition, Knowledge Deepening, and Knowledge Creation (UNESCO, 2018). As can be seen, this framework, in summary, is to increase the quality of education by effectively using the technologies available for education by teachers with appropriate pedagogical approaches for quality education.

The importance of the relation between technology and pedagogy is explained with the term of technological pedagogical content knowledge (TPACK), and this relation is stated to be important for the development of a good teacher (Mishra & Koehler, 2006). The studies in the literature show that there are problems in using information and communication technologies in education (Kayaduman, Sirakaya & Seferoglu, 2011), teachers' beliefs related to their teaching competency is influenced by their experiences about integrating the technology into education (Demir & Bozkurt, 2011), teachers' self-efficacy positively affect their willingness to use technology in their classes (Joo, Park & Lim, 2018), and acceptance level of technology affects teachers' self-efficacy level (Akturk & Delen, 2020). Furthermore, some studies in the literature suggest a significant positive relation between computer self-efficacy and teacher efficacy (Orhan, 2005; Maskan, 2011; Karadeniz, 2011; Tekinarslan, 2011; Yamamoto & Yamguchi, 2016; Yesilyurt, Ulas & Akan, 2016; Kundu, Bej & Day, 2020). Moreover, today's students, as well as teachers, are a part of the Net generation (Tapscott, 2008). ICT usage skills can also mean teaching skills in a sense today (Voogt & Roblin, 2012). Therefore, students and teachers actively use ICT in their daily lives. However, the teachers' lack of experience in using ICT for educational and instructional purposes causes deficiencies in helping their students gain 21st-century skills (Lei, 2009). Therefore, it can be said that teaching competencies for teachers and competencies in using ICT are two intertwined competencies for today's teachers. The two concepts and considering teachers' efficacy perception as based on an internal perception and self-efficacy perception of ICT as based on self-external control, it is deemed important to study Efficacy and ICT competences of pre-service teachers. ICT CFT touches on the importance of information technologies in the training of teachers in the age of technology that

we are in (UNESCO, 2018). In literature, studies show that higher competence in using ICT leads teachers to more frequent use of ICT in their lessons (Hatlevik, 2017). In addition to this, considering the studies which show that competency in using ICT is significantly important in the training of pre-service teachers (Albirini, 2006; Cavas, Cavas, Karaoglan & Kisla, 2009), the effect of teacher efficacy on competency in ICT is deemed to be an important subject that should be reviewed.

In addition to this effect, this study wonders about some other demographic variables which can be related to ICT. As seen above, many studies search for teacher efficacy and ICT in the literature. However, no studies are looking for this effect with some specific demographic variables. Thus, the demographic variables of a) gender, b) grade level, c) willingly choosing to become a teacher, d) re-choosing to become a teacher if having a chance are questioned in terms of their effect on ICT to contribute to the literature. The reason why they were used is that although some studies (such as Danner & Pessu, 2013; Yusuf & Balogun, 2011; Sad & Nalcaci, 2015; Gokcearslan, Karademir Coskun & Sahin, 2019; Gunduz, 2020) used these variables with basic statistical analyses, they did not conduct the relational analysis.

Furthermore, the literature shows that these are the most preferred variables in the studies on pre-service teachers. For this reason, while these variables present general information on the one hand, they also present the situations related to the teaching profession. In this context, this study seeks the answers to the following research problems:

- 1) Are teacher efficacy levels of pre-service teachers and the variables (gender, grade level, willingly choosing to become a teacher, re-choosing to become a teacher if having a chance) significantly predictors of information and communication technology competencies?
- 2) Do teacher efficacy levels of pre-service teachers differ depending on the variables (gender, grade level, willingly choosing to become a teacher, re-choosing to become a teacher if having a chance)?
- 3) Do pre-service teachers' information and communication technologies competency levels differ depending on the variables (gender, grade level, willingly choosing to become a teacher, re-choosing to become a teacher if having a chance)?

## Method

### Research Model

This study is prepared according to the quantitative research method and designed with a relational screening model. The relational screening model aims to reveal the existence or the level of the covariance between two or more variables (Karasar, 2012). In this context, it aims to test whether teacher efficacy levels and the demographic variables are significant predictors of pre-service teachers' information and communication technologies competencies.

### Population and Sample

The study population consists of Sakarya University Faculty of Education third and fourth-grade students. The study sample was selected with criterion sampling within the scope of purposeful sampling from non-random sampling methods. Accordingly, the study sample consisted of 234 third and fourth-grade pre-service teachers from the Education Faculty of Sakarya University who at least took either school experience or teaching application lessons. The demographic information about the sample is listed in Table 1.

**Table 1.**

*Demographic information about the participants*

Variables	Groups	N	%
Gender	Female	182	77.8
	Male	52	22.2
Grade	3rd grade	54	23.1
	4th grade	180	76.9
Choosing to Become a Teacher Willingly	Yes	179	76.5
	No	54	23.1
Would Choose to Become a Teacher Again	Yes	164	70.1
	No	68	29.1
Total		234	100

### Data Collection Tools

The form for demographic information that the researchers prepared; Ohio State Teacher Efficacy Scale (OSTES) that was adapted into Turkish by Baloglu & Karadag (2008) and Information and Communication Technologies Competency Scale (ICTCS) that was adapted into Turkish by Alkan & Emmioğlu-Sarikaya (2018) was used as the data collection tools in the study. Ohio State Teacher Efficacy Scale consists of five sub-dimensions: guidance, behavior management, motivation, teaching skill, and evaluation, and it has 24 items in total. Cronbach alpha value for this scale was detected as .80 in their study, while it was found as .92 in this study. Information and Communication Technologies Competency Scale consists of two sub-dimensions, such as ICT competencies to support students' ICT use and ICT competencies to plan to teach, and it has 19 items in total. Cronbach alpha value for this scale was found to be more than .70 in their study, while it was found as .92 in this study.

### Data Analysis

The data collected from 234 data collection tools were transferred to IBM SPSS 24 package software and accordingly analyzed. The normal distribution of the data was first tested with SPSS to decide the analysis to be done. The test results are listed in Table 2.

**Table 2.**

*Normality distribution test*

<b>Dimensions</b>	<b>N</b>	<b>Mean</b>	<b>sd</b>	<b>Skewness</b>	<b>Kurtosis</b>
ICTCS Total Score	234	4.00	.44	.289	.318
ICTCS ICT competencies to support students' ICT use	234	4.07	.44	.260	.607
ICTCS ICT competencies to plan teaching	234	3.90	.52	.175	-.600
OSTES Total Score	234	3.90	.39	.241	.474
OSTES Guidance Sub-dimension	234	3.93	.44	.108	-.051
OSTES Behavior Management Sub-dimension	234	3.86	.44	.305	.533
OSTES Teaching skill Sub-dimension	234	3.78	.44	.244	.183

OSTES Evaluation Sub-dimension	234	3.86	.59	-.263	.350
OSTES Motivation Sub-dimension	234	4.02	.43	.198	-.223

According to the analysis results, as the number of the participants was more than 30 and the values obtained from dividing the coefficient of skewness by standard error values were between +1.96 and -1.94, the groups are assumed to have a normal distribution (Can, 2014). In this respect, independent sample *t*-test and Pearson coefficient of correlation were used to analyze the data.

In addition, to meet regression assumptions, Mahalanobis distance values for multi-directional outlier analysis and multicollinearity control for multicollinearity, variance increase factors (VIF), and tolerance values (TV) were examined. According to the chi-square distribution table (Can, 2014), it is reported that in a regression model with five independent variables, values above 15.086 Mahalanobis value will be the extreme value at  $p=.01$  significance level. In this case, it was observed that there were no outliers at the .01 level in this study due to the Mahalanobis values varying in the maximum range of 1.095-12,329. On the other hand, multicollinearity control was performed, and it was determined that there was no multicollinearity problem based on the criteria stated by Field (2005) since the relationships between the data vary between -0.056 and 0.610; the VIF values ranged from 1.065 to 1.172 and remained below 10; the tolerance values ranged from 0.853 to 0.948 and were greater than 0.2.

## Findings

Whether the pre-service teachers' Ohio State Teacher Efficacy (OSTE) scores and their demographic variables are significant predictors of their Information and Communication Technologies Competency (ICTC) scores were analyzed with multiple linear regression. The results of the analysis are listed in Table 3.

**Table 3.**

*Multiple linear regression analysis for independent variables and ICTC*

Variable	B	Std. Error	$\beta$	t	p	Zero-order r	Partial
(Constant)	1,363	,238		5,730	,000		
OSTE	,665	,060	,595	11,005	,000	,610	,592
Gender	-,022	,057	-,021	-,390	,697	-,056	-,026



Grade level	-,027	,057	-,025	-,464	,643	,100	-,031
Willingly choosing to become a teacher	,105	,060	,100	1,758	,080	,198	,116
Re-choosing to become a teacher if having a chance	,010	,054	,010	,186	,853	,107	,012
R=0,618		R <sup>2</sup> =0,382					
F <sub>(5-225)</sub> =27,866		p=0,000					

Multiple linear regression analysis was conducted to reveal how OSTE, gender, grade level, willingly choosing to become a teacher, and re-choosing to become a teacher if having a chance variable would predict information and communication technologies competency. According to Table 3, as a result of this analysis, these variables together show a significant relationship (R=0.618, R<sup>2</sup>=0.382) with ICTC (F(5-225)=27.866, p<.01). These five variables together explain 38% of the variation in ICTC. According to the standardized regression coefficients, the relative importance of the predictor variables on ICTCS is as follows: OSTE (β=0,595), willingly choosing to become a teacher (β=0,100), re-choosing to become a teacher if having a chance (β=0,010), gender (β=-0,021), grade level (β=-0,025). Considering the significance tests of the regression coefficients, it is seen that only the OSTE variable among the predictive variables is a significant predictor on ICTC (p<.01). When the relationships between the predictor variable and ICTC are examined, the following correlations are seen: with OSTE (r=0.610), [partial r=0.592]; with gender (r=-0.056), [partial r=-0.026]; with grade level (r=0.100), [partial r=-0.031]; with the variable of willingly choosing to become a teacher (r=0.198), [partial r=0.116]; with the variable of willingly choosing to become a teacher (r=0.198), [partial r=0.116]; with the variable of re-choosing to become a teacher if having a chance (r=0.107), [partial r=0.012]. In this case, according to the correlational and regression tests of significance, only the OSTE variable was found to predict ICTC in the established regression model. Considering this prediction with Cohen's effect size formula [f<sup>2</sup>=R<sup>2</sup>/(1-R<sup>2</sup>)], it can be said that OSTE predicts ICTC to a large extent (Cohen, 1988) with a ratio of f<sup>2</sup>=0.61.

**Table 4.**

*Analysis of teacher efficacy and information and communication technologies competency levels depending on gender variable*

<b>Dimensions</b>	<b>Gender</b>	<b>N</b>	<b>Mean</b>	<b>sd</b>	<b>df</b>	<b>t</b>	<b>p</b>
ICTCS Total Score	Female	182	75.54	8.341	232	-1,080	.102
	Male	52	77.00	9.368			
ICTCS ICT competencies to support students' ICT use	Female	182	44.60	4.660	232	-.865	.079
	Male	52	45.26	5.459			
ICTCS ICT competencies to plan teaching	Female	182	30.93	4.291	232	-1,168	.539
	Male	52	31.73	4.498			
OSTES Total Score	Female	182	93.18	9.288	232	-1,189	.973
	Male	52	94.94	9.874			
OSTES Guidance Sub-dimension	Female	181	23.54	2.625	231	-.392	.549
	Male	52	23.71	2.823			
OSTES Behaviour Management Sub-dimension	Female	182	19.24	2.258	232	-1,013	.479
	Male	52	19.59	2.098			
OSTES Teaching skill Sub-dimension	Female	182	18.87	2.151	232	-.474	.864
	Male	52	19.03	2.408			
OSTES Evaluation Sub-dimension	Female	182	7.70	1.150	232	-.743	.603
	Male	52	7.84	1.258			
OSTES Motivation Sub-dimension	Female	180	24.04	2.532	230	-1,259	.331
	Male	52	24.55	2.782			

Witnessed in Table 3, teacher efficacy is the only and big predictor of ICT competency compared to the other variables. Therefore, the next research problems were tested. In this context, whether the pre-service teachers' OSTES scores and ICTCS scores significantly differ depending on gender variable was analyzed with unpaired *t*-test, and the results were listed in Table 4.

According to the results listed in Table 4, the pre-service teachers' scores of ICTCS total score [ $t(232) = -1.080$ ;  $p > .05$ ] did not show any significant difference in terms of gender variable, while its sub-dimensions also did not differ according to the

gender. Similarly, OSTES scores of pre-service teachers did not significantly differ depending on the gender variable [ $t(232) = -1.189$ ;  $p > .05$ ] like its sub-dimensions. For this reason, it was seen that the gender variable did not create a significant difference in terms of the variables.

Whether Ohio State Teacher Efficacy Scale scores and Information and Communication Technologies Competency Scale scores of the pre-service teachers significantly differ depending on the grade level was analyzed with unpaired  $t$ -test, and results were listed in Table 5.

**Table 5.**

*Analysis of teacher competency and information and communication technologies competency levels with respect to grade level variable*

Dimensions	Grade	N	Mean	sd	df	t	p
ICTCS Total Score	3rd	54	73.64	8.251	232	-	.030*
	4th	180	76.53	8.587			
ICTCS ICT competencies to support students' ICT use	3rd	54	44.01	4.191	232	-	.203
	4th	180	44.97	5.013			
ICTCS ICT competencies to plan teaching	3rd	54	29.62	4.614	232	-	.004**
	4th	180	31.55	4.167			
OSTES Total Score	3rd	54	90.48	8.323	232	-	.006**
	4th	180	94.50	9.563			
OSTES Guidance Sub-dimension	3rd	54	23.05	2.520	231	-	.097
	4th	179	23.74	2.694			
OSTES Behaviour Management Sub-dimension	3rd	54	18.81	2.092	232	-	.057
	4th	180	19.47	2.245			
OSTES Teaching skill Sub-dimension	3rd	54	18.01	1.710	232	-	.001**
	4th	180	19.17	2.272			
OSTES Evaluation Sub-dimension	3rd	54	7.370	1.086	232	-	.008**
	4th	180	7.850	1.179			

OSTES Motivation Sub-dimension	3rd	54	23.50	2.539	230	-	2,097	.037*
	4th	180	24.35	2.583				

\* $p < .01$ , \*\* $p < .05$

According to the results listed in Table 5, ICTCS competencies to support students' ICT use sub-dimension [ $t(232) = -1.278$ ;  $p > .05$ ], OSTES guidance sub-dimension [ $t(231) = -1.667$ ;  $p > .05$ ], OSTES behavior management sub-dimension [ $t(232) = -1.916$ ;  $p > .05$ ] scores of the pre-service teachers did not significantly differ according to the grade level. On the other hand, it was seen that there was a significant difference in favor of 4th grade students in ICTCS total score [ $t(232) = -2.185$ ;  $p < .05$ ] and ICT competencies to plan teaching that is a sub-dimension of ICTCS [ $t(232) = -2.905$ ;  $p > .05$ ]. Furthermore, OSTES total score [ $t(232) = -2.786$ ;  $p < .05$ ], OSTES teaching skill sub-dimension [ $t(232) = -3.464$ ;  $p < .05$ ], OSTES evaluation sub-dimension [ $t(232) = -2.668$ ;  $p < .05$ ] and OSTES motivation sub-dimension [ $t(232) = -2.097$ ;  $p < .05$ ] scores were significantly different in favor of the 4th grade students.

Whether Ohio State Teacher Efficacy Scale scores and Information and Communication Technologies Competency Scale scores of pre-service teachers significantly differed with respect to willingly choosing to become a teacher was analyzed with unpaired  $t$ -test, and these results were listed in Table 6.

**Table 6.**

*Analysis of pre-service teachers' teaching competency and information and communication technologies competency levels with respect to the variable of willingly choosing to become a teacher*

Dimensions	Willingly choosing to become a teacher	N	Mean	sd	df	t	p
ICTCS Total Score	Yes	179	76.94	8.387	231	3,469	.001**
	No	54	72.42	8.397			
ICTCS ICT competencies to support students' ICT use	Yes	179	45.29	4.757	231	2,974	.003**
	No	54	43.09	4.771			
ICTCS ICT competencies to plan teaching	Yes	179	31.65	4.281	231	3,519	.001**
	No	54	29.33	4.129			

OSTES Total Score	Yes	179	94.39	9.376	231	2,550	.011*
	No	54	90.70	9.158			
OSTES Guidance Sub-dimension	Yes	178	23.74	2.706	230	1,760	.089
	No	54	23.03	2.495			
OSTES Behaviour Management Sub-dimension	Yes	179	19.45	2.320	231	1,816	.071
	No	54	18.83	1.819			
OSTES Teaching skill Sub-dimension	Yes	179	19.04	2.235	231	1,757	.080
	No	54	18.44	2.080			
OSTES Evaluation Sub-dimension	Yes	179	7.87	1.115	231	3,471	.001**
	No	54	7.25	1.246			
OSTES Motivation Sub-dimension	Yes	179	24.35	2.482	229	2,310	.022*
	No	52	23.42	2.844			

According to the results in Table, OSTES guidance sub-dimension [ $t(230) = 1.760$ ;  $p > .05$ ], OSTES behavior [ $t(231) = 1.816$ ;  $p > .05$ ] and OSTES teaching skill [ $t(231) = 1.757$ ;  $p > .05$ ] sub-dimension scores did not significantly differ depending on the variable of willingly choosing to become a teacher. On the other hand, it was seen that pre-service teachers' ICTCS total score [ $t(231) = 3.469$ ;  $p < .01$ ], ICT competencies to support the use [ $t(231) = 2.974$ ;  $p < .01$ ] and ICT competencies to plan teaching [ $t(231) = 3.569$ ;  $p < .01$ ] sub-dimensions of ICTCS significantly differed in favor of those who willingly had chosen to become a teacher. Additionally, OSTES total score [ $t(231) = 2.550$ ;  $p < .05$ ], OSTES evaluation sub-dimension [ $t(231) = 3.471$ ;  $p < .01$ ] and OSTES motivation sub-dimension [ $t(229) = 2.310$ ;  $p < .05$ ] scores of the pre-service teachers again significantly differed in favor of those who willingly had chosen to become a teacher.

Whether Ohio State Teacher Efficacy Scale scores and Information and Communication Technologies Competency Scale scores of pre-service teachers differed depending on the variable of if they had had a second chance would they still choose to become a teacher was analyzed with unpaired  $t$ -test and the results were given in Table 7.

**Table 7.**

*Analysis of pre-service teachers' teaching competency and information and communication technologies competency levels with respect to the variable of re-choosing to become a teacher if having a chance.*

<b>Dimensions</b>	<b>Second chance to still become a teacher</b>	<b>N</b>	<b>Mean</b>	<b>sd</b>	<b>df</b>	<b>t</b>	<b>p</b>
ICTCS Total Score	Yes	164	76.61	8.463	230	1,628	.105
	No	68	74.64	8.191			
ICTCS ICT competencies to support students' ICT use	Yes	164	45.07	4.730	230	1,221	.223
	No	68	44.23	4.935			
ICTCS ICT competencies to plan teaching	Yes	164	31.53	4.327	230	1,851	.065
	No	68	30.41	3.917			
OSTES Total Score	Yes	164	94.15	9.379	230	1,516	.131
	No	68	92.08	9.583			
OSTES Guidance Sub-dimension	Yes	163	23.74	2.518	229	1,429	.154
	No	68	23.19	3.008			
OSTES Behaviour Management Sub-dimension	Yes	164	19.47	2.235	230	1,619	.107
	No	68	18.95	2.201			
OSTES Teaching Skill Sub-dimension	Yes	164	18.96	2.261	230	.575	.566
	No	68	18.77	2.114			
OSTES Evaluation Sub-dimension	Yes	164	7.81	1.199	230	1,611	.109
	No	68	7.54	1.112			
OSTES Motivation Sub-dimension	Yes	162	24.31	2.554	228	1,676	.095
	No	68	23.69	2.621			

\*p<.01, \*\*p<.05

According to the results listed in Table 7, the pre-service teachers' scores of ICTCS total score [ $t(230) = 1.628$ ;  $p > .05$ ] did not show any significant difference in terms of the variable of re-choosing to become a teacher if having a chance, while its sub-dimensions also did not differ according to the related variable. Similarly, OSTES scores of pre-service teachers did not significantly differ depending on the variable of re-choosing to become a teacher if having a chance [ $t(230) = 1.516$   $p > .05$ ] like its sub-dimensions. For this reason, it was seen that whether the pre-service teachers had a second chance, they would still choose to become a teacher or not did not create a significant difference in terms of the variables.

### **Conclusion, Discussion, and Recommendations**

This study is conducted to review information and communication technologies competencies and teaching competencies of pre-service teachers concerning various variables. In this study, of all the variables, only OSTE was a predictor on ICTC. In this predictor, the relationship between the two concepts is at the level of .61, and the effect size is at a large size. Based on the relations, a medium-level significant relationship is found between the total scores obtained from Ohio State Teacher Efficacy Scale and Information and Communication Technologies Competency Scale. These findings show a relation between the individuals' self-beliefs about their competency in the teaching profession and in using information and communication technologies efficiently in learning-teaching activities. These results may be due to the fact that the need to use technology, which is available in all areas of life, for educational purposes is felt by individuals to a great extent. Additionally, availabilities such as in-class digital materials offered by technology, digital classroom management tools, various automation tools used for educational activities, online learning, mobile learning, software, and materials developed for self-learning may be influential on these thoughts of individuals.

However, in terms of beliefs related to self-efficacy, the findings obtained from this sampling support that both nationally (Ministry of National Education teacher competencies, TFHEC) and internationally (UNESCO ICT Competency Framework for Teachers, European Commission Teacher Competences, ISTE Educational Technology Standards for Teachers) proposed teacher competencies should be associated with digital skills. It can be said that the results of the research partly confirm the results of the study, which suggests teachers' self-efficacy positively affected their intention to use technology in the classroom (Joo, Park & Lim, 2018). Furthermore, the results reached are similar to the results of studies that suggest a significantly positive relation between computer self-efficacy and teacher efficacy

(Orhan, 2005; Maskan, 2011; Karadeniz, 2011; Tekinarslan, 2011; Yesilyurt, Ulas & Akan, 2016). Results of studies that suggest teachers' teaching self-efficacy levels are affected by their acceptance level of technology can be correlated with the results of this study (Akturk & Delen, 2020).

The results show that teachers' self-efficacy and information and communication technologies competency do not differ depending on the variables of gender and whether pre-service teachers would choose the teaching profession again. Some studies in the literature show that pre-service teachers' information and communication technologies competencies do not differ depending on gender (Yusuf & Balogun, 2011; Sad & Nalcaci, 2015; Gokcearslan, Karademir Coskun & Sahin, 2019; Gunduz, 2020), which are in accordance with the results of this study. On the other hand, pre-service teachers' choice to become teachers if they had a second chance affects teacher self-efficacy or their using information and communication technologies. It is seen that teaching self-efficacy perception and information and communication technologies self-efficacy perception of pre-service teachers who willingly chose to become a teacher significantly differ compared to those who did not; it differs in teacher self-efficacy OSTES evaluation and motivation dimensions. High motivation in job performance of those who willingly and consciously chose their job may be the reason behind this. Lastly, teaching self-efficacy perception and information technologies self-efficacy perception of fourth and third-grade students significantly differ in favor of the fourth-grade students. These results may be caused by the fact that pre-service teachers gain experience in information and communication technologies during internships, school experience lessons, and their implementation in a school environment. In similar studies in the literature conducted by Danner & Pessu (2013) and Gokcearslan, Karademir Coskun & Sahin (2019), no significant difference was found depending on grade level or between undergraduate and graduate pre-service teachers. The findings obtained in this study are inconsistent with these results.

It can be clearly said that the recent studies and course of events show that teacher efficacy and information and communication technologies competencies are essentials for teacher education. For this reason, it is thought that the results of this study will contribute to the field and direct future studies in terms of both addressing this relationship and expanding it with some other demographic variables. Within the context of the conclusion of this study, some suggestions and the limitations of this study should be presented. This study was conducted on only the 3rd and 4th-grade pre-service teachers via only the quantitative research method. So, in future studies, the sample can be expanded with more pre-service teachers by determining whether teaching and ICT competency levels of pre-service teachers statistically differ depending on different grade levels and various variables. In the studies that



review pre-service teachers' professional and technical skills, teacher efficacy and information and communication technologies competencies can be addressed together with some other variables, considering the regression analysis results. Addressing this relation, studies based on new different analyzes can be made. Furthermore, different research methods can be tried using teacher efficacy and information and communication technologies competencies.

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