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Evaluation of Primary School Teachers' Technological Self-Efficacy

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ABSTRACT

The purpose of this study is to determine the technological self-efficacy of primary school teachers, and compare their technological efficiencies depending on gender and professional experience variables. The study was quantitative descriptive and survey method was applied to collect data. The data of the study was gathered through personal information questionnaire and "Technology Self-Efficacy Scale". The results of the research showed that technology self-efficacy beliefs of teacher were in the mid level. In addition, it was found that while technology self-efficacy beliefs of teachers did not differ in gender, but there became a difference depending on their professional experience.

Keywords:
Primary school; Teacher' beliefs; Technology, Self-efficacy.

Introduction

Technology is a concept originated from the "technologie" in French meaning "knowledge of application, science of application containing production methods, the tools and materials used and the ways they are used" (TDK, 2010). Alkan (1997) defines the concept of technology as "application of science to such fields as production, service, transportation etc.". Depending on these definitions, technology has a role in each of the social, economical and communal domains. In other words, people face technology in every field of their daily lives. They even comprehend and interpret events and phenomena better with the introduction of technology into their lives. In this sense, the fact that communities feel stronger for events and phenomena could only be realized by the use of technology by individuals (Gündüz and Odabaşı, 2004).

With the constant development of technology, changes become in every field of social life (Aydın, Baki and Köğce, 2008). Such changes show that communities have become a society of knowledge in changing and developing global world (Yılmaz and Horzum, 2005). Changes experienced in an information society put new responsibilities on the individuals that comprise a society. Some basic responsibilities in these responsibilities are that people are able to adapt technology to their lives and use it efficiently. In addition, they should attain knowledge, skills, attitudes and behaviors aiming at technology in order to be able to benefit from the opportunities of technology. The greatest share in attaining these habits is on teachers training people. In recent years, educational programs have been reviewed in the process of educational reform movements and it has been asked to extend the use of information technologies in learning settings. Therefore, it is of vital importance that teachers who are the practitioners of the teaching programs should use technology efficiently (MoNE[2], 2008), they should provide a teamwork in teaching environments and take the role of a guide in accessing knowledge.

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The Concept of Self-Efficacy

Based on Bandura's (1977; 1986) social learning theory, the concept of self-efficacy can be defined as a concept that shows how well an individual can carry out the actions that are necessary to cope with the possible situations faced with and expressing the judgments. On the other hand Zimmerman (1995) defines the concept of self-efficacy as the judgments over the ability of an individual to realize something or to succeed it. Individuals with a high self-efficacy pay a great effort to succeed, when faced with obstacles they do not give up easily and are insisted and patient (Aşkar and Umay, 2001). In addition, people's belief of self-efficacy level in any issue has impact on their performance. Self-efficacy beliefs are known to affect teachers' performance in the classroom and teachers with strong self-efficacy could be more passionate and ambitious (Tuckman and Sexton, 1990; Tschannen-Moran and Hoy, 2001). Besides, Schmitz (2000) points out that high self-efficient teachers are the ones who are fond of their professions and have high levels of satisfaction (cited in. Yılmaz *et al.*, 2004).

Within the context of continuous technological changes, self-efficacy has been viewed as the most useful individual domain in determining the outcomes technology influences (Beas & Salanova, 2006 as cited in Conrad and Monro, 2008). Technology efficacy of teachers was also stressed by ISTE[3] and knowledge and technology efficacy within the skills that teachers should have was highlighted. According to ISTE (2000), teaching standards comprises being a literate of technology, being able to use technology in the courses, leading students to use technology and arranging the setting in a way that students could use technology. In order for teachers to be able to offer their students rich learning settings integrated with new technologies, it is necessary that they should first attain the efficacy of technology literacy. Otherwise, no matter how well the curriculum may be prepared, the expected and desired result cannot be achieved unless teachers have desired efficacy (Bandura, 1995; Fullan, 1993).

Technology and Computer Self-Efficacy

A great body of research done in computer technology shows that computer self-efficacy construction is crucial in the basic element of an individual's behavior and attitudes (Beas & Salanova, 2006 as cited in Conrad and Monro, 2008). Many studies have been conducted to measure in-service teachers' and pre-service teachers' computer self efficacy perceptions (Erdem, 2007; Seferoğlu, 2007; Çağırgan-Gülten *et al.*, 2011; Adalıer, 2012). In particular, whether computer self-efficacy perceptions are related to such variables as genders, computer using experience and frequency of individuals' technology usage are examined in most of the studies done with teacher candidates (Aşkar and Umay, 2001; Akkoyunlu and Kurbanoglu, 2003; Akkoyunlu and Orhan, 2003; Yılmaz *et al.*, 2006; Özçelik and Kurt, 2007; Çetin, 2008; Topkaya-Zehir, 2010). Among these, Özçelik and Kurt (2007) determine the level of teachers' computer self-efficacy and whether the computer self-efficacy changes according to their age, gender, owning computer and frequency of computer use. The results indicate that the teachers' level of computer self-efficacy was 71,52. 20-25 aged and 0-5 years experienced teachers' computer self-efficacies were higher than the others. There was not a significant difference between gender and teachers' computer self-efficacy. The teachers who had computer and who always used computer had higher computer self-efficacies than the others. On the other hand, the efficacy and attitudes of teachers and teacher candidates aiming at computer or teaching technologies (Asan, 2003; Çelik and Bindak, 2005; Sa'ari *et al.*, 2005; Pala, 2006; Çelik and Kahyaoğlu, 2007; Özgen and Obay, 2008; Penna and Stara, 2009; Kutluca and Ekici, 2010; Adalıer, 2012) were also examined in many researches. For instance, Penna and Stara's (2009) study reports on an investigation performed in a primary school, designed to test whether expectations and opinions on computers, both of students and teachers might be related to the effectiveness of computer use within a particular educational context. Findings do not appear to support the hypothesis that a positive opinion on computers can lead to higher learning efficacy in a computer-based educational environment. Besides, Adalıer (2012) reveals the relation between 136 Turkish and English language teacher candidates' perceived computer self-efficacy and attitudes toward computer at the universities in Cyprus. He found that there is a medium level positive statistical difference between perceived computer self-efficacy and attitudes toward computer.

[3] International Society for Technology Education

The Importance and Purpose of the Study

What is explained up to here indicates that researches concerning technology and self-efficacy in general sense were realized through teachers and teacher candidates in the issues concerning computer self efficacy, efficacy for computer and teaching technologies, and attitudes. There are few studies in the literature as for especially in studies measuring teachers' basic technological efficacy in the fields of computer technology and software. In these studies, basic technology was in form of developing a scale of self evaluation or validity and reliability studies of current scales in different conditions (Ropp, 1999; Morales, Knezek, and Christensen, 2008; Tekinarslan, 2008; Tatar *et al*., 2009; Cerit, 2010; Gençtürk *et al*., 2010). For instance, Tekinarslan (2008) conducted validity and reliability studies of a scale namely The Basic Technology Competencies for Educators Inventory (Flowers and Algozzine, 2000) with the faculty of education students, in conditions of Turkey. Also, in their study Tatar *et al*., (2009) aimed to develop the "Science and Technology Self-Efficacy Scale" (SESST) for the purpose of evaluating the self-efficacy in science and technology of elementary school students and to conduct a validity and reliability assessment of this scale. Lastly, Gençtürk *et al*., (2010) aimed to obtain validity and reliability studies of "Technology Proficiency Self-Assessment (TPSA)" scale, developed by Ropp (1999) and Cerit (2010) explored the validity and reliability of the Turkish version of the Teacher Efficacy Scale (TES) developed by Gibson and Dembo (1984).

As known to most of us, teachers' competencies and experiences are effective on their benefiting from technology in educational settings. It is striking that there is a gap in the literature in terms of the results of the studies measuring technological self-efficacy of teachers. In this context, there is a need in particular for studies investigating how basic technological self efficacy beliefs of teachers change depending on different variables. Especially, as no study has been carried out into how basic technological self efficacy beliefs of teachers change depending on different variables, it is believed that such a study will contribute to the field. In addition, by determining the self evaluation of teachers through this study and knowing how efficient they are in terms of benefiting from technology, the attempts that teacher training institutions and school should initiate for the future will be put forth.

The purpose of the current study was to determine technological self efficacy of primary teachers (1-8th grade) working in primary schools and put a connection of these beliefs depending on the variables of gender and professional experience.

Research problems: The following problems will guide this study.

1. At which level are the technological self efficiency of primary school teachers?

2. Do technological self efficacy beliefs of teachers show a significant difference in terms of their gender and professional experiences?

Method

In this descriptive study, the survey model was used. The sample of the study consisted of 201 teachers working at the ten primary schools in the city belonging the north-east providence of Turkey during the fall semester of 2009-2010 academic year. The data for the working group was given Table 1.

Table 1. The dispersion of teachers in the working group according to their gender and professional experience

Personal Information		f	%	Total
Gender	Male	107	53	201
	Female	94	47	
Professional experience	1-5 year	24	11,9	201
	6-10 year	38	18,9	
	11-15 year	48	23,9	
	16-20 year	36	17,9	
	21-25year	25	12,4	
	25+	30	14,9	

Data Collection and Analysis

In order to gather data in the research, "Technology Proficiency Self-Assessment Scale" developed by Ropp (1999) and adapted to Turkish by Gençtürk *et al.*, 2010 was utilized. The scale is a 5-item likert type scale and consists of 20 items. Cronbach Alpha reliability coefficient was measured as 0.95. The highest score to be gathered in the scale is 100 while the lowest is 20. To collect some information from the participants "personal information questionnaire" was also added to this scale.

Data collection tool was performed during teachers' out of class time and completed in around 20 minutes. The data obtained from the collection procedure was then prepared for the appropriate statistical procedures on computer, using SPSS 15.0. Arithmetic means and standard deviations for the variables were determined. Whether there was a difference between the variables was determined by using independent t test and one way variance analysis at the level of 0,05 significance level.

Findings

In addition to the main problems of this study, there were some descriptive findings related to teachers' ownership to personal computer and their frequency of using it. Based on the collected data, 95 % of teachers have had personal computers. Also, most of the teachers (56 %) use computer 1-5 hours a week and around 19 % of them use it 6-10 hours a week. The percentage of teachers using computer 20 hours or more was rather low with 10 %.

Findings of this study were presented under the following subtitles:

- technological self efficacy levels,
- differences of their technology self efficacy believes depending on their genders and professional experiences.

Teachers' Level of Technological Self-Efficacy

The data concerning the percentage of teachers' agreeing on each item taking place in the technology self-efficacy scale and their level of technological self-efficacy were given in Table 2 and Table 3 below.

Table 2. Percentages of teachers' answers to technology self-efficacy scale

Items **I feel confident that I could....**	**Strongly disagree**		**Don't agree**		**Undecided**		**Agree**		**Strongly agree**	
	f	%	f	%	f	%	f	%	f	**%**
1. ... send E-mail to a friend.	15	7.5	16	8	8	4	56	28	106	**53**
2. ... subscribe to a discussion list.	28	14	36	18	38	19	35	17	64	32
3. ... create a "nickname" or an "alias" to send E-mail to several people at once.	31	15.4	50	25	28	14	35	17	57	28
4. ... send a document as an attachment to an E-mail message.	24	12	36	18	21	10	44	22	76	37
5. ... keep copies of outgoing messages that I send to others.	18	9	30	15	23	11	57	27	76	38
6. ... use an Internet search engine (e.g., Google, Infoseek or Alta Vista) to find Web pages related to my subject matter interests.	17	8,5	11	5.5	9	4.5	57	28	107	**53**
7. ... search for and find the Career Center/Human Resources Institution Web site.	13	6.5	9	4.5	10	5	58	30	111	**55**
8. ... create my own World Wide Web home page.	45	22.4	50	25	56	28	22	11	28	**14**
9. ... keep track of Web sites I have visited so that I can return to them later. (An example is using bookmarks.)	14	7	15	7.5	18	9	55	27.4	99	49
10. ... find primary sources of information on the Internet that I can use in my teaching.	13	6.5	7	3.5	10	5	64	32	107	**53**

11. ... use a spreadsheet to create a pie chart of the proportions of the different colors of M&Ms in a bag.		16	39	19	40	20	51	25	39	19
12. ... create a newsletter with graphics and text in three columns.	38	19	54	27	51	25	27	13	31	15
13. ... save documents in formats so that others can read them if they have different word processing programs (eg., saving Word, ClarisWorks, RTF, or text).	35	17	45	22	27	13	41	20	53	26
14. ... use the computer to create a slideshow presentation.	31	15	24	12	28	14	59	29	59	29
15. ... create a database of information about important authors in a subject matter field.	34	17	42	21	49	24	45	22	31	**15**
16. ... write an essay describing how I would use technology in my classroom.	24	12	29	14	42	21	62	31	44	22
17. ... create a lesson or unit that incorporates subject matter software as an integral part.	35	17	38	19	53	26	47	23	28	**14**
18. ... use technology to collaborate with other interns, teachers, or students who are distant from my classroom.	24	12	26	13	40	20	65	32	46	23
19. ... describe 5 software programs that I would use in my teaching.	43	21	44	22	62	31	30	15	22	**11**
20. ... write a plan with a budget to buy technology for my classroom.	27	13	38	19	56	28	50	25	30	15

Regarding the data given in Table 2, it was found that teachers had a higher level of technological self-efficacy in the skills of receiving and sending e-mail, sharing files and making a research in search engines compared to other items. It was also determined that teachers had lower self-efficacy beliefs in the skills that require expert knowledge such as preparing a web site, creating database, getting information about the software related to their fields compared to other items.

Table 3. Teachers' level of technology self-efficacy beliefs

N	Range	Minimum Score	Maximum Score	$\overline{X}$	SS
201	80	20	100	68,28	19,70

Maximum, minimum and mean scores the teachers take in the scale of technology self efficacy were given in Table 3. Depending on these data, mean value for self-efficacy of teachers was found as 68.28. This value took place between the choice of "Undecided" (3x20=60) and "I agree" (4x20=80). These results indicate that technology self-efficacy believes of teachers were closer to the choice of "I agree".

Findings of Technology Self-Efficacy Believes Of Teachers Concerning the Variables of Genders and Professional Experience

In this part, the differences of technology self-efficacy beliefs of teachers concerning the variables of genders and professional experience were given. In this purpose, t test and one way ANOVA statistical techniques were used for unrelated samplings.

Technology Self-Efficacy Believes of Teachers Concerning Their Gender

In Table 4, t test results for the unrelated samplings carried out to determine the difference of teachers depending on the mean scores they got in technology self-efficacy scale according to gender were given.

Table 4. t test results of the technology self-efficacy belief scores for the difference depending on their genders

Levene's test for Equality of Variances			Gender	N	$\overline{X}$	Ss	df	t	p
Equal variances assumed	F ,10	Sig. ,748	Female	94	67	67	199	1,11	
			Male	107	70	70			,27

Depending on the data in Table 4, technology self-efficacy beliefs of teachers did not have any significant difference in their genders (t_{199}=1,11, p>,05). The mean scores of technology self-efficacy levels of male teachers ($\overline{X}$ =70) were higher than those of female teachers ($\overline{X}$ =67). But this finding was not found statistically significant.

Technology Self-Efficacy Believes of Teachers Concerning Their Professional Experience

In the tables below, one way ANOVA results carried out to determine the difference of teachers depending on the mean scores they got in technology self-efficacy scale according to their professional experience were given. Before the ANOVA test was conducted, homogeneity of variances was controlled as seen in Table 5 below.

Table 5. Test of Homogeneity of Variances

Levene Statistic	df1	df2	Sig.
1,340	5	195	,249

Table 5.1. Descriptive data concerning professional experience of teachers

Professional experience (Years)	N	$\overline{X}$	Ss
1. 1-5 year	24	81.58	18.64
2. 6-10 year	38	76.42	19.20
3. 11-15 year	48	67.66	16.05
4. 16-20 year	36	65.41	17.03
5. 21-25 year	25	65.92	22.34
6. 25+	30	53.70	16.69
Total	201	68.27	19.69

Table 5.2. ANOVA results for the difference of the scores teachers obtained in technology self-efficacy depending on their professional experience

Variance Source	Sum of Squares	df	Mean Square	F	p	Tukey
Between Groups	13595.74	5	2719.14	8.28	.000	1-3,4,5,6 2-6
Within Groups	63988.65	195	328.14			3-6
Total	77584.39	200				

Depending on the descriptive data given in Table 5.1 and the results of variance analysis in Table 5.2, mean scores teachers obtained in the scale of technology self-efficacy were significantly different in their professional education [$F_{(5\text{-}195)}$= 8.28, p<.05]. The mean scores of the teachers with professional experience of 1-5 years in technology self-efficacy scale was $\overline{X}$ =81.58, those of the ones with 6-10 years was $\overline{X}$ =76.42, teachers with professional experience of 11-15 years had a mean score of $\overline{X}$ =67.66, the ones with professional experience of 16-20 years had a mean score of $\overline{X}$ =65.41, teachers having professional experience of 21-25 had a mean score of $\overline{X}$ =65.92, and mean score of teachers with professional experience of 25 years and more was found as $\overline{X}$ =53.70. Tukey HSD multiple comparison test was carried out in order to determine between which groups there were significant differences. According to the results of the test, the significant difference occurred between the teachers with professional experience of 1-5 years (that is the ones in the 1st group) and the ones in the 3rd, 4th, 5th and 6th groups. In addition, it was also found that there was a significant difference between the teachers in the 2nd and 3rd group and 6th group (in other words,

between the teachers having professional experience of 6-10, 11-15 years and those with experience of 25 years and more).

Conclusions and Discussion

The current study was carried out to find out primary teachers' technology self-efficacy beliefs and to investigate the relation of this belief with different variables. As it was given in Table 2 regarding the technological self-efficacy of teachers, it is likely to say that teachers considered themselves more efficient in such skills as receiving and sending emails, sharing files and searching in search engines. However, it was found that self-efficacy beliefs concerning skills that require expertise such as preparing one's own website, creating database, having information about the software regarding their fields were lower compared to other items. Individuals with a high computer self-efficacy perception is known to be more successful in using a computer, to be willing to take responsibility and to be successful in fulfilling the responsibility (Langford and Reeves, 1998). With the current study, it was determined that teachers' technology self-efficacy beliefs were at mid level. Similarly, Topkaya-Zehir (2010) investigate pre-service English language teachers' perceptions of computer self-efficacy and found that pre-service English teachers had a moderate level of computer self-efficacy perceptions.

Depending on the findings in this research, no significant relation was found between teachers' technology self-efficacy beliefs and their gender. However, the means of male teachers' technology self-efficacy levels were found higher than those of female teachers. Gender is thought to be a significant variable as seen in the literature. While there is a significant relation in favor of male in some studies (Akkoyunlu and Orhan, 2003; Deniz, 2005; Bullington, Case and Han, 2005), in others no significant relation was found in terms of gender (Baki, Kutluca and Birgin, 2008; Çavaş *et al.*, 2009; Kutluca and Ekici, 2010). For instance, Kutluca and Ekici (2010) found that while self-efficacy perceptions of teacher candidates concerning Computer Supported Education had a difference according to the frequency and duration of using computer, it had no difference depending on gender, the registered program and the status of having a computer. Some studies (Cassidy and Eachus, 2002; Akkoyunlu and Orhan, 2003; Tekinarslan, 2008) pointed out that there was a significant relation in favor of male teachers between gender and levels of basic technology self-efficacy. For instance, in the study conducted by Cassidy and Eachus (2002) males showed significantly higher CSE than females. Similarly, Miura (1987) found in a study carried out at the level of graduate students that male students had a significantly higher level of computer self-efficacy belief compared to that of female students. In particular, there might come out very different results in the studies carried out with teachers and teacher candidates concerning computer and educational technologies. As an example, Özgen and Obay (2008) determined that the attitudes of secondary school mathematics teacher candidates towards educational technology according to genders had no significant difference. Also, in his study Pala (2006) found that the attitudes of teachers towards educational technologies were positive and these attitudes did not differ depending on gender. Conversely, Hashim and Mustapha (2004) found that especially female students have positive attitudes toward learning about and working with computers.

In this study, the difference between technological self-efficacy of teachers and their professional experience was found statistically significant. The relation between technology self-efficacy of teachers with experience of 1-5 years and the ones having experience over 10 years was in favor of the teachers with experience of 1-5 years. It is among the findings of the current study that the relation between the teachers having experience of 6-10 years and 11-15 years and those with experience of 25 years and over was significant. Such a case shows that the technology self-efficacy of teachers with less experience was at a better level compared to the ones with more experience.

It is likely to think that such a result obtained in the study is related to the fact that in particular the skills regarding information communication technologies in the programs of higher education training teachers for the past 5 years has taken place intensively. There are other studies showing that self-efficacy declines depending on age (Korobili, Togiaa and Malliari, 2010; Tella and Ayeni, 2006). Unlike professional experience, as self-efficacy belief of using computer was examined according to age, students' self-efficacy belief of using computer increased depending on age (Akkoyunlu and Orhan, 2003). Such a result could be explained in a way that as the age of students increase, their experience of using computer increases.

In the light of the results obtained in the study, some suggestions to the researchers could be recommended. In order to increase attitudes and self-efficacy of teachers towards technology, they should be offered to carry out activities on computer. In this purpose, primary teachers should be given courses to help them improve their computer experience at school and in the town. Different educational software could be introduced to teachers in the courses and they could be informed about how to use it in the courses. Teaching programs in the faculties of educations could be designed in a way to open courses so as to inform the teachers of the future about how to carry out technology based teaching in their classes.

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