Investigation of School Administrators' Technological Leadership in Terms of Gender

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Abstract

In this study, it was aimed to determine the effect of gender on the technological leadership of school administrators. For this purpose, 31 studies were reached between 2008-2018 years. These studies were analyzed by using the meta-analysis method. The total sample size of the analyzed studies is found as 9867. In the studies analyzed in the meta-analysis, there are two different types of data groups: the technological leadership of the administrators in teachers' eyes and the technological leadership of the administrators in their own eyes. As a result of the analysis; it has been determined that both teachers and administrators think that male school administrators have higher technological leadership than women (ES = -0.010). In addition to this result, it has been determined that the effect of gender variable on technological leadership is mostly in administrators, but overall effect size is weak in teachers (ES = 0.009) and managers (ES = -0.044).

Key words: Technological leadership, meta-analysis, school administrator

Introduction

The desire of people to live together made them into groups, which caused groups to need a guide and a pioneer. For this reason, leadership has been an important concept for people living together from past to present. The importance of leadership is understood from the fact that it is a concept with more than 350 definitions (Şişman, 2014) and it is the subject that has been the most researched and written in the world (Güney, 2015). Despite its different definitions, the leader can be defined as "the most responsible person in the organization as much as it is important in terms of being an example, it is the most responsible person in reaching and ending the goals of the organization and follower" (Gençay, 2014, p. 11). Leadership means that expanding the person's vision, increasing his performance, raising his personality above normal constraints (Drucker, 1974). It can be also said that leadership means trying to create an organizational culture on the one hand, and fulfilling various managerial duties on the other hand (Rathert & Kırkgöz, 2017).

As a result of changing time, space and living conditions, different types of leadership have started to emerge. The change process also affects human and environmental conditions, and the leadership models that prevail are being replaced by new leadership types day by day (Buluç, 2008). However, when the literature is analyzed, new (contemporary) leadership approaches are handled by researchers under different titles (Canbolat, 2016; Güney, 2015; Konan, 2015; Sabuncuoğlu & Vergiliel-Tüz, 2015) and technological leadership within these titles (Konan, 2015) appears to take place. Today, leadership has the task of developing effective and innovative schools and facilitating quality teaching and learning (Dinham, 2005). With today's rapid change, the importance of technological leadership is increasing day by day (Brooks-Young, 2002; Chang, 2011).

At the international level, technological leadership is emphasized in the effective use of technology in various studies (Anderson & Dexter, 2005; Bridges, 2003; Yee, 2000), which causes school principals to be effective in preparing schools and students for the technology and information age (Ross & Bailey, 1996). Hope, Kelly, and Guyden (2000) emphasize that technology leadership involves not only understanding technologies but also how technology can be implemented. School administrators should be leaders who play a decisive role in the effective use of innovations and technology in schools and these roles can be defined as technological leadership (Yu & Durrington, 2006). Tanzer (2004) defines the technology leader as the person who conducts the necessary co-orientation in order to use the technology which is the necessity of the era effectively and with maximum efficiency, as the person who influences, directs and

manages the organization. Another definition is, the technology leader is the person who ensures the harmony between person and technology components and tries to establish the right relationship between them in the application of technology (Hamzah, Nordin, Jusoff, Karim, & Yusof, 2010). Rapid development of information technologies, changes in educational environments with innovations, and frequent use of technology in schools have brought technological leadership to the agenda for school administrators. Because the school administrators are the people who will ensure that innovations are established in schools and schools keep up with change. Technological leadership, which is important in the effective use of technology (Anderson & Dexter, 2005), requires school principals to be effective in preparing schools and students for the technology and information age (Ross & Bailey, 1996). Grady (2011) also emphasizes that technology leadership includes different leadership characteristics and requires the use of technology from top to bottom in school. School administrators affect this by influencing, directing and managing other stakeholders of the school; in other words, they will succeed by using technological leadership skills.

Information, media and technology skills are among the basic dimensions of 21st century skills (P21, 2019). For this reason, one of the goals of the school in this developing and constantly changing era is to train new generations as an information society individual by including new technologies in education and training environments (Çevik, 2006). With the integration of technology into education, it has become almost imperative for school administrators to adapt themselves to these developments. The fact that school administrators state that they need technological leadership more and more every day (Hacıfazlıoğlu, Karadeniz & Dalgic, 2011a) is a proof of this.

Different definitions related to technological leadership highlight the need to identify the roles and responsibilities of technological leaders and standardize them (Ulukaya, Yıldırım & Özeke, 2017). Various studies are carried out for this purpose. One of the most comprehensive of these belongs to the International Society for Technology in Education (ISTE) (Hacıfazlıoğlu, Karadeniz & Dalgıç, 2011b). The US-based International Society for Technology in Education (ISTE) first announced its national technology leadership standards (Hacıfazlıoğlu et al., 2011b) in November 2001. Later, in 2009, these standards were reviewed and NETS-A 2009 was created. While NETS-A has 6 dimensions in 2002, these standards were collected in 5 dimensions with NETS-A 2009 (Banoğlu, 2012). These five dimensions are; visionary leadership, digital age learning culture, excellence in professional development, systematic development and digital citizenship. These standards are the features sought in the technological leader (Hayytov, 2013).

It can be said that factors such as seeing technology as an important part of the change in the information age, realizing that students have started to play a central role in their lives, thinking that the use of technology contributes to increase the effectiveness and efficiency of their educational processes has made technological leadership an essential feature for teachers. Teachers' ability to demonstrate technological leadership requires schools to have technological equipment as well as this skill. These may also be influenced by the principal's role in the technological leadership, which expresses the use and diffusion of technology. It should not be forgotten that, as stated by Baş (2012), the principal's stay away from technological developments will result in the school being insensitive to changes. It has been stated that the strong leadership of technology in schools will greatly affect the inclusion of technology (Brooks-Young, 2002).

Different research findings contributing to the recognition of the importance of the technological leadership roles of school administrators have led to an increase in the research conducted to examine the technological leadership characteristics of school administrators and to determine the personal factors affecting their technological leadership. One of the personal factors examined in the technological leadership of school administrators is gender. When the researches were examined, it was seen that the participants consisted of two different groups such as teachers and administrators, therefore, the gender variable was handled in two different ways as the gender of the administrators and teachers.

When the researches on the technological leadership of school administrators are examined, the participants; from school administrators (Aktaş, 2016; Alkrdem, 2014; Banoğlu, 2011; Brunson, 2015; Bülbül & Çuhadar, 2012; Curyn, 2013; Aktay & Çakır, 2018; Çalık, Demirsoy, 2016; Depew, 2015; Doğan,

2018; Duncan, 2011; Şişman-Eren, 2010; Gültekin, 2013; Gürkan, 2017, Güven, 2015; Hayytov, 2013; Kör, Erbay, & Engin, 2016; Uçkan, 2010; Ulukaya, 2015; Yorulmaz-Can, 2016), from teachers (Baş, 2012; Durnalı, 2018; Engür, 2014; Ertuğrul, 2014; Gençay, 2018; Gerçek, 2016; Görgülü, 2013; Gürkan-Beyaz, 2014; Karabağ-Köse, Yurdakul, & Onuk, 2017; Irmak, 2015; Ölçek , 2014; Öztaş, 2013; Samancıoğlu et al., 2015; Sincar, 2009), it is also seen that it consists of both teachers and administrators (Balaban, 2012; Cantürk, 2016).

Whether the technological leadership of managers varies by gender or not has been discussed in many studies (Banoğlu, 2011; Baş, 2012; Bülbül & Çuhadar, 2012; Ertuğrul, 2014; Gürkan-Beyaz, 2014; Hayytov, 2013; Ölçek, 2014; Ulukaya, 2015) and different results have been found in these studies. For this reason, this research was carried out in order to make a general inference about the gender factor in the technological leadership of school administrators. The aim of the study was to determine the effect of gender on the technological leadership of school administrators. Within the scope of this general purpose, answers were sought for the following questions:

1. What are the descriptive features of the studies on technological leadership between the years 2008-2018?
2. What is the overall effect of gender on technological leadership?
3. Does the gender of teachers affect the perceptions of technological leadership about school administrators?
4. Does the gender of school administrators affect their perceptions about their technological leadership?
5. Is the effect of gender on technological leadership different in terms of the type of study?

Method

In this research, meta-analysis method was used to determine the effect of gender in technological leadership. According to Chambers (2004), meta-analysis is "one of the most obvious ways to quantitatively synthesize research findings" (p.35). Meta-analysis is to interpret the results of all the researches done on a subject, using a special program, after making the re-analysis (Lipsey & Wilson, 2000; 2). The difference of meta-analysis from other studies is the use of different statistics in analyzing the research findings (Durlak, 1995). Today, with the help of the meta-analysis method, which is used frequently in educational sciences, statistical operations are carried out and evaluated with the research data (Sağlam & Yüksel, 2007).

Collection of data

In the research, studies examining the differences of technological leadership by gender were included. In the process of determining these studies; YÖK thesis database, Google academic, Proquest, Scopus and EBSCOhost search engines were used. The examinations in the specified databases were first made on October 2, 2019, then repeated on October 16, 2019 and necessary checks were carried out. To reach the data in the research, the keyword "technological leadership", "technology leadership" and "technological leaders" were used in Turkish and English.

In the meta-analysis method applications, some selection criteria should be determined for the studies to be included in the analysis during the screening process (Whitehead, 2002; 14). Selection criteria used in the screening process in the research are as follows: 1) Whether the research is a thesis or an article; 3) The research made in relation to school administrators; 4) Numerical data such as number of samples, arithmetic mean, standard deviation found in the research; 5) The research was built between 2008-2018. 6) The gender variable has been examined.

In the studies that supply these conditions and are reached, the articles produced from the thesis are excluded from the evaluation and only theses are included in the study. As a result of the investigations, it was determined that 31 of the studies examined the subject of technological leadership and gender and the total sample size was 9867.

Data analysis

The analysis made in the research consists of two parts. In the first part, descriptive analysis of the studies included in the research was made. In this context, analysis was made using percentage and frequency values according to the type of study, year of study, school type variables. In the second part, 31 studies reached were analyzed using the meta-analysis method.

In meta-analysis, two types of effect models are used as fixed and random effects model. In the fixed effect model; it is assumed that all studies in the analysis have a real effect size. In the random effects model; it is stated that the actual effect may vary from study to study (Borenstein, Hedges, Higgins, & Rothstein, 2013). It is possible to decide which model to use in meta-analysis with the heterogeneity test. In addition, I^2 value is interpreted as low when 25%, medium when 50%, and high level of heterogeneity when 75% (Cooper, Hedges, & Valentine, 2009). In evaluating the results obtained in meta-analysis, Q value is generally used (Dinçer, 2014).

In this research, Comprehensive Meta-Analysis program (CMA) was used in the analysis. During the analysis, in addition to calculating the overall effect, a heterogeneity test was also carried out, and the graphics and statistics related to publication bias were also examined and evaluated. While evaluating the research, p, Q, I^2 evaluations were used. In the evaluation of statistics, 0.05 p significance level was chosen.

Statistically, the effect size (d or g) has the same meaning regardless of the study pattern (Borenstein et al., 2013; 3,30). In this study, the values accepted for Cohen's d were used while classifying the effect level of the studies. Impact magnitude according to this classification is "0-0.20 = weak effect, 0.21-0.50 = low effect (modest effect), 0.51-1.00 = medium effect (moderate effect),> 1.00 = strong effect" (Cohen, Manion & Morrison, 2007).

In the study, women were taken as experimental group and men as control group according to gender. The positive effect value (g) shows that there is an effect in favor of women according to gender. The researches were scanned separately by two researchers. The formula [Consensus / (Consensus + Disagreement)] x 100, which was proposed by Miles and Huberman (1994), was used for the reliability of the study. In conclusion, 90% agreement was determined among the researchers.

Findings

Descriptive features of the studies that examine the effect of gender on technological leadership on school administrators are presented in Table 1.

Table 1. *Descriptive Statistics of Studies on Technological Leadership*

		Gender	
		Frequency	**Percent (%)**
Type of study	Article	6	25%
	Master thesis	14	50%
	Doctoral dissertation	8	25%
Year of the study	2009	1	4%
	2010	1	4 %
	2011	2	7 %
	2012	3	11 %
	2013	4	14 %
	2014	4	14 %
	2015	3	11 %
	2016	5	18%
	2017	2	7 %
	2018	3	11 %

School type			
	Primary education	8	29%
	Secondary education	1	4%
	Elementary + High School	3	11%
	High School	5	18%
	All	11	39%

In Table 1, it is seen that between 2008 and 2018, 28 studies were reached in the form of 14 master thesis, 8 doctoral dissertation, and 6 articles that examined the effect of gender on the technological leadership of school administrators. Since the opinions of both administrators and teachers were received in 3 studies, the data set included in the analysis consisted of 31 studies. It is concluded that the studies were mostly carried out in 2016. In addition, it is seen that the research, which examines the effect of gender in technological leadership, is mostly done in all school types. Also, when the studies conducted were examined, it was determined that NETS-A (Banoğlu, 2011; Hacıfazlıoğlu et al., 2011a; Sincar, 2009; Şişman-Eren, 2010) was taken as a starting point in the scale development process by many researchers.

The effect of gender on technological leadership

The first aim of the study is to determine the effect of gender on the technological leadership of school administrators. In line with the determined purpose, first of all, the publication bias of the studies included in the meta-analysis through graphics and statistics were examined. The funnel scatter graphic obtained is given in Figure 1.
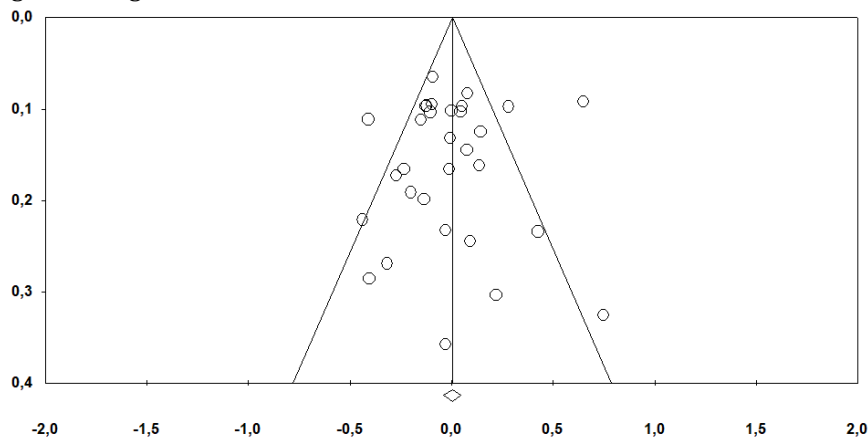

Figure 1. *Publication bias funnel plot*

When Figure 1 is examined, it can be said that the funnel plot of the studies is scattered in the upper and lower sections, so the sample numbers of the studies differ. In addition, it is seen that the overall studies are scattered almost symmetrically on both sides of the vertical line and four studies are located outside the funnel plot. When Classic fail-safe N is examined, no studies were required for 0.05 value; when Begg and Mazumdar rank correlation was examined, p value was 0.85 and Tau coefficient was 0.18. Based on these examinations, it can be said that there is no publication bias in the research.

After determining that there is no publication bias, heterogeneity examination was started. The funnel graph obtained for this purpose is given in Figure 2.
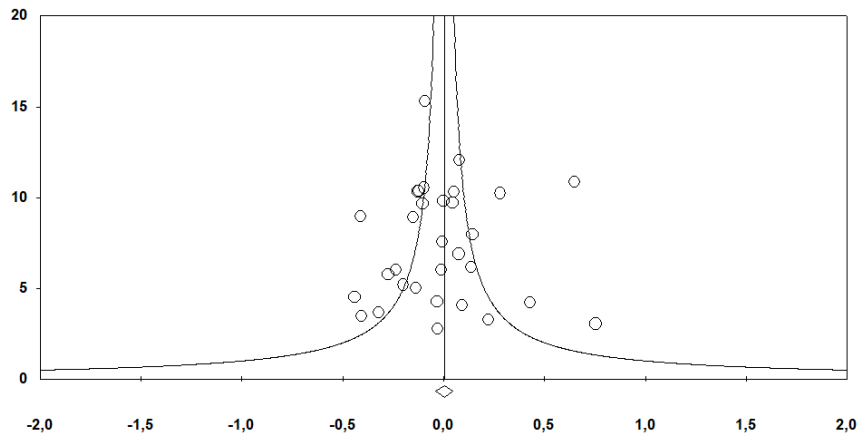
Figure 2. *Heterogeneity funnel plot*

When Figure 2 is examined, it is seen that some of the studies are not within the slope lines. Therefore, it can be said that the research is heterogeneous. This finding was supported by heterogeneity analysis. As a result of the heterogeneity test, it was observed that Q = 107.178, df = 30, p = 0.00. In addition; I^2 value that another measure of heterogeneity calculated as 72%. As a result of the fact that the P value is less than 0.05 and the Q value is greater than the corresponding value in the X^2 the I^2 value is high, it is understood that the meta-analysis application is heterogeneous. For this reason, the effect and the overall effect of the studies were calculated according to the random effect model.

In order to supply easiness for the examination, the studies are listed according to the first surname of the author and the year of publication. Findings regarding the effect of the gender variable on the technological leadership of the administrators are given in Figure 3, Table 2 and Table 3.
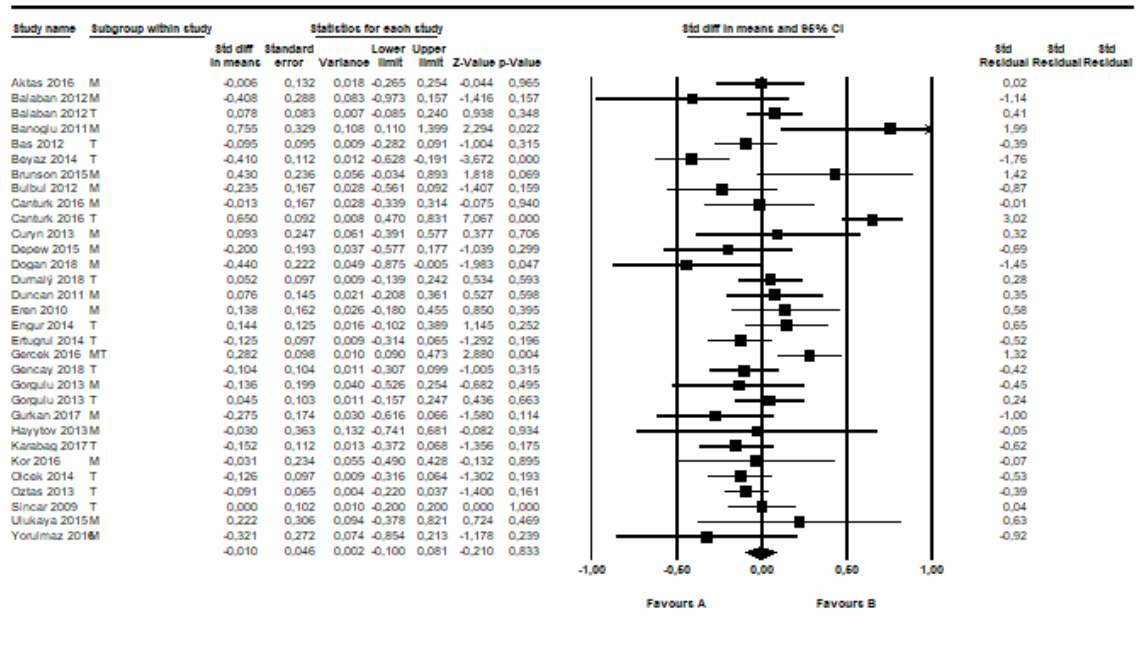

Figure 3. *Forest plot on the effect of gender on technological leadership*

When Figure 3 is examined, it is seen that the weights of the studies included in the analysis are in similar ranges. It was only observed that the weight of the research conducted by Cantürk (2016) with teachers was different from the others (3.02).

Table 2. *The Overall Effect of Gender on Technological Leadership*

	ES	Q (df)	I²	S Error	Lower Limit	Upper Limit
Tech. Leadership	-0.010	30	72.009	0.023	-0.100	0.081

When the data in Table 2 are analyzed, it is seen in the data obtained from 31 studies that between 30 degrees of freedom and 95% confidence interval between -0.100 and 0.081, and the general effect of gender on technological leadership (ES = -0.010) is weak. When Cantürk's (2016) research removed, it was seen that the overall effect (ES = -0.041) increased but remained weak again, so the results did not change much. In addition, the results can be interpreted that men have more technological leadership skills than women.

Secondly, the effects of the gender of teachers and school administrators on the technological leadership perceptions of school administrators were examined in this research. In this review, all research is included in the analysis, except for a research done together with teachers and administrators. As a result of the evaluations, it was decided to use the fixed model in the analysis of the data of the administrators and the random model in the analysis of the data of the teachers.

Table 3. *Examining the Effect of Gender on Technological Leadership According to Teachers and Administrators*

	Effect Size	Q (df)	I²	S Error	Lower Limit	Upper Limit
Teacher	-0.009	12	84.053	0.067	-0.140	0.122
Manager	-0.044	16	29.806	0.048	-0.139	0.051

When 13 studies related to teachers in Table 3 and 17 studies related to administrators are examined, it is seen that the impact value regarding the technological leadership of school administrators is -0.009 according to the gender of the teachers and -0.044 according to the gender of the administrators. According to these impact values; when the opinions of teachers and administrators are evaluated separately, it can be said that the technological leadership perceptions about male administrators are higher. In addition, the effect of the gender variable on technological leadership; although still it is higher in managers, it can be interpreted as weak in both groups.

Analyzes were also made for intermediate variables (moderators) that could explain this difference. For this purpose; according to the type of the study, the effect of gender on the technological leadership perceptions of school administrators was examined. In this review, all research is included in the analysis. As a result of the evaluations, it was decided to use a fixed model in the analysis of the data of the articles and doctoral dissertation, and a random model in the analysis of the master thesis' data.

Table 4. *Examining the Effect of Gender on Technological Leadership According to the Type of Study*

	ES	Q (df)	I²	S Error	Lower Limit	Upper Limit
Article	-0.155	5	50.867	0.075	-0.302	-0.007
Master thesis	-0.055	15	55.787	0.045	-0.144	0.034
Doctoral dissertation	0.188	8	78.951	0.045	0.100	0.275

When 9 data sets that consists of 6 articles, 16 master thesis and 9 doctoral dissertations in Table 4 are examined, the impact value of the technological leadership of school administrators in the articles are -0.155; master thesis are -0.055, and doctoral dissertation are 0.118. According to these impact values; it can be said that the technological leadership perceptions about female managers are higher in doctoral dissertation. In addition, the effect of the gender variable on technological leadership, it can be interpreted as weak in all three groups although higher in doctoral dissertation. Variance between studies was not statistically significant for the study type intermediate variable (Q = 0.002, p> .05). For this reason, the fact

the studies are articles or thesis doesn't change the effect size of the school administrators' technological leadership according to the gender variable that can be said.

Results, Conclusions and Recommendations

In this research; meta-analysis of the studies conducted in schools related to the technological leadership of school administrators was made, it is aimed to determine the effect of gender on technological leadership. In the research, a total of 28 studies including 14 master thesis, 8 doctoral dissertation and 6 articles were reached; however, because of the opinions of both teachers and administrators in all three studies, a total of 31 studies were analyzed by using the meta-analysis method. The sample numbers of the analyzed studies differed significantly from each other; it was determined that the sample consisted of a total of 9867 people, 4021 women and 5846 men. It has been observed that researches on the effect of gender on the technological leadership of school administrators in school administrators were carried out mostly in 2016 and most of the research was carried out in all educational institutions including primary education, secondary education and high schools. In addition, researchers at the scale of the development process greatly benefit from the NETS-A standard, the impact on the efforts to emerge gender on technological leadership was mostly done in Turkey.

As a result of the research; it has been determined that teachers and administrators think that male school administrators have higher technological leadership than women. In addition, it was determined that the effect of gender variable on technological leadership is mostly in managers, but overall effect size is weak in both groups. It can be also said that the fact the studies are articles or theses that doesn't change the effect size of the school administrators regarding the technological leadership according to the gender variable.

While evaluating these findings, the high number of women among teachers and the number of men among school administrators should not be ignored. In this context, it can be said that the majority of female teachers and male administrators think that male school administrators have higher technological leadership. It can also be said that administrators tend to evaluate their technological leadership more positively than teachers when evaluating themselves.

When the studies included in the meta-analysis were examined one by one, it was determined that the impact values of school administrators in terms of technological leadership were only moderate in two studies (Banoğlu, 2011; Cantürk (T), 2016), and in other studies it was weak effect and modest effect. Therefore, the finding that gender variable has a weak effect on technological leadership behaviors of school administrators is supported by research results.

According to the studies in the literature on whether the technological leadership differs in terms of gender according to school administrators are (Aktaş, 2016; Banoğlu, 2011; Brunson, 2015; Bülbül & Çuhadar, 2012; Cantürk, 2016; Curnyn, 2013; Depew, 2015; Doğan, 2018; Duncan, 2011; Görgülü, 2013; Gürkan, 2017; Güven, 2015; Hayytov, 2013; Kör, 2016; Şişman-Eren, 2010; Ulukaya, 2015; Uçkan, 2010; Uysal-Balaban, 2012; Yorulmaz, 2016). In these studies, it was concluded that the technology leadership competencies of school administrators don't differ in terms of their gender (Alkdrem, 2014; Beyaz, 2014; Brunson, 2015; Bülbül & Çuhadar, 2012; Can, 2008; Cantürk & Aksu, 2017; Çakır & Aktay, 2018; Görgülü, 2013; Gürkan, 2017; Güven, 2015; Hayytov, 2013; Ölçek, 2014; Şişman- Eren, 2010; Uçkan, 2010; Ulukaya, 2015; Uysal-Balaban, 2012). In addition, Doğan (2018) concluded that the technological leadership self-efficacy of female and male administrators doesn't change according to gender, while male school administrators find this issue more important.

Studies addressing whether teachers' opinions on the technological leadership of school administrators differ in terms of gender are (Baş, 2012; Beyaz, 2014; Demirsoy, 2016; Durnalı, 2018; Engür, 2014; Ertuğrul, 2014; Gençay, 2018; Real, 2016; Görgülü, 2013; Karabağ-Köse et al., 2017; Ölçek, 2014; Öztaş, 2013; Sincar, 2009; Ulukaya, 2015). In most of these studies, there is no gender difference between the opinions of teachers (Baş, 2012; Engür, 2014; Ertuğrul, 2014; Görgülü, 2013; Hayytov, 2013; Irmak, 2015; Ölçek, 2014; Öztaş, 2013; Sincar, 2009; Uçkan, 2010 Uysal-Balaban, 2012) was reached. The reason for this was stated by Ölçek (2014) that gender discrimination has been a social bias for years, but the end of

this discrimination in recent years has reflected in the behavior of school administrators towards teachers. Despite these studies, Gerçek (2016) has reached a conclusion in favor of female teachers regarding the technology leadership level of managers.

Considering that the technological leadership of female school principals is low compared to men, when the school principal is evaluated by considering the low number of female employees, this situation should be considered in the context of women being a candidate for management. In this regard, women who want to become school administrators can be recommended to be empowered in technological leadership.

It can be said that research on the technological leadership of school administrators is not much. It can be also said that the required statistics are not reported in order to perform meta-analysis in the studies in reached studies and this situation makes it difficult to carry out meta-analysis studies and this decreases the generalizability. Therefore, more research is needed to better understand the technological leadership of school principals and to understand the impact of cultural differences on these behaviors. This research was carried out to determine the effect of school administrators' gender on the technological leadership of themselves. Meta-analysis with different variables on technological leadership of school administrators can also be done.

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