An Analysis of the Technology Leadership Behaviours of School Principals from the Perspective of Teachers

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ABSTRACT
This study aimed to examine the technology leadership behaviours of school principals based on the perceptions of teachers, by employing a mixed method design in which quantitative and qualitative methods were used concurrently. It was conducted with teachers working in public schools in a province in the West Black Sea Region, Turkey. The quantitative data were obtained from 198 teachers using the Technology Leadership Scale, while the qualitative data were collected from 24 teachers through open-ended questions containing the sub-dimensions of the Technology Leadership Scale. The quantitative data were analysed with descriptive statistics, independent samples t-test, and ANOVA test, while the qualitative data analysis was conducted through the descriptive analysis approach using MaxQDA 2020 software. The results revealed that the teachers participating in the study consider their school principals' levels of technology-related leadership behaviour as sufficient. No statistically significant difference was observed between the technology leadership behaviours, and the variables of the teachers' gender, educational background, and professional seniority. Statistical significance was found between the teachers' perceptions regarding the school principals' technology leadership levels and the variable of teachers' length of work in the same school. The teachers with shorter length of work in the same school regard the technology leadership levels of school principals higher than those with longer length of work. The results obtained from the qualitative dimension of the research show that the school principals behave fairly in terms of enabling the use of technology, create the technology infrastructure, inform the teachers against cybercrimes and contribute to the increase of their motivation.
Keywords: Technology leadership, technology integration, teacher motivation

INTRODUCTION
In line with the technological advancements, countries deem it necessary to make major investments in the use and integration of technology into the field of education with the purpose of preparing their citizens for the future. In this regard, it is of great importance that school principals have a vision on the use and integration of technology to achieve the goals of such investments. Today, school principals are the very first administrators who are responsible for initiating and implementing the technological transformation in schools through information and communication technology (ICT) (Durnalı, 2019). Currently, with the increasing use of quality technology, the need is growing for school principals with a vision for technology leadership to integrate schools into the world of technology (Banoğlu, 2011). This need has led to the emergence of the concept of technology leadership that combines educational technology and school administration in the field of education (McLeod, & Richardson, 2011). School principals should perform the role of technology leadership (Yieng & Daud, 2017). In this respect, a variety of definitions of technology leadership have been made in the relevant literature. For example, according to Cuban, Kirkpatrick and Peck (2001), a technology leader is a person who integrates technology into the curriculum, and acts as a leader in due course. In another definition, a technology leader is a person who leads the reforms for technology integration in the school and involves all stakeholders of the school in the integration process (Flanagan & Jacobsen, 2003). According to similar definitions, a technology leader is someone who knows how to behave in the face of a problem encountered in school and comes up with a solution by taking advantage of technology (McLeod & Richardson, 2011; Perez & Uline, 2003). With its head office in the USA, the "International Society for Technology in Education" (ISTE), has more than 100,000 stakeholders in the world and is a non-governmental organization that sets and publishes standards on education and technology (Gökbulut & Çoklar, 2017). In 2002, the ISTE first published the National Educational Technology Standards for Administrators (NETS-A) pertaining to the competencies of school principals in technology leadership. Having updated the NETS-A standards in 2009, the ISTE set further technology standards in 2018 under the name of the ISTE Standards for Education Leaders, which define an educational leader as an administrator who guides teachers in learning the digital age by empowering them on matters such as equity, digital citizenship, vision building for an educational institution, team building and continuous professional development. It is said that the principals of

successful schools are not only teaching leaders, strategic leaders, community leaders, and change leaders, but also technology leaders (Yieng, & Daud, 2017).

School principals act as decision makers in schools. On facing the necessity of an urgent decision-making in sudden and rapidly developing situations, they should be able to make quick decisions by using ICT facilities (Sönmez & Gül, 2014). School principals with high ICT competencies can take advantage of technology effectively (Aydoğan, 2011).

The recent COVID-19 pandemic has reminded us once again of the importance of educational technology, which is an integral part of efficient education. In the framework of technology use, one of the factors that has a critical impact on learning is school principals (Anderson & Dexter, 2005). The beliefs and opinions of a teaching leader are very important in the success or failure of the kind of technology to be used for teaching in schools (Chang, 2012; Hughes & Zachariah, 2001). School principals must be competent to be able to create a common vision, make use of pedagogical methods which are appropriate to be harmonious with technology, support technology coaching, and provide technology infrastructure for their schools (Christensen, Eichhorn, Prestridge & et al., 2018). School principals, who exhibit technology-related leadership behaviour through such skills, are likely to affect technology integration at school in positive manner (Samancıoğlu, Bağlıbel, Kalman & Sincar, 2015). For a sound education system, it is of great importance to reveal the extent of the impacts of school principals' technology leadership behaviours not only on technology integration but also on teachers. In the literature, the studies conducted with school principals report that school principals consider their technological leadership levels as high (Banoğlu, 2011; Bülbül & Çuhadar, 2012; Çakır & Aktay, 2018; Çalık, Çoban & Özdemir, 2019; Görgülü, Küçükali & Ada, 2013; Gürkan, 2017; Sezer & Deryakulu, 2012). However, the results based on school principals' self-evaluation and their own opinions regarding their high level of technological leadership may not reflect the real situation. The opinions of teachers, who are one of the most important stakeholders of education, are very important in revealing the technological leadership levels of school principals. In this respect, revealing the views of teachers by means of quantitative and qualitative data can contribute to the literature. The present study has aimed to determine the technology-related leadership behaviours of school principals based on how teachers actually perceive the situation.

For the purpose of study, answers were sought to the following questions:

Questions to be answered in the quantitative dimension of the research:
According to the teacher perceptions,
- what is the level of technology leadership behaviour of the school principal?
- is there a statistically significant difference between the level of technology leadership behaviour of the school principals and the variables of gender, educational background, length of work in the same school, and professional seniority?

Questions to be answered in the qualitative dimension of the research:
Do the school principals,
- enable teachers to incorporate technology into the teaching process?
- ensure that all teachers benefit equally from the school's technological opportunities?
- take certain precautions against cybercrimes, and inform teachers about them?

provide solutions to teachers' technological equipment (licensed software, hardware, etc.) needs?

RESEARCH METHOD

Research Model

This study was designed on the basis of a mixed methods research approach, which comprises both qualitative and quantitative research designs, and was described as an alternative scientific method by Teddlie and Tashakkori (2015: 4). The mixed methods design is a much more sophisticated process, beyond the ordinary use of qualitative and quantitative research data concurrently. The research process can be carried out using different mixed designs. This study employed the exploratory sequential mixed methods design (Creswell, 2016). By drawing on this design, it was aimed to explain the quantitative data in more detail by collecting quantitative data in the first place, followed by the qualitative interviews. At first, this study revealed the teachers' perceptions regarding the technology leadership competency of their school principals through quantitative findings. Later, the teachers were interviewed about their school principals' technology leadership behaviour to collect qualitative findings.

The quantitative method was employed to explore whether or not the teachers' perceptions regarding the technology leadership of their school principals varied with respect to the variables of gender, educational

background (bachelor's degree-master's degree), length of work in the same school, and professional seniority by using the correlational research design.

All ethical principles were taken into consideration in this study. Ethical permission of the research was obtained from the Human Research Ethics Committee of Zonguldak Bülent Ecevit University (Date and Protocol Number: 26/02/2021-67)

Participants

The sample group consisted of the teachers working in public schools in the West Black Sea Region, Turkey in 2020-2021 academic year. The sample was selected using the convenience sampling method- one of the purposive sampling techniques. In this technique, the participants are selected depending on certain conditions such as time, money, and location (Canbazoğlu Bilici, 2019). The qualitative data were collected from 24 teachers. On the other hand 198 teachers participated the quantitative part of the study. Table 1 presents the demographic characteristics of the teachers participating in the quantitative part of study.

Table 1. *Demographic characteristics of the teachers participating in the quantitative part of the study.*

		N	%
Gender	Male	87	43.9
	Female	111	56.1
Educational Background	Bachelor's Degree	171	86.4
	Master's Degree	27	13.6
Professional Seniority	0-5 Years	20	10.1
	6-10 Years	34	17.2
	11-15 Years	25	12.6
	16-20 Years	47	23.7
	21-25 Years	37	18.7
	26 Years and More	35	17.7
Total		198	100

Data Collection Tool

In the quantitative stage, the study employed the School Principals' Technology Leadership Behaviour Scale developed by Durnalı (2016). The scale consists of 4 factors and 18 items, which comprise 6 items for Motivation, 3 items for Encouragement, 4 items for Infrastructure, and 5 items for Legal Knowledge. The scale has a 5-point Likert structure ranging from Strongly Disagree (1) and Strongly Agree (5). The overall Cronbach's Alpha reliability coefficient is .72, while for the subfactors, it is .90 in the first subscale, .88 in the second, .87 in the third, and .70 in the fourth subscale. The Cronbach's Alpha reliability coefficient for the overall scale obtained in this study was .97, while it was .94 in the first dimension, .90 in the second, .95 in the third, and .93 in the fourth. In the qualitative stage of the study, the data were collected with semi-structured interview forms containing open-ended questions developed by the researchers. In general, with an interview form, researchers can ask the previously prepared questions, get more detailed information about the subject matter, ask additional questions, analyse the data faster, and make comparisons (Büyüköztürk, Çakmak, Akgün, Karadeniz & Demirel, 2012; Türnüklü, 2000; Yıldırım & Şimşek, 2011).

The interview questions were prepared by taking the sub-factors of the Technology Leadership Scale into consideration, upon which the relevant categories were created. Two academicians from the field of educational sciences were consulted for their opinions regarding the appropriateness of the questions. A pilot trial was conducted with two teachers prior to the survey. It was agreed that the questions were comprehensible.

Collection of Data

Data were collected in 2021. The quantitative data were collected online from teachers through the School Principals' Technology Leadership Behaviour Scale, which was added to the Google Forms. In the collection of qualitative data, instead of face-to-face interviews, online meetings were arranged with the teachers via the Zoom platform due to the COVID-19 pandemic. Prior to the interviews, all teachers participating in the study were contacted by phone and given detailed information about the purpose and scope of the study. They were also explained that this research was a scientific study in that the information they shared in the interview would only be used within the scope of the current study, and that their names would remain anonymous. The participants were also informed that the interview would be recorded so that the interview data could be deciphered, but that they could terminate the interview whenever they wanted. Of all the participants, 12 agreed to interview through the Zoom platform, whereas the other 12 of them stated that if the interview form was shared with them digitally

(via e-mail), they could answer the questions on the form in writing and send them back to the researchers in a digital environment at a convenient time. The requests of the participants were accepted by the researchers, and the data from the aforementioned 12 participants were collected in that manner. The interviews made through the Zoom platform took approximately 20-30 minutes.

Data Analysis

In the quantitative part of the study, descriptive statistics were used to analyse the teachers' opinions about the technology leadership behaviours of the school principals. Kolmogorov-Smirnov test was applied and results analysed to determine whether the data were normally distributed. At the end of the test, the Kolmogorov-Smirnov significance value was found $p < 0.05$, according to which Skewness-Kurtosis test results were examined in order to decide whether the data were in normal distribution. The scale presented the Skewness values as -1.016 and Kurtosis values as 0.008 based on the results obtained. According to Tabachnick and Fidell (2013), when Skewness and Kurtosis values are between -1.5 and +1.5, it is considered that the data are normally distributed. In this sense, it was decided to apply parametric tests, assuming that the data were distributed normally in the analyses.

Independent samples t-test was applied to determine the difference between technology leadership levels and the variables of teachers' gender, educational background, and length of work with the same principal. A one-way ANOVA was conducted to find out the difference between technology leadership levels and the variables of teachers' length of work in the same school and their professional seniority. SPSS.21 software was used to analyse the data. Research hypotheses were interpreted at a 0.95 confidence interval ($p = 0.05$).

In the analysis of qualitative data, the video recordings of the Zoom interviews were listened to by both researchers separately, and then deciphered and transcribed. The texts were compared by the researchers to confirm their accuracy. Descriptive analysis method was used to evaluate the data. In this method, the data obtained are summarized and interpreted according to previously determined themes (Yıldırım & Şimşek, 2011). The relevant themes were created on the basis of the sub-dimensions of the Technology Leadership Scale, used in the quantitative dimension of the research, namely, Motivation, Encouragement, Infrastructure, and Legal Knowledge. Since the identities of the teachers participating in the study were meant to be kept confidential, each teacher was given a code (T1, T2…T24). Research data were presented under the themes in a simple, meaningful, and logical manner.

FINDINGS

Results from the quantitative stage:

Table 2 shows the descriptive statistics for the teachers' perceptions regarding the school principals' technology leadership competencies.

Table 2. *Teachers' perceptions regarding the school principals' technology leadership competencies*

Factors	N	Minimum	Maximum	$\overline{X}$	Ss	Scale
Motivation	198	8	30	24.81	5.76	Agree
Encouragement	198	3	15	12.43	3.12	Agree
Infrastructure	198	4	20	15.79	4.60	Agree
Legal Knowledge	198	9	25	21.39	4.32	Agree
Technology leadership (General)	198	31	90	74.44	16.63	Agree

As can be seen in Table 2, the arithmetic mean values of the scores from the Technology Leadership Scale are as follows: Motivation ($\overline{X}$=24.81), Encouragement ($\overline{X}$=12.43), Infrastructure ($\overline{X}$=15.79), Legal Knowledge ($\overline{X}$=21.39), with the general total score for Technology Leadership ($\overline{X}$=74.44). Given the mean scores obtained from the scale, it is clearly seen that technology leadership and all of its sub-factors are at the scale of "I Agree". The independent sample t-test results for the technology leadership and its sub-factors according to the variable of teachers' gender are given in Table 3.

Table 3. *The t Test Results for Technology Leadership Scores by Gender*

Scale factors		N	$\overline{X}$	Ss	Sd	t	p
Motivation	Male	87	24.66	5.60	196	-.32	.74
	Female	111	24.93	5.90			
Encouragement	Male	87	12.49	3.00	196	.23	.81
	Female	111	12.38	3.23			
Infrastructure	Male	87	15.65	4.75	196	-.38	.70

	Female	111	15.90	4.49			
Legal Knowledge	Male	87	20.82	4.66	196	-1.60	.11
	Female	111	21.83	3.99			
Technology Leadership (Total)	Male	87	73.64	17.06	196	-.59	-1.42
	Female	111	75.07	16.32			

As shown in Table 3, no statistically significant difference was found between the scores of the scale factors of Technology Leadership scale, i.e., Motivation [t(196)=-.32; p>.05], Encouragement [t(196)=.23; p>.05], Infrastructure [t(196)=-.38; p>.05], Technology Leadership (Total) [t(196)=-.59; p>.05] and Legal Knowledge [t(196)=-.59; p>.05] according to the variable of gender.

Table 4 presents the independent sample t-test results for technology leadership and its sub-factors by the variable of the teachers' educational background (Bachelor's-Master's Degree).

Table 4. *The t-test Results for the Technology Leadership Scores by Educational Background*

Scale factors		**N**	$\overline{X}$	**Ss**	**Sd**	**t**	**p**
Motivation	Bachelor's Degree	171	24.83	5.79	196	.07	.94
	Master's Degree	27	24.74	5.62			
Encouragement	Bachelor's Degree	171	12.40	3.17	196	-.28	.77
	Master's Degree	27	12.59	2.87			
Infrastructure	Bachelor's Degree	171	15.79	4.49	196	-.02	.98
	Master's Degree	27	15.81	5.31			
Legal Knowledge	Bachelor's Degree	171	21.41	4.26	196	-.17	.86
	Master's Degree	27	21.25	4.75			
Technology Leadership (Total)	Bachelor's Degree	171	74.45	16.60	196	.01	.99
	Master's Degree	27	74.40	17.14			

As demonstrated in Table 4, no statistically significant difference was found between the scores of the scale factors of Technology Leadership scale, i.e. Motivation [t(196)=.07; p>.05], Encouragement [t(196)=-.28; p>.05], Infrastructure [t(196)=-.02; p>.05], Legal Knowledge [t(196)=-.17; p>.05], and Technology Leadership (Total) [t(196)=.99; p>.05] according to the teachers' educational background (Bachelor's Degree or Master's Degree).
This study investigated the statistical difference between the teachers' length of work in the same school and technology leadership with its sub-factors. Among the teachers who participated in the study, there was only 1 teacher working for 26 years and above, 2 teachers between 21-25 years, 6 teachers between 16-20 years. Since the number of the teachers was not suitable to create a group for analysis, those 9 teachers were included in the 11-15-year category. One-way analysis of variance (ANOVA) was applied to determine whether there was a difference between the teachers' length of work in the same school and their perceptions regarding the principals' technological leadership competency. As a result of the analysis of variance, a statistically significant difference was found between the teachers' length of work in the same school and their perceptions of technological leadership. In order to determine the year range of this difference, Scheffé's test was applied as a Post Hoc Test. Test results are given in Table 5.

Table 5.*The ANOVA results for the technology leadership scores according to the teachers' length of work in the same school.*

Length of work	**N**	$\overline{X}$	**Source of Variance**	**Square Sum**	**sd**	**Mean Square**	**F**	**p**	**Significance**
A) 0-5 years	113	76.84	Inter-groups	2594.88	2	1297.44	4.87	.00*	A>B
B) 6-10 years	65	69.27	Intra-groups	51902.00	195	266.16			
C) 11-15 years	20	77.65	Total	54496.88	197				
Total	198								

***p<.05**

Table 5 shows the presence of a significant difference between teachers' length of work in the same school and their perception of technological leadership [F(2,195) = 4.87, p<.05]. It also appeared that the perceptions of the

teachers working in the same school for 0-5 years on the technology leadership competence of the school principals ($\bar{X}$=76.84) were higher than those who worked between 6-10 years ($\bar{X}$=69.27).
A one-way (ANOVA) was applied to determine whether there was a statistical significance between the teachers' perceptions regarding the technology leadership competence of school principals and the professional seniority of teachers; and the test results are given in Table 6.

Table 6. *The ANOVA analysis results regarding the teachers' professional seniority and their perceptions of school principals' technology leadership.*

Seniority	N	$\bar{X}$	Source of Variance	Square Sum	sd	Mean Square	F	p
0-5 years	20	75.60	Inter-groups	153.46	5	30.693	.108	.99
6-10 years	34	74.97	Intra-groups	54343.42	192	283.03		
11-15 years	25	72.84	Total	54496.88	197			
16-20 years	47	74.70						
21-25 years	37	75.05						
26 years and more	35	73.42						
Total	198	74.44						

As a result of the ANOVA test, no statistically significant difference was found between the variable of professional seniority of teachers and their perceptions regarding the technology leadership competency of school principals [F(5,192) =.108, p>.05].

Results from the Qualitative Stage

In order to explore the teachers' views about the technological leadership competencies of school principals, qualitative interview questions were formed by taking into account the items of the Technology Leadership scale used in the quantitative dimension of the research. The data obtained from the qualitative interviews were analyzed using the MAXQDA 2020 software. As a result of the analysis of the data, the categories of Fair Use, Infrastructure, Encouragement, Legal Knowledge, and Motivation were created according to teacher perceptions. The MAX Maps codes of these categories are given in Figure 1.

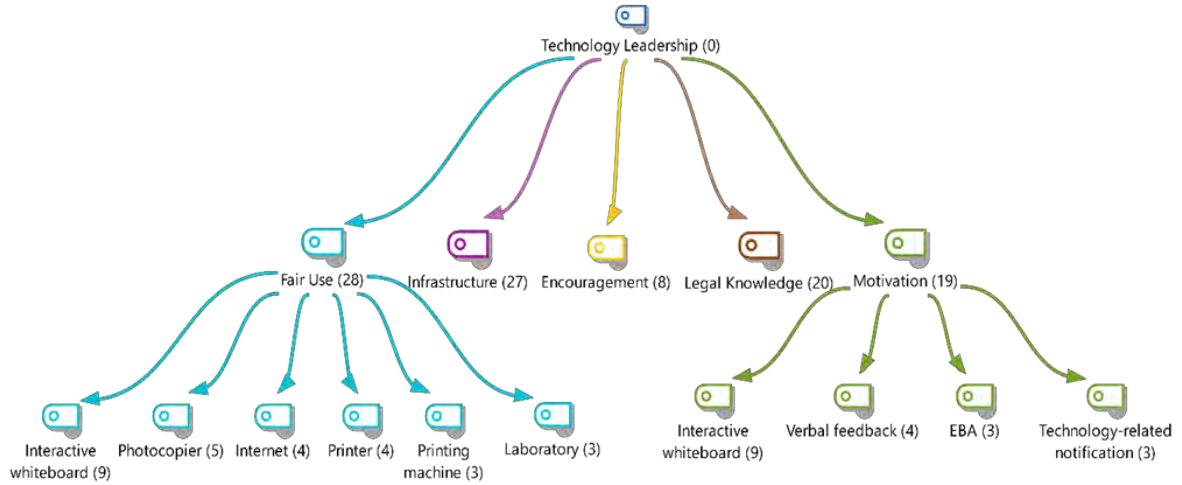

Figure 1. *MAX Maps codes of teachers' perceptions towards school principals' technology-related leadership behaviours*

As can be seen in Figure 1, school principals are believed to behave fairly in the use of technology at school, attach importance to technological infrastructure, motivate and encourage teachers, and inform them about cybercrimes and legal issues.

The category of "Fair Use" obtained as a result of the data analysis seems to include such codes as using the interactive boards, photocopiers, internet, printers, printing machines, and laboratories. The relevant teacher opinions are as follows: *Our principal places technological devices such as computers (T1), internet connection, photocopy machines (T2), and colour printers (T3) in common areas so that teachers can use, making them*

available to all teachers (T6). Our school principal takes necessary decisions at the teachers' meetings so that these devices can be used efficiently (T8). Our principal makes necessary arrangements in the curriculum so that all English teachers can benefit from the computer laboratory in English lessons (T10). In case of breakdown of technological devices, our principal gets them repaired immediately and provides maintenance (T20).

In the category of "Infrastructure", school principals are considered to provide the necessary infrastructure in the schools for the use of technology. The relevant teacher views are given as follows: *Our school principals attach importance to the technological infrastructure and provide the necessary tools and materials (T1). In case of breakdown of these devices, they have them repaired and maintained immediately, (T5) and cover their expenses (T3). Our principal receives support from parent associations in meeting such expenses (T12).*

In the category of "Encouragement", school principals are considered to lead teachers to professional development courses and seminars on technology use. Some relevant teacher views are given as follows: *Our school principal encourages us to join in in-service training courses so that we can overcome our deficiencies in technology use and integration (T8) and informs us periodically about local and national in-service training courses (T4, T10, T23). Our principal organizes seminars for the professional development of teachers (T6).*

In the category of "Legal Knowledge" school principals are considered to inform the teachers about cybercrimes and legal issues. The relevant teacher views can be found as follows: *Our school principal is alert to cybercrimes (T1), and holds seminars with the attendance of school counsellors (T2), informatics teachers (T10), and field experts (T10). Our principal informs about safe internet and cybercrime at teacher meetings, creates e-safety boards (T7), and informs students and teachers about cyberbullying (T9).*

In the category of "Motivation", school principals are considered to encourage teachers to use interactive whiteboards, Educational Information Network (EBA), and technology, as well as verbally rewarding them to increase their motivation. The relevant opinions of teachers are as follows: *Our principal gives seminars and trainings to teachers who have difficulties in using interactive whiteboards (T1, T6, T8), helps them with software updates and increases our motivation (T2). Our principal equips our educational environments with technological tools. For example, our school is the only one with a robotic coding classroom in our district. We are given seminars on this subject (T3). Our principal encourages us to join in in-service training courses in order to support our professional development (T8). Our principal makes the necessary plans so that our teachers can benefit from computer laboratories in all courses (T10). In particular, our principal gives information about the effective use of the EBA by holding meetings, classroom observations, and inspections (T11) in order to inform both students and teachers (T5). When we use technology effectively, our principal praises our work and appreciates us (T23).*

DISCUSSION AND CONCLUSION

The present study has attempted to determine the technology leadership behaviours of school principals based on teacher perceptions. For this purpose, both quantitative and qualitative data were collected from teachers.

In the present study, the teachers' perceptions regarding the school principals' technology leadership and the sub-factors of the scale, i.e., Motivation, Encouragement, Infrastructure, and Legal Knowledge were found to indicate the scale of "I Agree". In other words, it can be assumed that the teachers participating in the study regard the school principals competent in terms of technology leadership. In support of the present study, relevant studies in the literature reported that the teachers find the technology leadership levels of school principals as high (Durnalı, 2019; Sezer & Deryakulu, 2012). Similarly, a number of studies conducted with school principals concluded that school principals perceived themselves as competent in terms of technological leadership (Aktaş, 2016; Çakır & Aktay, 2018; Banoğlu, 2011; Biçer & Koç, 2019; Bülbül & Çuhadar, 2012; Görgülü, Küçükali & Ada, 2013; Gürkan, 2017; Sezer & Deryakulu, 2012). Just like those studies in the literature in which school principals consider their technology leadership levels as high, the studies conducted with teachers show that teachers deem the technology leadership levels of school principals sufficient. On the basis of these results, it can be assumed that the school principals of our day tend to keep up with the digital age, provide technology integration and work in harmony with teachers and technology.

In the qualitative aspect of the research, the teachers stated that school principals support them in terms of technology integration at school, encourage them for professional development, and lead them to in-service training courses, meet the technological infrastructure needs of the school, provide information against cybercrimes, act fairly in the use of technology, and have high motivation about technology. The participants were of the opinion that school principals treat them fairly when it comes to using technological devices such as computers, interactive whiteboards, photocopiers, printing machines, and printers. Moreover, they stated that the school principals informed them about the use of interactive whiteboards, EBA and technological tools, and praised

them verbally, which is why their motivation was high. It can be assumed that teachers' motivation is increased when their efforts are noticed and when they are appreciated by the principals, provided with technological infrastructure support and treated fairly, which in return will create a positive effect on educational activities. According to these results, the findings obtained in the qualitative dimension of the research support the quantitative findings so much so that it can be concluded that teachers' perceptions regarding technological leadership and school principals' technology leadership behaviours overlap.

The result obtained in the quantitative dimension of the study indicated no significant difference between the technological leadership competencies of school principals and the sub-factors, namely, motivation, encouragement, and infrastructure according to the variable of teachers' gender. In other words, male and female teachers seem to perceive the motivation, encouragement, infrastructure, legal knowledge and technology-related leadership behaviours of school principals in the same way. In support of our results, Durnalı (2019) found no statistical significance in teachers' perceptions regarding the technological leadership competencies of school principals by gender. In the literature, there are other studies conducted with school principals, in which there is no difference in the technological leadership competencies of male and female school principals, which supports our results (Bülbül & Çuhadar, 2012; Çakır & Aktay, 2018; Görgülü, Küçükali & Ada, 2013; Gürkan, 2017). Contrary to these findings, a study in the literature reported that female school principals consider their technological leadership levels higher than male school principals (Banoğlu, 2011); and another study indicated that male school principals have higher technological leadership levels than female school principals (Aktaş, 2016). The reason why the results of the present study and some other study results in the literature differ may be that the studies have been conducted in different years and in different types of schools.

No statistically significant difference was found between the teachers' perceptions on technology leadership competencies of school principals and the sub-factors of motivation, encouragement, legal knowledge and infrastructure according to the teachers' educational background (Bachelor's Degree-Master's Degree). In other words, it can be assumed that the teachers with bachelor's and master's degrees perceived the motivation, encouragement, legal knowledge, infrastructure, and technology leadership competence of the school principals at the same level. In a study conducted with teachers, Durnalı (2019) reported results similar to the current research findings. Supporting the findings of the present study, some other studies conducted with school principals reported no statistical difference between the technology leadership competence of school principals according to whether they have bachelor's or master's degrees (Aktaş, 2016; Bülbül & Çuhadar, 2012; Çakır & Aktay, 2018; Gürkan, 2017; Sezer & Deryakulu, 2012).

A statistically significant difference was observed between the teachers' perceptions regarding the technology leadership competence of school principals and the sub-factors of motivation, encouragement, legal knowledge, and infrastructure, according to the teachers' length of work in the same school. The teachers with professional seniority of 0-5 years had higher esteem for the technology leadership level of their school principals when compared to those with professional seniority of 6-10 years. Such a result may be accounted for by possibility that teachers working in the same school for 6-10 years may have experienced undesirable situations with school principals over time.

According to the variable of the teachers' professional seniority, no significant difference was found between the teachers' perceptions regarding the technology leadership competence of school principals, and the sub-factors of motivation, encouragement, legal knowledge, and infrastructure. It can, therefore, be argued that the teachers' perceptions on the technology leadership of their school principals do not change according to their seniority. Furthermore, supporting the results of our study, Durnalı (2019) found no significant difference in the teachers' perceptions regarding the technology leadership of school principals according to the variable of professional seniority in a study conducted with teachers. In the literature, there are other studies conducted with school principals, in which no significant difference was reported between technology leadership and the relevant competencies in its subdimensions according to the professional seniority of the school principals, which supports the results of this study (Aktaş, 2016; Çakır & Aktay, 2018; Görgülü, Küçükali & Ada, 2013). Based on such results, it can be indicated that no difference exists between professional seniority of teachers and their perceptions of their school principals with respect to technology leadership.

Suggestions

Conducted with teachers, this study used quantitative and qualitative methods concurrently. Similar mixed studies involving school principals can be carried out in the future by taking into account their technological knowledge levels. Future studies may also explore to what extent school principals make use of their technological competence for the benefit of the school and teachers.

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