Investigation of School Administrators' Technological Leadership Behaviors in the Context of Teachers' Professional Development

Metin IŞIK [1]

[1] isik.metin@ahievran.edu.tr, orcid.org/0000-0002-7431-4091, Kırşehir Ahi Evran University, Turkey

To Cite: Işık, M. (2023). Investigation of school administrators' technological leadership behaviors in the context of teachers' professional development. *Malaysian Online Journal of Educational Technology, 11*(4), 238-257. http://dx.doi.org/10.52380/mojet.2023.11.4.530

ABSTRACT

The objective of this research is to examine the influence of school principals' technological leadership practices on teachers' professional growth. In the contemporary educational landscape, principals' adeptness in technological leadership holds significant implications for fostering teachers' professional evolution. A mixed-method converging parallel design was employed in this study, facilitating both quantitative and qualitative data collection and analysis. The research sample comprised 418 teachers from various types of schools in Istanbul's districts of Beylikdüzü, Büyükçekmece, Silivri Avcılar, and Esenyurt during the spring term of the 2022-2023 academic year. Quantitative data were procured using the "School Principal Technological Leadership Behavior Scale (SPTLBS)" developed by Durnalı (2018). In contrast, qualitative data were gathered using an "Interview Form" curated by the researcher. Throughout the research process, the researcher ensured the participating teachers were fully informed about the measurement tool and their voluntary participation was respected. Descriptive statistical techniques, including arithmetic mean and inferential statistics, including t-tests, were used to analyze the quantitative data. For qualitative data analysis, the MAXQDA program was utilized. The study hypothesizes that school principals' technological leadership practices significantly impact teachers' professional development. Interestingly, the principals' technological leadership practices did not significantly vary according to the teachers' education level, age, tenure, or teaching field. In qualitative findings, participants suggested that the influence on teachers' professional development was jointly attributable to both the teacher and the principal.

Keywords: *Technological leadership, professional development, educational technology, effective learning,*

Article History:
Received: 4 July 2023
Received in revised form: 30 August 2023
Accepted: 10 October 2023
Article type: Research Article

INTRODUCTION

The advent of technology has become a pivotal player in elevating individuals' quality of life and facilitating equal access to education and related services (Şentürk et al., 2011). One of the core objectives of modern education is nurturing individuals who can adeptly utilize contemporary technology (Can, 2003). Realizing this aim necessitates teachers who effectively employ technology as a pedagogical tool, and technological leaders or school administrators who can unlock their potential (Durnalı and Akbaşlı, 2020). Education systems bear the responsibility of equipping individuals with the necessary skills and knowledge for life. Given the dynamic nature of society, individuals must continuously evolve and adapt, potentially even spearheading societal transformations. Continuous learning, therefore, is deemed essential not only to satisfy their individual needs and enhance their knowledge and skills, but also to fulfill their professional

obligations (Şenel and Gençoğlu, 2003). Enhanced educational outcomes can be achieved through strategic integration of information and communication technologies, thus necessitating school administrators to bolster their technological leadership competencies (Sincar and Aslan, 2011). Technological leadership, defined as the strategic management of technology use, encourages effective technology utilization and prioritization within organizations (Choi, Lee & Kim, 2015; Kim & Lee, 2015; Liu, Magjuka & Lee, 2011). Çakır, (2020) concluded that teachers who use computers more often have higher perceptions of school administrators' technology leadership. School principals' technological leadership behaviors play a pivotal role in honing teachers' technological skills, fostering positive attitudes towards technology, and enhancing student success (Kim & Lee, 2015; Wang & Lin, 2018). Hence, there is an increasing need for research probing into the impact of school principals' technological leadership behaviors (Choi, Lee & Kim, 2015).

Today's pedagogical landscape is continually morphing under the influence of rapid technological advancements, making professional development an essential component for teachers to keep pace (Kaya & Kartallıoğlu, 2010). Globally, teachers' professional development is recognized as a potent tool for bolstering school effectiveness, marked by activities designed to augment their knowledge base, skill set, and overall efficacy (Slot, Romijn, & Wysłowska, 2017; Zepeda, Parylo, & Bengtson, 2014; Wallin, 2003). It contributes to enhancing the individual performance of administrators and teachers alike (Blandford, 2012). Given that the effectiveness of schools is increasingly linked to teachers' professional development, this aspect has emerged as a common feature of successful schools (Van den Berg, 2002; Doran, 2004). School principals hold a critical responsibility in advocating and facilitating teachers' engagement in professional development activities, as schools serve as environments where teachers are both educated and professionally trained (Banoğlu & Peker, 2012). Encouraging continuous professional development of teachers is regarded as one of the significant duties of school principals (Guskey, 2000). Indeed, in successful educational institutions, school administrators actively encourage and foster teachers' professional development (Aydın, 2011; Çelik, 2012; the Ministry of National Education (MEB), 2014).

Teachers' professional development is deemed integral to bolstering the quality of education, given its contributory role to effective pedagogical practices (Özgenel, 2019). Such professional development is not a static occurrence, rather it represents a dynamic process extending throughout a teacher's career (Bilge and Aslanargun, 2018). Teachers encouraged by their school principals to engage in professional development are more likely to participate in activities such as seminars, in-service training, and further education. However, it's important to note that school principals fostering teachers' professional development also need to focus on their self-improvement (Çelik, 2012). In order to maximize their professional development, teachers are encouraged to actively engage with the communities surrounding their schools (Kızılkaya, 2012). Teachers try to improve their professional development by participating in different activities such as courses, workshops, congresses and conferences organized for their professional development (Bredeson, 2000; Duncan, Range, & Scherz, 2011; Drago-Severson, 2007; Guskey, 2000; Guskey, 2002; Holland, 2009). Literature highlights an array of studies focusing on technology leadership, leadership skills, self-efficacy perception, and leadership roles (Engür, 2014; Görgülü, 2013; Gültekin, 2013; Irmak, 2015; Ölçek, 2014; Öztaş, 2013; Sincar, 2009; Tanzer, 2004). It is very important for school principals to show technological leadership behaviors and to have the qualifications to adapt to the age in the use of innovation in technology in education. Technological leadership behaviors of school principals also affect teachers' professional development. Examining the technology leadership behaviors of school principals in terms of teachers' professional development constitutes the problem of the research. The study aims to discern perceptions regarding the influence of school principals' technological leadership behaviors on teachers' professional development. By providing insightful data to researchers, practitioners, and policy makers, the study strives to enhance understanding and improve both the technological leadership competencies of school principals and the professional development of teachers.

This research is set to explore the relationship between school principals' technology leadership behavior levels and teachers' professional development. The study seeks answers to the following questions:

- Do the technological leadership behaviors of school principals vary significantly based on factors including gender, age, tenure, tenure with the principal, graduation, teaching field, and education level?

- Is there a correlation between school principals' technological leadership competencies and the professional development of teachers?

RESEARCH METHOD

Research Model

This research adopts a descriptive approach aimed at elucidating the relationships between findings. A mixed-methods analysis technique is utilized in the study, which simultaneously accommodates both quantitative and qualitative data to yield more comprehensive and nuanced insights (Johnson & Onwuegbuzie, 2004). The research design adheres to a convergent parallel model where qualitative and quantitative methods are concurrently employed (Cresswel, 2014; Çelik and Buluç, 2018). In this convergent design, qualitative and quantitative data are initially collected concurrently, yet separately. Following this, each data set undergoes independent analysis. After obtaining two separate sets of results, these are then synthesized by the researcher. The final step involves the researcher interpreting the degree of correlation between the two sets of results and/or merging them to address the broader objectives of the study (Creswell and Clark, 2018). This research seeks to examine teachers' perceptions of technological leadership behaviors and their impacts on professional development both quantitatively and qualitatively, thereby providing more thorough answers to research questions using the mixed-method approach.

Participants

The research's study group comprises 20 teachers from different types and levels of schools in Avcılar, Beylikdüzü, Büyükçekmece, Esenyurt and Silivri districts of Istanbul, selected using the maximum diversity sampling method, a type of purposive sampling. The study group of studies designed with the phenomenology model varies between 10 and 15 people (Starks and Triniad (2007). In this context, the study group was composed of 20 people and an in-depth examination of the phenomenon was conducted. The aim of maximum diversity sampling is to identify and elucidate major themes encapsulating a broad spectrum of differences pertaining to the event or phenomenon under study (Neuman, 2014).

The study's population consists of 160,000 teachers working in public schools in Istanbul (Ministry of National Education, 2023). The sample includes teachers from Avcılar, Beylikdüzü, Büyükçekmece, Esenyurt and Silivri districts of Istanbul, chosen using simple random sampling. The quantitative data tool was distributed online to the identified sample group. Of the 418 teachers (spanning preschool, primary school, middle school, and high school) randomly selected from the determined schools, 408 were deemed valid after invalid entries were discarded.

Out of the total participants, 60% (n=245) are female teachers, while 40% (n=163) are male. When considering the age groups, 34.1% (n=139) fall within the 31-40 age range, 46.1% (n=188) are between 41-50 years, and 19.9% (n=81) are 51 or older. In terms of education level, a majority of participants (77.5%, n=316) hold an undergraduate degree, whereas 22.5% (n=92) have obtained a postgraduate degree. Regarding tenure, 6.1% (n=25) have 0-5 years of experience, 10% (n=41) have 6-10 years, 18.4% (n=75) have 11-15 years, 15.7% (n=64) have 16-20 years, and 49.8% (n=203) have over 21 years of experience. The teachers' specializations vary, with 25.5% (n=104) in primary school teaching, 20.8% (n=85) in social sciences, 18.4% (n=75) in science and math, 9.3% (n=38) in foreign languages, 10.8% (n=44) in special education/psychological counseling/guidance/preschool education, and 15.2% (n=62) in other areas. The duration of employment under the current principal is 0-5 years for 78.9% (n=322) of the participants and 6-10 years for the remaining 21.1% (n=86). Lastly, concerning the length of service at the current school, 50% (n=204) have been there for 0-5 years, 26.7% (n=109) for 6-10 years, 14% (n=57) for 11-15 years, and 9.3% (n=38) for over 16 years.

The demographic characteristics of the teachers who participated in the qualitative phase of the study are, it is clear that the study group is comprised of 14 female and 6 male teachers. In terms of age, 20% of teachers (N=20) are aged between 20-30, 35% are aged between 31-40, and 45% are aged between 41-50. There is a relatively balanced distribution across the various tenure groups. Regarding educational attainment, 60% of the teachers possess a bachelor's degree, while 40% have earned a postgraduate degree.

As for the tenure at the current school, half of the teachers have served at the school for 1-5 years, while the remaining are evenly spread across other categories. Considering the tenure with the current principal, it is worth noting that the principal's tenure at a single school would be capped at eight years, following two four-year appointments. As such, none of the teachers reported working with the same principal for more than eight years, hence, only tenure periods of 0-5 years and 6-10 years have been indicated. As for the teaching field, teachers specialize in a diverse array of subjects, with the highest concentration in classroom teaching.

For the qualitative data, content analysis technique was employed, enabling the extraction of key themes and relationships from the collected data. In this process, the researcher generated themes and codes. However, as both quantitative and qualitative methodologies were used, expressions belonging to qualitative findings were not quantified. The primary aim of the content analysis was to identify key concepts and relationships to better understand the data. As a result, three key themes—"Professional Development," "Teacher," and "Leader"—were identified.

In qualitative research, the validity of the study is enhanced by detailing how results were reached and presenting collected data in a comprehensive manner. In a descriptive analysis, it is crucial to present direct quotations from interviewees and base the results on these insights (Yıldırım & Şimşek, 2016). In this study, care was taken to present participants' perspectives accurately, using direct quotations to ensure the credibility of the research. Themes and codes developed by the researcher were aligned with the participants' views to serve the research's purpose. These measures facilitated the identification of similarities and differences among participants' views, and the resultant findings were interpreted according to the research questions. To maintain anonymity, the researcher used code names (G1, G2, etc.) instead of participants' real names when citing their opinions.

Data Collection Tool

Quantitative data in the study was collected through the "School Principal Technological Leadership Behavior Scale (SPTLBS)". The "School Principal Technological Leadership Behavior Scale (SPTLBS)" was employed in this study to examine the perceptions of teachers regarding the technological leadership behaviors of school principals. Developed by Durnalı (2018), the SPTLBS comprises eighteen items organized under four dimensions: motivation, orientation, infrastructure, and law. It is designed to assess the technological leadership behaviors manifested by school principals in terms of technology usage in middle schools, as perceived by the teachers. The Cronbach's Alpha reliability coefficient of the scale's four-dimensional structure was found to be .72, with individual reliability coefficients of .90 for the motivation sub-dimension, .88 for the orientation sub-dimension, .87 for the infrastructure sub-dimension, and .70 for the law sub-dimension. The SPTLBS is a five-point Likert-type scale featuring options ranging from "strongly disagree" to "strongly agree". High scores on the scale indicate high levels of the associated behaviors by school principals, while low scores suggest less prevalence of these behaviors.

Interview Form: To scrutinize the technological leadership behaviors of school principals, an initial literature review was conducted to address the question, "What are the requisite behaviors for a manager to effectively facilitate teachers' utilization of technology in education and to monitor the technological advancements within the school setting?" The content validity of the research was assessed by two experts in educational sciences, two school principals, and two teachers. It was also ensured that the research questions aligned with the dimensions in the "School Principal Technological Leadership Behavior Scale". Based on these determinations, the data collection tool for the study was developed.

Data Analysis

Data were collected by administering the School Principal's Technological Leadership Behavior Scale (SPTLBS) via a Google Form, and the participants' responses were transformed into research data. Following the removal of incomplete forms and problematic entries in the demographic information section, as well as the exclusion of outlier data, a total of 408 scale forms were deemed valid for analysis. The arithmetic mean of the SPTLBS scores are tabulated in Table 1, stratified by grading levels. The interpretations in the findings section are based on these participation level ranges.

Table 1. *Score Ranges Corresponding to SPTLBS Options*

Degree	Options	Score Ranges
1	Strongly Disagree	1,00-1,80
2	Disagree	1,81-2,60
3	Neutral	2,61-3,40
4	Agree	3,41-4,20
5	Strongly Agree	4,21-5,00

In this study, the data were initially analyzed through frequency and percentage analyses. For variables that contained two sub-categories, independent t-tests were employed; for those with three or more sub-categories, a one-way analysis of variance (ANOVA) was utilized. The significance level was determined as $p<.05$ for the interpretation of the results.

Table 2. *Normality Distribution APA Table Representation*

	N	M	Median	Skewness	Kurtosis	P
Total	408	4.14	4.05	-.48	-.21	.00

FINDINGS

Teachers' perspectives on the technological leadership behaviors of school principals were scrutinized, taking into account various variables such as gender, education level, age, tenure, teaching field, tenure with current principal, and total length of service at the school.

Table 3. *T-test Comparison of Teacher Opinions on Principals' Technological Leadership Behaviors, Divided by Gender*

Dimension	Groups	N	M	SD	t	df	p
Motivation	Female	245	4.03	.64	-1.16	406	.04*
	Male	163	4.17	.63			
Guidance	Female	245	4.15	.71	-1.98	406	.32
	Male	163	4.22	.66			
Infrastructure	Female	245	4.11	.70	-.97	406	.26
	Male	163	4.19	.66			
Law	Female	245	4.17	.76	-1.11	406	.98
	Male	163	4.17	.74			
Total Score	Female	245	4.21	.65	.02	406	.24
	Male	163	4.13	.67			

*.95 confidence interval

Table 3 illustrates that there is no significant gender-based difference at a .95 confidence interval concerning guidance, infrastructure, law, and the total score on the principals' technological leadership behavior scale. However, a statistically significant gender-based disparity was noticed within the .95 confidence level in the "motivation" sub-dimension of this scale ($t(406)=-1.16$). Male teachers ($M = 4.17$) rated the principals' technological leadership behaviors higher in the motivation dimension compared to female teachers ($M = 4.03$). This outcome suggests that male teachers perceive these behaviors as having a more positive impact on their motivation than female teachers do, indicating a significant correlation between the degree of principals' technological leadership behaviors and teacher gender.

Table 4 reveals no significant variance at the .95 confidence level across the dimensions of motivation, guidance, infrastructure, law, and overall scores in relation to the education level variable on the principals' technological leadership behavior scale.

Table 4 *T-test Comparison of Teacher Opinions on Principals' Technological Leadership Behaviors, Divided by Education Level*

Dimension	Groups	N	M	SD	t	df	p
Motivation	Undergraduate	316	4.09	.69	.25	406	.79
	Postgraduate	92	4.07	.70			
Guidance	Undergraduate	316	4.17	.68	-.60	406	.54
	Postgraduate	92	4.22	.67			
Infrastructure	Undergraduate	316	4.11	.76	-1.41	406	.15
	Postgraduate	92	4.24	.69			
Law	Undergraduate	316	4.16	.65	-.56	406	.57
	Postgraduate	92	4.21	.70			
Total Score	Undergraduate	316	4.13	.64	-.54	406	.58
	Postgraduate	92	4.17	.64			

*.95 confidence interval

Table 5. *ANOVA Comparison of Teacher Opinions on Principals' Technological Leadership Behaviors, Divided by Age*

Dimension	Groups	*n*	M	*SD*	*df*	*F*	*p*
Motivation	31 - 40 years	139	4.11	.74	405	.20	.81
	41 - 50 years	188	4.10	.64			
	51 +	81	4.05	.72			
	Total	408	4.09	.69			
Guidance	31 - 40 years	139	4.19	.73	405	.07	.93
	41 - 50 years	188	4.19	.64			
	51 +	81	4.16	.69			
	Total	408	4.18	.68			
Infrastructure	31 - 40 years	139	4.16	.80	405	.16	.84
	41 - 50 years	188	4.15	.72			
	51 +	81	4.10	.74			
	Total	408	4.14	.75			
Law	31 - 40 years	139	4.18	.71	405	.03	.96
	41 - 50 years	188	4.16	.66			
	51 +	81	4.18	.56			
	Total	408	4.17	.66			
Total Score	31 - 40 years	139	4.15	.69	405	.08	.91
	41 - 50 years	188	4.14	.61			
	51 +	81	4.11	.62			
	Total	408	4.14	.64			

As shown in Table 5, no substantial divergence at the .95 confidence level is detected regarding motivation, infrastructure, law, and total scores in relation to the age variable on the principals' technological leadership behavior scale.

Table 6. *ANOVA comparison of teacher opinions on principals' technological leadership behaviors, divided by tenure*

Dimension	Groups	*n*	M	*SD*	*df*	*F*	*p*
Motivation	0 - 5 years	25	4.24	.73	403	.69	.59
	6 - 10 years	41	4.12	.68			
	11 – 15 years	75	4.08	.64			
	16 - 20 years	64	4.17	.70			
	21 +	203	4.05	.70			
	Total	408	4.09	.69			
Guidance	0 - 5 years	25	4.34	.69	403	.69	.59
	6 - 10 years	41	4.15	.76			
	11 - 15 years	75	4.16	.67			
	16 - 20 years	64	4.26	.65			
	21 +	203	4.15	.68			
	Total	408	4.18	.68			
Infrastructure	0 - 5 years	25	4.22	.89	403	.40	.80
	6 - 10 years	41	4.14	.71			
	11 - 15 years	75	4.12	.78			
	16 - 20 years	64	4.24	.62			
	21 +	203	4.11	.77			
	Total	408	4.14	.75			
Law	0 - 5 years	25	4.37	.62	403	1.00	.40
	6 - 10 years	41	4.13	.78			
	11 - 15 years	75	4.14	.68			
	16 - 20 years	64	4.25	.63			
	21 +	203	4.14	.64			
	Total	408	4.17	.66			
Total Score	0 - 5 years	25	4.29	.69	403	.76	.55
	6 - 10 years	41	4.13	.69			
	11 - 15 years	75	4.12	.63			
	16 - 20 years	64	4.22	.60			
	21 +	203	4.10	.64			
	Total	408	4.14	.64			

As presented in Table 6, there is no significant difference at the .95 confidence level in the dimensions of motivation, direction, infrastructure, law, and total scores, according to the tenure of the school principals, on the technological leadership behavior scale.

Table 7 demonstrates that there is no significant difference within the .95 confidence interval in terms of motivation, infrastructure, law, and total scores on the technological leadership behavior scale of school principals according to teachers' teaching fields.

Table 7. *Teachers' Views on the Technological Leadership Behaviors of School Principals by Teaching Field, ANOVA test*

Dimension	Groups	*n*	M	*SD*	*df*	*F*	*p*
Motivation	Classroom Teaching	104	4.04	.72	402	.84	.59
	Social Science	85	4.13	.66			
	Natural Sciences - Math	75	4.15	.66			
	Foreign Language	38	4.18	.61			
	Special Education - PCG - Preschool Education	44	4.12	.65			
	Visual Arts / Music / Physical Education / Vocational Courses (Graphic Design, etc.)	62	3.96	.79			
	Total	408	4.09	.69			
Guidance	Classroom Teaching	104	4.12	.71	402	1.07	.59
	Social Science	85	4.25	.61			
	Natural Sciences - Math	75	4.23	.67			
	Foreign Language	38	4.30	.58			
	Special Education - PCG - Preschool Education	44	4.21	.68			
	Visual Arts / Music / Physical Education / Vocational Courses (Graphic Design, etc.)	62	4.05	.79			
	Total	408	4.18	.685			
Infrastructure	Classroom Teaching	104	4.04	.75	402	.79	.80
	Social Science	85	4.16	.70			
	Natural Sciences - Math	75	4.21	.76			
	Foreign Language	38	4.25	.73			
	Special Education - PCG - Preschool Education	44	4.22	.80			
	Visual Arts / Music / Physical Education / Vocational Courses (Graphic Design, etc.)	62	4.09	.79			
	Total	408	4.14	.75			
Law	Classroom Teaching	104	4.04	.65	402	1.57	.40
	Social Science	85	4.21	.57			
	Natural Sciences - Math	75	4.28	.64			
	Foreign Language	38	4.21	.63			
	Special Education - PCG - Preschool Education	44	4.27	.67			
	Visual Arts / Music / Physical Education / Vocational Courses (Graphic Design, etc.)	62	4.11	.79			
	Total	408	4.17	.66			
Total Score	Classroom Teaching	104	4.05	.65	402	1.07	.55
	Social Science	85	4.18	.58			
	Natural Sciences - Math	75	4.21	.64			
	Foreign Language	38	4.22	.59			
	Special Education - PCG - Preschool Education	44	4.20	.65			
	Visual Arts / Music / Physical Education / Vocational Courses (Graphic Design, etc.)	62	4.05	.72			
	Total	408	4.14	.64			

Table 8. *Teachers' Perspectives on the Technological Leadership Behaviors of School Principals by Tenure with the School Principal - T-Test*

Dimension	Groups	N	M	SD	t	df	p
Motivation	0 – 5 years	322	4.08	.73	-.73	406	.39
	6 – 10 years	86	4.14	.55			
Guidance	0 – 5 years	322	4.16	.72	-1.17	406	.16
	6 – 10 years	86	4.26	.52			
Infrastructure	0 – 5 years	322	4.11	.79	-1.67	406	.04*
	6 – 10 years	86	4.26	.56			
Law	0 – 5 years	322	4.15	.67	-1.39	406	.16
	6 – 10 years	86	4.26	.61			
Total Score	0 – 5 years	322	4.12	.67	-1.30	406	.12
	6 – 10 years	86	4.22	.50			

Table 8 reveals no significant difference in the dimensions of motivation, direction, law, and overall score within the .95 confidence interval, according to the length of teachers' tenure with the school principal, on the technological leadership behavior scale of school principals. However, a statistically significant difference emerges within the .95 confidence interval in the participation levels of teachers concerning the "infrastructure" sub-dimension of the technological leadership behavior scale of school principals, according to their tenure with the school principal (t(406)=-1.67). Teachers with a tenure of 6-10 years with the school principal (M = 4.26) rate the principal's technological leadership behavior higher in the infrastructure dimension than those with a tenure of 0-5 years (M = 4.11). This implies that teachers with a tenure of 6-10 years perceive the school principal's impact on technological infrastructure as more substantial than their counterparts who have a tenure of 0-5 years. This could also be understood as a significant association between the level of technological leadership behavior of school administrators and the length of teachers' tenure with the school principal.

Table 9. *ANOVA Test of Teachers' Perceptions of School Principals' Technological Leadership Behavior According to Total Tenure at the School*

Dimension	Groups	*n*	M	*SD*	*df*	*F*	*p*	*Source of Difference*
Motivation	0 - 5 years	204	4.20	.67	404	1.97	.00	0–5 years > 6–10 years 0–5 years > 11–15 years 0–5 years > 16 years and above 11–15 years > 16 years and above
	6 - 10 years	109	4.02	.71				
	11 - 15 years	57	3.99	.63				
	16 years and above	38	3.84	.73				
	Total Score	408	4.09	.69				
Guidance	0 - 5 years	204	4.29	.67	404	1.95	.00	0–5 years > 6–10 years 0–5 years > 11–15 years 0–5 years > 16 years and above 6-10 years > 16 years and above 11-15 years > 16 years and above
	6 - 10 years	109	4.13	.69				
	11 - 15 years	57	4.04	.64				
	16 years and above	38	3.95	.67				
	Total Score	408	4.18	.68				
Infrastructure	0 - 5 years	204	4.29	.71	404	3.41	.00	0–5 years > 6–10 years 0–5 years > 11–15 years 0–5 years > 16 years and above 11-15 years > 16 years and above
	6 - 10 years	109	4.05	.76				
	11 - 15 years	57	4.01	.65				
	16 years and above	38	3.82	.88				
	Total Score	408	4.14	.75				
Law	0 - 5 years	204	4.26	.65	404	1.16	.04	0–5 years > 16 years and above
	6 – 10 years	109	4.13	.68				

	11 - 15 years	57	4.08	.54				
	16 years and above	38	3.98	.75				
	Total Score	408	4.17	.66				
Total Score	0 - 5 years	204	4.25	.63	404	1.98	.00	0–5 years > 6–10 years 0–5 years > 11–15 years 0–5 years > 16 years
	6 - 10 years	109	4.07	.65				
	11 - 15 years	57	4.03	.55				
	16 years and above	38	3.90	.71				
	Total Score	408	4.14	.64				

*.95 confidence interval

Table 9 demonstrates that there is a significant difference in teachers' perceptions of school principals' technological leadership behavior in the dimensions of motivation ($F(404)= 1.97$, $p<.05$), direction ($F(404)= 1.95$, $p<.05$), infrastructure ($F(404)= 3.41$, $p<.05$), law ($F(404)= 1.16$, $p<.05$), and total score ($F(404)= 1.98$, $p<.05$) according to the total tenure at the school.

Upon scrutinizing the group differentials, it was established that teachers with a tenure of 0 – 5 years at the school have a more favorable view of the motivation dimension (M = 4.20) than their counterparts with tenures of 6 – 10 years (M = 4.02), 11 – 15 years (M = 3.99), and over 16 years (M = 3.84). In the direction dimension, teachers with a tenure of 0 – 5 years (M = 4.29) hold a more positive outlook than teachers with tenures of 6 – 10 years (M = 4.13), 11 – 15 years (M = 4.04), and over 16 years (M = 3.95). Additionally, teachers with a tenure of 6 – 10 years (M = 4.13) have a more favorable view than those with a tenure exceeding 16 years (M = 3.95), whereas teachers with a tenure of 11 – 15 years (M = 4.04) perceive the direction dimension more positively than those with a tenure over 16 years (M = 3.95).

In the infrastructure dimension, teachers with a tenure of 0 – 5 years (M = 4.29) hold a more favorable view compared to teachers with tenures of 6 – 10 years (M = 4.05), 11 – 15 years (M = 4.01), and over 16 years (M = 3.82). In the law dimension, teachers with a tenure of 0 – 5 years (M = 4.29) have a more positive outlook than those with a tenure exceeding 16 years (M = 3.98). Regarding the total score, teachers with a tenure of 0 – 5 years (M = 4.25) perceive the situation more favorably than teachers with tenures of 6 – 10 years (M = 4.07), 11 – 15 years (M = 4.03), and over 16 years (M = 3.90). These findings suggest a significant correlation between the technological leadership behavior of school administrators and the total tenure of teachers in the school.

Qualitative Findings

The findings of this study suggest that the technological leadership practices demonstrated by school principals significantly enhance the technological aptitude of teachers. Further, it has been established that these leadership behaviors foster a positive shift in teachers' attitudes towards the utilization of technology.

1. Professional Development

Teachers participating in the study have acknowledged the substantial role technology plays in their professional growth, stating that both the individual teacher and the school principal have significant roles in this respect. Additionally, they assert that the technological leadership behavior of school principals positively impacts their professional advancement. They also stress that their technological proficiency positively influences their teaching practices and student outcomes. Nonetheless, while teachers acknowledge their capability to utilize technology in academic environments, they maintain that their technological expertise might not yet be at the level necessary for their professional growth.

”Technology is indispensable for a teacher's professional development; professional growth can be achieved without prior knowledge of technology, it is feasible now, and it is imperative. You are compelled to enhance your skills." (P, 3)

""Technology plays a pivotal role in my professional development. Particularly as a novice teacher, I can say from personal experience that when I embarked on my teaching career, I hadn't had any exposure to this aspect during my university years." (P, 16)

""Professionally, irrespective of our level of knowledge and expertise in our respective fields, we still require mentors to guide us." (P, 9)

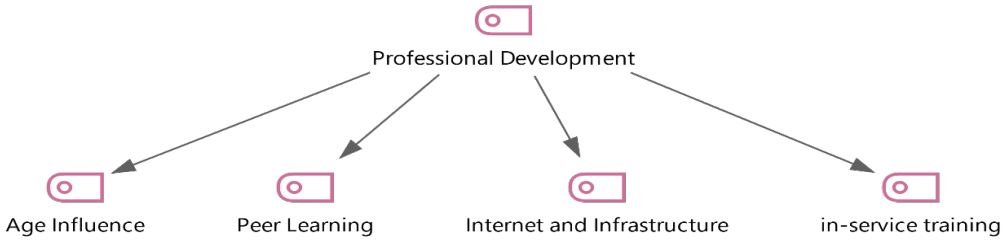

Figure 1. *Professional Development*

a. In-Service Training:

The study participants, comprising of teachers, have emphasized the importance of in-service training, such as in-person workshops and seminars, for their professional growth, particularly in light of rapid technological developments. They opine that acquiring training in relevant areas is crucial for enhancing their technological skills and overall professional advancement.

"Ultimately, improvement relies heavily on the individual teacher. There are no limiting circumstances; it solely depends on the teacher's initiative."(P, 5)

"I partake in in-service training for personal enrichment, in addition to other training programs. I attend workshops, seminars, and symposiums." (P, 7)

"There are colleagues who possess expertise, and they have conducted seminars for us. However, schools require targeted training specific to this subject matter; seminars are needed." (P, 1)

b. Peer Learning:

According to the teachers participating in the study, they meet their professional development needs by learning from their peers. They perceive their colleagues as notably effective in disseminating knowledge and technological innovations, whereas they suggest that school administrators may not consistently offer adequate solutions. The role of peer learning is substantial in their acquisition of new technological knowledge and skills.

"Mutual support prevails among us, while others also attempt to help, ultimately, we discover solutions within our group." (P, 8)

"In our school, individuals document their initiatives with their peers. The role of the administrator is less significant in this aspect. (P, 17)

"Commonly, teachers grapple with technological challenges, such as a lack of knowledge in certain areas, and we allocate those tasks to someone more proficient. For instance, I... we face certain issues, but as I stated, we navigate them within our collective. (P, 12)

c. Age Influence:

According to the participating teachers, the age of school administrators and teachers impacts their technological behaviors; younger teachers and school leaders are more enthusiastic about staying updated with technological advancements and innovations. They perceive that younger administrators exhibit a higher level of positive technological leadership behaviors, characterized by an energetic and rapid pace in adopting technology.

" Currently, I hold no expectations from the school administrators. Given that I am of a slightly different age group, many older teachers lack such expectations as they themselves do not utilize technology. (P, 15)

" Younger teachers are able to satisfy their desires and needs through various channels, whereas those with longer tenure might find it challenging to stay abreast of current issues." (P, 10)

" If we consider the school administration's attitude, they are also approximately of our age group, hence, they too lack proficiency in technology. (P, 9)

d. Internet and Infrastructure:

Upon reviewing the perspectives of the participating teachers, it becomes apparent that the most pressing issue concerning technology within their schools pertains to technological infrastructure and internet access. Participants feel that the absence of an adequate technological infrastructure and reliable internet connectivity obstructs the efficacious employment of technology in education.

" My exposure to technology at school has been limited, primarily due to infrastructure problems such as internet connectivity issues. At times, we encounter problems with applications on smart boards; it's an infrastructure matter. (P, 19)

" I am frequently confronted with technological infrastructure issues at school; we experience problems with applications on the smart board... we lack modern equipment, and much of what we possess isn't licensed. Additionally, there are internet connection issues in the secondary phase." (P, 10)

" In schools, we encounter issues related to the hardware aspect of technology. We possess a limited number of updated tools, and the majority of them are not licensed. In the secondary phase, we face infrastructure problems along with internet connectivity issues." (P, 20)

2. Teacher

Upon examining the responses of the participating teachers to questions pertaining to their school principal's technological leadership behaviors, the emerging codes offer valuable insights regarding their professional development. The teachers' perceptions of their school principal's technological leadership, expectations, eagerness to employ technology in education, and technological proficiencies can be critically evaluated within the framework of their professional development.

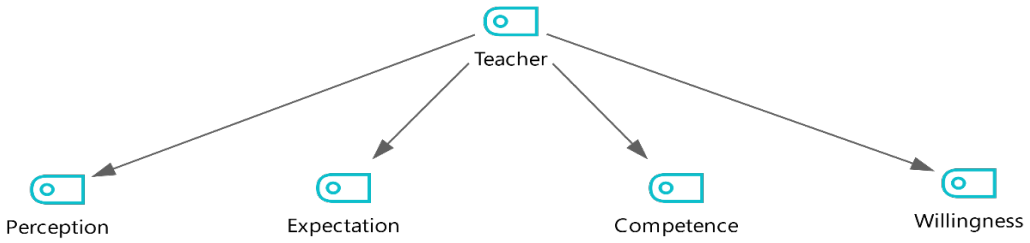

Figure 2. *Teacher*

a. Perception:

The teachers' perceptions of their school principal's technological leadership behaviors primarily focus on perceived competence, which is generally deemed low. However, they respond positively to the willingness to use technology in education.

" As far as the advancement of technology is concerned, it is pivotal for the teacher; the responsibility lies entirely with the teacher. (P, 14)

" Of course, engaging with students directly, transmitting emotions, making eye contact is more effective, but there are numerous benefits that technology can provide. Hence, we need to develop ourselves proficiently to convey that energy." (P, 15)

" Correct utilization of technology is crucial, and as teachers, we should consistently exemplify this to our students. (P, 19)

b. Expectation

The majority of participating teachers assert that their aspirations concerning technology usage are met with positive responses from the school principals. They further mention that when issues surpass their competence, the school principals tend to adopt different problem-solving strategies.

" Teachers undoubtedly have expectations, and that's why the school administration offers support. However, my experience in vocational school was different; even when I made requests, it posed a challenge for them to respond accordingly." (P, 1)

" I see ourselves as the locomotive, and the school principal as the one driving the carriages. The school principal should possess the capabilities to provide support to the teachers. (P, 9)

" In professional development, there should be a balance in technology use. The pandemic served as a litmus test for us. Relying exclusively on technology for communication might not be as effective as face-to-face education. However, the approach should be balanced, incorporating technology while ensuring active student engagement in the learning process." (P, 7)

c. Willingness:

Participating teachers believe that their individual willingness and efforts carry as much weight as the school principals' technological leadership behaviors in promoting technology use in education and improving teachers' technological competencies. They regard their personal willingness as a significant factor in enhancing their technological skills.

" The teacher's individual effort and willingness are vital in this context. They can either confine themselves to pre-set programs in the classroom or explore other settings, but their individual effort is of paramount importance." (P, 18)

" As technology advances, I believe it's incumbent upon teachers to stay abreast of it. It's a matter of the teacher's attitude." (P, 3)

" I may not be very active in professional development, but I try to watch many videos. For instance, on YouTube or social media, we need to synchronize our pronunciations." (P, 15)

d. Competence:

Participants indicate that the technological leadership behaviors of school principals vary in line with their perceived competence. Teachers perceive themselves as adequately competent in the use of technology and in meeting their technological needs.

" I'm not adept at every technology-related program; there are certainly things I don't know. Therefore, I strive to learn from them. For instance, I still favor using the traditional board more frequently. (P, 5)

" Technology is evolving rapidly, and of course, I don't consider myself wholly proficient. Several factors come into play here, including a degree of self-criticism. However, I'm not entirely uninformed either. (P, 7)

" Keeping pace with these innovations is challenging and can make us feel inadequate. Our difficulties in staying abreast of the latest technological trends affect us." (P, 10)

3. Manager/Leader

Participating teachers believe that the principals' proficiency levels and technological opportunities significantly influence their motivating attitudes regarding their technological leadership behaviors, the use of technology in education, and teachers' wishes and expectations in the context of their professional tenure.

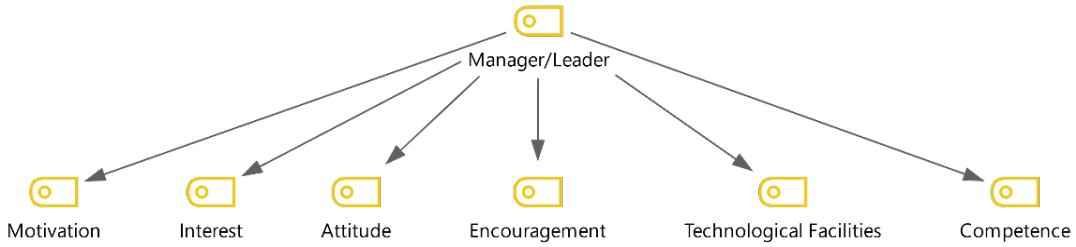

Figure 3. *Manager/Leader*

a. Motivation

The motivational attitudes of school principals enhance teachers' engagement in technological utilization and professional development.

" The school principal's attitude significantly influences me in the classroom, particularly in terms of motivation. When my motivation is high, and I can teach the way I prefer without restrictions, both my students and I feel more content. (P, 12)

" The principal should possess enough competence to offer motivating activities or exemplars for teachers to emulate. (P, 18)

" When the school principal provides support, it positively influences teachers, leading them to engage in more productive work. (P, 13)

b. Attitude

When exploring teachers' perceptions regarding school principals' technological leadership behaviors, two contrasting viewpoints about school principals surface. Some participants perceive the principals' attitudes towards technology as positive, while others report not observing positive attitudes and behaviors from the school principals. It is apparent that school principals' technological leadership behaviors fluctuate depending on their problem-solving abilities and responsiveness to teachers' technological needs.

"I find our school administrators' attitude towards technology to be extremely positive and appropriate. They act swiftly and effectively." (P, 1)

"The school principal responds to teachers in a constructive, repairing, and adaptive manner, positively influencing teachers' attitudes towards technology." (P, 3)

"We are all pleased with the school principal's problem-solving attitude; they never say there are no possibilities. If you haven't used technology, it's because you chose not to, as the administration is genuinely helpful in this regard." (P, 14)

c. Interest

Some participants believe that school principals show interest in teachers' use of technology in education, while others mention that they do not observe any interest from school principals regarding technology use. Half of the participants state that school principals do not exhibit technological leadership behaviors in solving the problems related to technology use in the school, while others mention that school principals' positive attitudes positively influence teachers' professional development.

"Our school principal doesn't show much interest when there's a problem related to technology." (P, 3)

"In general, I can give school principals a nine out of ten in terms of their interest and support towards technology. They encourage its use and any technological shortcomings or issues are less likely to be ignored." (P, 20)

"Most of the time, when there's a technological issue, it gets postponed. When a teacher goes to the school principal with a problem, as a leader, they say they'll handle it and take a look. Then, they forget about it, and we have to remind them and seek help. Technological problems are often just pushed a bit further into the future." (P, 17)

d. Competence

According to the participating teachers, school principals' technological competence determines their attitudes and behaviors towards technology. Participants believe that school principals' technological competence influences their approaches to teachers' professional development and the use of technology in education.

"The use of technology in education will increase. It's related to the competence of the school principal. The principal should possess sufficient competence to provide motivating activities or examples for teachers to work towards. However, unfortunately, such competence is lacking in our school principal, and as a result, teachers are not implementing or improving themselves. (P, 18)

"Our principal, for instance, continuously collaborates with the computer teacher to conduct inspections. They attempt to resolve any issues immediately. I haven't faced any problems since whenever we raise an issue, the principal communicates with the relevant person and seeks a solution." (P, 19)

"I believe that if you approach the school principal with any technological problem, they will likely provide an answer or a solution, at least in areas with which they are familiar." (P, 9)

e. Encouragement

When analyzing the views of participating teachers, it is observed that the positive attitudes and behaviors of school principals towards technology are deemed supportive for teachers' technological proficiency and professional development.

"My school principal was very supportive, and he was also technologically proficient. He possessed good knowledge and resources in this area, and he provided us with support. (P, 2)

"The attitudes and approaches of school administrators towards technology are supportive of teachers, but they are not perfect." (P, 16)

"The support from the school principal positively impacts teachers, and as a result, more positive work is accomplished. If the principal doesn't support me, I may not make progress." (P, 13)

f. Technological Facilities

When examining the views of participating teachers, it becomes evident that the technological facilities in schools and the technological behaviors of school principals are perceived to impact teachers' use of technology in education and their professional development.

"School administrators strive to provide us with opportunities and resources for using technology in education, in line with the possibilities provided by the government." (P, 19)

"Initially, addressing the deficiencies in our technological devices is crucial." (P, 7)

"Interactive whiteboards have significantly eased our work. Various applications are available, and it is necessary to be knowledgeable about them. Technology greatly facilitates our work (P, 11)

DISCUSSION AND CONCLUSION

In this section, teachers' perspectives regarding school administrators' technological leadership behaviors and the findings accrued through interviews are discussed concerning their implications on teachers' professional development. The research outcomes suggest that the technological leadership behaviors of school principals do not vary based on teachers' level of education, age, tenure, or teaching field. Factors such as the teachers' educational level, age, tenure, and teaching field do not influence their perception of school principals' technological competencies. The contributions of school principals to teachers' professional development are perceived to be consistent across different genders, tenures, and teaching fields (Bilge & Aslanargun, 2018). Participating teachers articulate that the technological leadership behaviors of school principals have a significant impact on their professional development. Teachers express the belief that they need to continually develop themselves to keep pace with technological advancements and remain informed. Prior studies by Easton (2008) and Wang & Lin (2018) also corroborated that school principals' technological leadership behaviors contribute to the enhancement of teachers' technological skills and attitudes towards technology use.

Pertaining to school principals' technological leadership behaviors, a significant difference is evident based on gender. Male teachers perceive school principals as demonstrating a higher level of technological leadership behavior compared to their female counterparts. This implies that the technological leadership behaviors of school principals have a more favorable impact on the professional development of male teachers than on female teachers. Several studies in existing literature (Akbulut, Odabaşı & Kuzu, 2011; Sağlam, 2007; Ulaş & Ozan, 2010) support this result. The technological leadership behaviors of school principals contribute to the enhancement of teachers' skills in using technology and their attitudes towards technology use (Wang & Lin, 2018).

In terms of teachers' views on school principals' technological leadership behaviors, a significant difference arises based on the tenure of working with the school principal. Teachers who have worked with the school principal for 6-10 years hold more positive views about the principal's technological leadership behavior in terms of infrastructure dimension compared to those with 0-5 years of experience with the principal. This indicates that the technological infrastructure of schools under the Ministry of National Education satisfies teachers' expectations. The tenure of working with the school principal can be interpreted in light of teachers' communication, support, motivational behavior, and attitudes towards their supervisors. Technological competence includes awareness of current technologies and technological advancements. Staying abreast of these developments is both necessary and inevitable for everyone in today's world (Çoklar & Şahin, 2014). According to the variable of school administrators' years of service, it was concluded that experienced school administrators showed more technological leadership self-efficacy (Öztürk, 2021).

In the qualitative component of the study, participating teachers highlighted issues related to the technological infrastructure of schools, specifically concerning internet access. It is clear that participating teachers value their perception of school principals' technological leadership behaviors, attitudes, expectations, desires, and technological competencies in terms of their professional development.

Teachers' perspectives on school principals' technological leadership behaviors suggest that their attitudes, interest, competence, motivation, supportive approach, and technological facilities impact their professional development. Teachers who receive support from school principals for their professional development can more readily participate in activities such as workshops and postgraduate education. However, school principals who support teachers' professional development also need to foster their own growth. Technology is a tool that significantly enhances the extent of collaborative networks for educators to share their thoughts, both nationally and globally (Reese, 2010). Numerous efforts have been made to improve teachers' technological competence through courses on technology use, online in-service training, etc. (Keleş & Çelik, 2013). Interactions with students, teachers, and school administrators, with whom teachers continually engage in schools, can be more effective in supporting their professional development than off-site in-service training activities (Kaya, 2010; İlğan, 2013).

Effective utilization of technology in education constitutes a multidimensional and intricate process, necessitating educators to exhibit competencies in the application of educational technologies (Chai, Koh, Tsai & Tan, 2011; Kabakçı Yurdakul, 2011). The technological leadership behavior of school principals is pivotal and determinant in the acquisition of this competency by teachers. The technological proficiency of teachers is vital for their ongoing professional development and for embodying an example of effective technology usage for students (Dağ, 2016). Participating teachers regard in-service training and peer learning as the most productive means for keeping abreast with technological advancements and embracing innovations. They also maintain that the age of teachers and school administrators influences their learning capacity. Existing literature bolsters the notion that collaborating with peers and exchanging information about effective practices amplifies the development of learned skills (Blandford, 2001; DeMonte, 2013). Disseminating the experiences and successes of colleagues among grade-level teachers within the framework of professional development can enhance each other's teaching abilities (Zepeda, Parylo & Ilgan, 2013).

In a general sense, according to the research findings, the technological leadership behaviors of school principals have a positive influence on teachers' professional development. It is anticipated that school principals will demonstrate a high level of competence in technological leadership behaviors to ensure more efficacious and efficient employment of technology in the learning environment. The technological leadership behaviors of school principals hold a critical role in guiding teachers' utilization of technology in education. The availability and sustainability of technological facilities, infrastructure, and internet access in schools represent essential factors that must be contemplated for the integration of technology in education and the motivation of teachers. School principals carry a significant role in supplying the necessary technological resources for educational purposes. Collectively, the study implies that the technological leadership of school principals is instrumental in fostering teachers' professional advancement and cultivating an environment conducive to technology integration in education. To ensure successful implementation, the provision of ample technological resources and support from school administrators are essential for teachers to employ technology effectively in their teaching practices.

The findings underscore that effective technological leadership exhibited by school principals fosters an environment that promotes and encourages teachers to augment their technological proficiencies. This, in turn, empowers teachers to integrate technology more efficiently into their instructional practices, consequently enriching the learning experiences of students.

Moreover, the study uncovers that the advantageous role of school principals' technological leadership transcends simply enhancing teachers' skills. It also shapes teachers' attitudes towards the adoption of technology. When principals manifest robust technological leadership, teachers are more inclined to perceive technology as a beneficial instrument for teaching and learning, leading to a more enthusiastic and receptive approach towards incorporating technology into their classrooms.

In conclusion, the research emphasizes the crucial impact of school principals' technological leadership in nurturing a technologically proficient and responsive teaching workforce. Their leadership behaviors not only amplify teachers' technological skills but also significantly contribute to molding their attitudes and willingness to integrate technology as an integral component of contemporary education.

Based on the findings of the study, the following suggestions can be made to researchers and practitioners: Initiatives should be implemented to fulfill the technological requirements and tackle the challenges in schools. Offering technical support services to schools will assist in the widespread adoption of technology in education. Technological training initiatives should be organized for school principals to boost their technological leadership behaviors and keep abreast of technological advancements. Recognizing the professional development needs of teachers and orchestrating activities to improve their technological knowledge and skills is of paramount importance. Professional development pursuits, such as mentoring, coaching, and team collaborations, should be designed interactively to effectively integrate technology usage. Given the teaching fields, types of schools, and tenures of school principals and teachers, tailored training programs should be promoted to cater to their specific needs and anticipations regarding technological advancements and professional growth.

REFERENCES

Akbulut, Y., Odabaşı, H., & Kuzu, A. (2011). Perceptions of preservice teachers regarding the integration of information and communication technologies in Turkish education faculties. *Turkish Online Journal of Educational Technology, 10*(3), 175-184. https://dergipark.org.tr/tr/pub/mersinefd/issue/17396/181802

Aydın, M. (2011). *Çağdaş eğitim denetimi*. Hatipoğlu.

Banoğlu, P. ve Peker, S. (2012). Öğrenen örgüt olma yolunda ilköğretim okul yöneticilerinin okullarına ve kendilerine ilişkin algı durumları. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 43*: 71-82. http://efdergi.hacettepe.edu.tr/shw_artcl-352.html

Bilge, B. ve Aslanargun, E. (2018). Öğretmenlerin mesleki gelişimleri ve okul müdürlerinin katkı düzeyleri, *Siirt Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 6*(12), 278-303. Retrieved from https://dergipark.org.tr/tr/pub/susbid/issue/41861/476008

Blandford, S. (2001). Professional development in schools. F. Banks ve S. Mayes. (Ed.), *Early Professional development for eachers* (pp.12-19) içinde. David Fulton Publishers.

Blandford, S. (2012). *Managing professional development in schools.* Routledge.

Bredeson, P. V. (2000) The school principal's role in teacher professional development, *Journal of In-Service Education, 26*(2), 385-401. https://doi.org/10.1080/13674580000200114

Can, T. (2003). Bolu orta öğretim okulları yöneticilerinin teknolojik liderlik yeterlilikleri. *The Turkish Online Journal of Educational Technology, 2*(3), 94-107. http://www.tojet.net/articles/v2i3/2312.pdf

Chai, C. S., Koh, J. H. L., Tsai, C. C., & Tan, L. L. W. (2011). Modeling primary school preservice teachers' technological pedagogical content knowledge (TPACK) for meaningful learning with information and communication technology. *Computers & Education, 57*(1), 1184-1193. https://www.learntechlib.org/p/50742/.

Choi, S. K., Lee, D., & Kim, J. (2015). Technology leadership, innovation and organizational performance in Korean companies. Journal of Business Research, 68(7), 1505-1509.

Creswell, J. W. ve Clark, V. P. L. (2018). *Karma yöntem araştırmaları tasarımı ve yürütülmesi* (Y. Dede & G. S. B. Demir, Çev. Eds.). Anı.

Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.

Çakır, Ö. (2020). *Okul yöneticilerinin teknopedagojik ve teknoloji liderliği yeterlikleri* [Yayınlanmış doktora tezi]. Fırat Üniversitesi, Elâzığ

Çelik, Ö. ve Buluç, B. (2018). Disiplinler arası yaklaşımla değer öğretiminde yaratıcı drama yönteminin kullanılması. *Erzincan Üniversitesi Eğitim Fakültesi Dergisi. 20*(1), 67-88. https://doi.org/10.17556/erziefd.325878

Çelik, V. (2012). *Eğitimsel liderlik*. Pegem Akademi.

Çoklar, A. N., ve Şahin, Y. L. (2014). Technology literacy according to students: what is ıt, where are we and what should we do for parents and children? *Turkish Online Journal of Qualitative Inquiry, 5*(2), 27-34. https://doi.org/10.17569/tojqi.44937

Dağ, F. (2016). Yaşam boyu öğrenme bağlamında Türkiye'de öğretmenlerin teknolojik yeterliliklerinin geliştirilmesine yönelik mesleki gelişim çalışmalarının incelenmesi. *International Journal of Human Sciences, 13*(1), 90-111. http://dx.doi.org/10.14687/ijhs.v13i1.3523

DeMonte, J. (2013). *High quality Professional development for teachers: Supportingi teacher training and to improve student learning.* Centers for American Progress. https://files.eric.ed.gov/fulltext/ED561095.pdf

Doran, J. A. (2004). *Effective school characteristics and student achievement correlates as perceived by teachers in American-style international schools* [Doctoral dissertation]. University of Central Florida. https://stars.library.ucf.edu/etd/182

Drago-Severson, E. (2007). Helping teachers learn: Principals as professional development leaders. *Teachers College Record, 109*(1), 70-125. https://eric.ed.gov/?id=EJ820420

Duncan, H., Range, B., & Scherz, S. (2011). From professional preparation to on-the-job development: What do beginning principals need? *International Journal of Educational Leadership Preparation, 6*(3), 1-20. https://files.eric.ed.gov/fulltext/EJ974249.pdf

Durnalı, M. (2018). *Öğretmenlere göre okul müdürlerinin teknolojik liderlik davranışları ve bilgi yönetimini gerçekleştirme düzeyleri* (Doktora Tezi). Hacettepe Üniversitesi, Ankara. https://doi.org/10.30831/akukeg.449484

Durnalı, M. & Akbaşlı, S. (2020). Okul müdürleri teknolojik liderlik davranışlarının okulda bilgi yönetiminin gerçekleşme düzeyine etkisi. *Milli Eğitim Dergisi, 49*(225), 23-54. https://dergipark.org.tr/tr/download/article-file/972797

Durnalı, M., (Ed.) (2020). *Utilizing technologies, knowledge and smart systems in educational administration and leadership*. IGI Global. https://doi.org/10.31681/jetol.687001

Easton, L. B. (2008). From professional development to professional development. *Phi Delta Kappan, 89*(10), 755-759. https://eric.ed.gov/?id=EJ798618

Eraslan, A. (2009). Reasons for the success of PISA in Finland: Lessons to be taken for Turkey. *Electronic Journal of and Science and Mathematics Education (EFMED), 3*(2), 238-248. https://dergipark.org.tr/tr/download/article-file/39791

Engür, A. (2014). *Teknoloji öğretmenlerinin okul müdürlerinin teknolojik liderik becerileri hakkındaki görüşleri* [Yüksek lisans tezi]. Akdeniz Üniversitesi, Antalya. http://acikerisim.akdeniz.edu.tr:8080/xmlui/handle/123456789/2358

Görgülü, D. (2013). *Bilgi toplumuna geçiş sürecinde okul yöneticilerinin teknolojik liderlik yeterlilikleri açısından incelenmesi (Konya ili örneği)* [Yüksek lisans tezi]. Atatürk Üniversitesi, Erzurum. https://tez.yok.gov.tr/UlusalTezMerkezi/tezSorguSonucYeni.jsp

Guskey, T. R. (2000). *Evaluating professional development.* Corwin Press, Inc.

Guskey, T. R. (2002). Does it make a difference? Evaluating professional development. *Educational Leadership, 59*(6), 45. https://pdo.ascd.org/LMSCourses/PD13OC010M/media/Leading_Prof_Learning_M6_Reading1.pdf

Gültekin, F. (2013). *Ortaöğretim yöneticilerinin teknoloji liderliği - öz-yeterlik algıları* [Yüksek lisans tezi]. Marmara Üniversitesi, İstanbul.

Holland, H. (2005). Teaching teachers: Professional development to ımprove student achievement. AERA Research Points, *American Educational Research Association (AERA), 3*(1). https://files.eric.ed.gov/fulltext/ED491587.pdf

Irmak, M. (2015). *İlkokul ve ortaokul öğretmenlerinin, yöneticilerinin "teknoloji liderliği" düzeylerine ilişkin algıları* [Yüksek lisans tezi]. Pamukkale Üniversitesi, Denizli. https://gcris.pau.edu.tr/bitstream/11499/606/1/Mehmet%20Irmak.pdf

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher, 33*(7), 14-26. https://doi.org/10.3102/0013189X033007014

İlğan, A. (2013). Öğretmenler için etkili mesleki gelişim faaliyetleri. [Effective Professional development for tecahers]. *Uşak Üniversitesi Sosyal Bilimler Dergisi*, Özel Sayı. https://dergipark.org.tr/tr/pub/usaksosbil/issue/21642/232634

Kabakçı Yurdakul, I. (2011). Öğretmen adaylarının teknopedagojik eğitim yeterliliklerinin bilgi ve iletişim teknolojilerinin kullanımları açısından incelenmesi. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 40,* 397-408. http://efdergi.hacettepe.edu.tr/yonetim/icerik/makaleler/424-published.pdf

Kaya, S. & Kartallıoğlu, S. (2010). Okul temelli mesleki gelişim modeline yönelik koordinatör görüşleri. *Abant İzzet Baysal Üniversitesi Eğitim Fakültesi Dergisi, 10*(2), 115-130. https://dergipark.org.tr/tr/pub/aibuefd/issue/1499/18142

Keleş, E., & Çelik, D. (2013). 2000-2010 Yılları arasında bilgisayar teknolojileri ve eğitimde kullanımlarına yönelik yürütülen hizmet içi eğitim kurslarının incelenmesi. *Journal of Instructional Technologies & Teacher Education*, *2*(1), 164-194. https://dergipark.org.tr/tr/pub/jitte/issue/25080/264693

Kızılkaya, H. A. (2012). *Öğretmenlerin mesleki gelişimlerinin mesleki gelişime yönelik tutumları ve iş doyumları bakımından incelenmesi üzerine bir araştırma* [Yayımlanmamış yüksek lisans tezi]. Kırıkkale Üniversitesi, Kırıkkale.

Kim, S., & Lee, G. (2015). Effects of IT capability and organizational learning on innovation and performance in SMEs: A South Korean study. *Journal of Business Research, 68*(7), 1592-1599. https://core.ac.uk/download/pdf/234627556.pdf

Liu, S. Y., Magjuka, R. J., & Lee, S. H. (2011). An analysis of instructor–learner interaction in online courses. *International Review of Research in Open and Distance Learning, 12*(3), 49-65. https://files.eric.ed.gov/fulltext/EJ1090880.pdf

Millî Eğitim Bakanlığı, MEB (2014). *Millî Eğitim Bakanlığı Okulöncesi ve İlköğretim Kurumları Yönetmeliği.* Resmî Gazete (29072). https://www.resmigazete.gov.tr/eskiler/2015/06/20150625-3.htm

Neuman, L. W. (2014). *Social research methods: Qualitative and quantitative approaches*. Pearson.

Ölçek, G. (2014). *İlköğretim okullarında görev yapan müdürlerin teknoloji liderliği düzeylerine ilişkin okul müdürü ve öğretmenlerinin görüşlerinin incelenmesi* [Yüksek lisans tezi]. Uşak Üniversitesi, Uşak.

Özgenel, M. (2019). Öğretmenlerin mesleki gelişimlerine ilişkin fenomenolojik bir araştırma. *Academic Platform Journal of Education and Change, 2*(2), 128-143. https://dergipark.org.tr/tr/download/article-file/921608

Öztaş, A. (2013). *Resmi ortaöğretim okulu yöneticilerinin teknoloji liderliği rollerine ilişkin öğretmen görüşleri* [Yüksek lisans tezi]. Marmara Üniversitesi, İstanbul.

Öztürk, D. (2021). *Lise yöneticilerinin teknolojik liderlik öz yeterliklerinin incelenmesi* [Yüksek lisans tezi]. Uludağ Üniversitesi, Bursa.

Reese, S. (2010). Bringing effective professional. *Techniques, 85*(6), 38-43.

Sağlam, F. (2007). *İlköğretim okullarında görev yapan öğretmenlerin derslerinde bilgi teknolojisi kaynaklarından yararlanma öz-yeterlilikleri ve etki algılarının değerlendirilmesi* [Yüksek lisans tezi]. Yeditepe Üniversitesi, İstanbul.

Sincar, M. (2009). *İlköğretim okulu yöneticilerinin teknoloji liderliği rollerine ilişkin bir inceleme (Gaziantep ili örneği)* [Doktora tezi]. İnönü Üniversitesi, Malatya.

Sincar, M. & Aslan, B. (2011). İlköğretim öğretmenlerinin okul yöneticilerinin teknoloji liderliği rollerine ilişkin görüşleri. *Gaziantep Üniversitesi Sosyal Bilimler Dergisi, 10*(1), 571 – 595. https://dergipark.org.tr/tr/download/article-file/223408

Slot, P., Romijn, B. & Wysłowska, O. (2017). T5. 2 Inventory and analysis of professional development and models related to inclusiveness. ISOTIS. http://www.isotis.org/wp-content/uploads/2019/03/ISOTIS_D4.2_Inventory-of-promising-curriculum-pedagogy-social-climate-interventions.pdf

Starks, H. ve Trinidad, S. B. (2007). Choose your method: a comparison of phenomenology, discourse analysis, and grounded theory. Qualitative Health Research, 17(10), 1372-380. https://journals.sagepub.com/doi/abs/10.1177/1049732307307031

Şenel, A. & Gençoğlu, S. (2003). Küreselleşen dünyada teknoloji eğitimi. *Gazi Üniversitesi Endüstriyel Sanatlar Eğitim Fakültesi Dergisi, 11*(12), 45-65. https://dergipark.org.tr/tr/pub/esef/issue/30467/308211

Tanzer, S. (2004). *Mesleki ve teknik öğretim okulu yöneticilerinin teknolojik liderlik yeterlikleri* (Yüksek lisans tezi). Abant İzzet Baysal Üniversitesi, Sosyal Bilimler Enstitüsü, Bolu.

Ulaş, H. & Ozan C. (2010). Sınıf öğretmenlerinin eğitim teknolojileri açısından yeterlilik düzeyi. *Atatürk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 14(1)*, 63-84 https://dergipark.org.tr/tr/pub/ataunisosbil/issue/2825/38166

Van den Berg, R. (2002). Teachers' meanings regarding educational practice. *Review of Educational Research, 72*(4), 577-625. https://doi.org/10.3102/00346543072004577

Wallin, J. (2003). Improving school effectiveness. *ABAC Journal, 23*(1), 61-72. http://www.assumptionjournal.au.edu/index.php/abacjournal/article/view/687/608

Wang, Q., & Lin, H. (2018). The impact of school principals' technology leadership behaviors on teachers' professional development: The mediating role of teacher outcome expectancy. *Educational Technology & Society, 21*(3), 143-155.

Zepeda, S. J. Parylo, O. & Bengtson, E. (2014). Analyzing principal professional development practices through the lens of adult learning theory. *Professional Development in Education, 40*(2), 295-315. https://doi.org/10.1080/19415257.2013.821667

Zepeda, S. J. Parylo, O. & Ilgan, A. (2013). Teacher peer coaching in Amerikan and Turkish schools. *International Journal of Mentoring and Coaching in Education, 2*(1), 64-82.