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School Principals' Technological Leadership Self-Efficacies and 21st Century Teacher Skills*

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ABSTRACT

This research aims to explore the technological leadership self-efficacy (TLS) of school principals and their use of 21st-century teacher skills (CTS). Furthermore, the study investigates potential variations in self-efficacy and teacher skills among school principals based on certain variables, including gender, administrative seniority, teaching seniority, education status, participation in in-service training on information technologies, and daily average internet use. The research employs a correlational survey model, a quantitative methodology, to scrutinize the interplay between school principals' TLS and their proficiency in 21st CTS. The study encompasses 102 voluntary school principals employed in public schools during the 2021-2022 academic year as participants. Three data collection instruments are utilized within the study. The data analysis involves descriptive statistics, t-tests for unrelated samples, ANOVA, Pearson correlation analysis, and regression analysis. The research findings indicate that the mean scores for school principals' TLS and their use of 21st CTS are notably high. A moderate, positive, and statistically significant correlation is observed between school principals' technological leadership self-efficacy and their utilization of 21st CTS. Additionally, it is deduced that school principals' 21st CTS significantly predict their TLS. Seminars could be considered to enhance the competencies of school principals in adapting to changing learning-teaching environments driven by technology.

Okul Yöneticilerinin Teknoloji Liderliği Öz-Yeterlikleri ve 21. Yüzyıl Öğreten Becerileri

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ÖZ

Bu araştırma okul yöneticilerinin teknoloji liderliği öz-yeterliklerini ve 21. yüzyıl öğreten becerileri kullanımını incelemeyi amaçlamıştır. Ayrıca öz-yeterlik ve becerilerinin cinsiyet, yöneticilik hizmet yılı, öğretmenlik hizmet yılı, eğitim durumu, bilişim teknolojileriyle ilgili hizmet içi eğitim alma durumu, günlük ortalama internet kullanım süresi değişkenlere göre farklılaşıp farklılaşmadığı incelenmiştir. Okul yöneticilerinin teknoloji liderliği öz-yeterlikleri ve 21. yüzyıl öğreten becerileri kullanımları arasındaki ilişki araştırılmıştır. Araştırmada nicel yaklaşımlardan ilişkisel tarama modeli kullanılmıştır. Araştırmanın katılımcıları 2021-2022 eğitim-öğretim yılında devlet okullarında görevli, araştırmaya gönüllü katılan 102 okul yöneticisidir. Üç tane veri toplama aracı araştırmada kullanılmıştır. Verilerin analiz edilirken betimsel istatistikler, ilişkisiz örneklemler için t-testi, ANOVA, Pearson korelasyon analizi ve regresyon analizi yapılmıştır. Araştırmanın sonucunda okul yöneticilerinin teknoloji liderliği öz-yeterliği puan ortalamaları yüksek bulunmuştur. Katılımcıların 21. yüzyıl öğreten becerileri kullanımı puan ortalamasının çok yüksek olduğu sonucuna ulaşılmıştır. Katılımcıların teknoloji liderlik öz-yeterlikleri ve 21. yüzyıl öğreten becerileri kullanımları arasında pozitif, orta düzeyde, anlamlı ilişki bulunmuştur. Ayrıca okul yöneticilerinin 21. yüzyıl öğreten becerilerinin teknoloji liderliği öz-yeterliklerinin anlamlı bir yordayıcısı olduğu tespit edilmiştir. Teknolojiyle değişen öğrenme-öğretme ortamlarında okul yöneticilerinin yeterliklerini geliştirmek için seminerler verilebilir.

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INTRODUCTION

Advances in technology affect many areas including economy and health, and have significant implications on the education system. Hence, societies have to reorganize their educational institutions based on the requirements of the information age. The developments and changes in the 21st century have an impact on education systems and create the necessity of changing individuals' knowledge, skills and competencies (Cansoy, 2018).

To be a successful in the 21st century, school leaders must assume the responsibility of transforming the teaching practices in educational institutions and prepare students to be productive citizens in the digital world (Fisher & Waller, 2013). School principals should not only supervise the educational processes of the school, but also create an educational environment that can meet the requirements of the 21st century (Garan, 2022). With their authorities and responsibilities, school principals are in a key position in the effective and educational use of technology at schools (Banoğlu, 2012). School principals have a role to play in providing technological infrastructure, software and opportunities to increase teacher competencies for the development of 21st century skills (Sulaiman & Ismail, 2020). School principals' leadership skills have gained importance in addition to their administrative skills in the information society (Numanoğlu, 1999).

Technology leader is an individual who mobilizes the people working in the organization, uses technology, and also enables and encourages the employees to use technology (Bülbül & Çuhadar, 2012). Technology leadership is the application of leadership skills required by school leaders to help their institutions apply technology in useful ways and prepare their schools for the 21st century (Hero, 2020). Technology is a concept related to change and change needs strong leadership, hence, administrators' good leadership practices will improve institutions (Afshari et al., 2009). Technological leadership practices may have far-reaching effects on school culture and teachers' professional learning orientations (Banoğlu et al., 2023). School principals' self-confidence and self-efficacy in using their technological leadership skills will increase the motivation for technology integration at schools (Hacıfazlıoğlu et al., 2011).

In response to the changes brought about by the COVID-19 pandemic, school principals are making significant efforts to prepare an environment suitable to learning, risk taking, and growth by using technology (Gonzales & Jackson, 2020). School leaders are expected not only to use their existing skills and knowledge to overcome the difficulties faced by their students caused by the pandemic, but also to develop new knowledge and skills by changing some of their existing roles (Pollock, 2020). In addition, teaching competencies are also important requirements considering that school principals started their professional lives as teachers and still continue to teach (Bush, 2018). In their research, Nzoka and Orodho (2014) concluded that while most school principals have the necessary academic qualifications and have received some administrative training in the past, they cannot demonstrate mastery in leadership and/or management skills in the field.

It can be argued that it is important for administrators to reveal their leadership competencies for corporate goals and for utilizing their employees' knowledge, skills, and expertise (Özdemir et al., 2015). With the widespread use of technology in today's Covid-19 pandemic, schools have entered a digital transformation process. In this process, it is important to reveal the technology use leadership and 21st century teaching skills of school principals for the quality of education in schools. School principals' successful execution and guidance in all processes, including the pandemic, increases the quality and success of education at school. In addition, school principals should have the 21st century skills to keep up with the era. Hence, determining to what extent school principals have technological leadership self-efficacy (TLS) as well as 21st century teacher skills (CTS) is of great importance to ensure effective technology integration at schools. This research set out to examine school principals' TLS and their use of 21st CTS with correlational survey model. The main research problem is "What is the level of school principals' TLS and use of 21st CTS?". Answers were sought to the following research problems/sub-problems:

1. What is school principals' TLS level?

2. Does school principals' TLS differ according to gender, educational status, in-service training, seniority, and duration of internet use?

3. What is school principals' 21st CTS level?

4. Do school principals' 21st CTS differ according to gender, educational background, in-service training, seniority, and duration of internet use?

5. Do school principals' 21st CTS significantly predict their TLS?

Technological Leadership Self-Efficacy

By definition, a leader can is an individual who brings people together within the framework of certain purposes and takes action (Demirdağ, 2015). Leadership is related to the initiation, organization, motivation, and direction of the actions of the members of a group to achieve group goals in a specific situation (Ojo & Olonian, 2008). The leaders of the organization initiate the first actions in the formation of an organizational culture (Taşdemir & İpek, 2019). Literature review presents studies that address the leadership types of school principals in different ways. Uysal e al., (2020) classified leadership styles as classic, modern, post-modern, new, supportive, value-oriented, people-oriented, and leadership in a chaos environment.

School principals' leadership role manifests itself in all aspects regarding the general duties of the school administration (Ojo & Olonian, 2008). Today, school principals are expected to carry out technological leadership, which facilitates organizational decisions, policies, and effective use of educational technologies (Eren & Kurt, 2011). Technology leaders are individuals who use technology and enable employees use technology as well while activating the power of their employees (Can, 2003). School principals with TLS believe in themselves to display the necessary positive behaviors and efforts in the use of technology at schools, the dissemination of technology, and the creation of technology-related environments (Çalık et al., 2019).

Technology leadership is a school characteristic consistent with the emerging consensus about distributed leadership (Hamzah et al., 2010). Hacıfazlıoğlu et al. (2010) reported that National Educational Technology Standards for Administrators (NETS-A) prepared by the International Society for Technology in Education (ISTE) is one of the most comprehensive studies conducted to identify school principals' technological leadership competencies. NETS-A (ISTE, 2002), providing suggestions about what school principals should know about technology and their roles, explained technological leadership standards in 6 dimensions: leadership and vision, learning and teaching, productivity and professional practice, support, management and operations, evaluation, social, legal, and ethical issues (Hacıfazlıoğlu et al., 2010). In 2009, ISTE summarized the technological leadership aspects for administrators in 5 dimensions (ISTE, 2009): visionary leadership (VL), digital age learning culture (DALC), excellence in professional practice (EPP), systematic development (SD) and digital citizenship (DC).

Administrative competencies that define the expectations from administrators in ensuring organizational effectiveness should be examined from a very broad perspective by including technology use competence, communication, and leadership competence (Ağaoğlu et al., 2012). The concept of self-efficacy stands out while identfying and evaluating school principals' technological competencies (Hacıfazlıoğlu et al., 2011). School principals with high self-efficacy beliefs are determined to achieve their goals and are open to determining a new strategy in a different situation (Cobanoglu &Yurek, 2018).

Hamzah et al. (2010) stated that teachers and administrators are faced with the mission of reformatting classrooms and schools in a society transformed by digital technologies and added that school principals take on leadership responsibilities in technological areas where they are inexperienced or have little training. Fisher and Waller (2013) found positive relationship between school principals' technological leadership competencies and teachers' competencies in integrating technology and

technology-related professional development. Based on this result, it can be argued that the increase in school principals' technology leadership competencies also increases teachers' competencies in integrating technology into their classrooms.

21st Century Skills

21st century skills are high-level skills and competencies that individuals need to have to adapt to the changes brought by the information society, to keep up with technology, to select, analyze and evaluate information from rapidly produced information stacks, to transform this information into a product and to use it in daily life (Anagün et al., 2016). By providing engaging learning opportunities in unique contexts, 21st century skills need to be taught to students and integrated into the existing curriculum (Larson & Miller, 2011). The importance of 21st century skills for administrators in this process cannot be overlooked. In their research, Phonsa et al. (2019) aimed to examine primary school principals' 21st century skills to create development strategies and to evaluate the strategies used to develop 21st century skills. Based on the research results, school principals' 21st century skills included the following components: management skills, technology, and communication skills, thinking skills, participation and teamwork skills, and self-development and development of others. Helvacı and Yörük (2021) aimed to examine the relationship between school principals' 21st century skill levels and their ability to manage change in schools according to teacher perceptions and found a high, positive relationship between school principals' 21st century skill competence levels and their ability to manage change.

The study conducted by Voogt and Roblin (2010) explained the conceptualization of 21st century skills of different institutions and organizations in different frameworks by addressing the Partnership for 21st century skills (P21), En Gauge, Assessment and Teaching of 21st Century Skills (ATCS), National Educational Technology Standards (NETS/ISTE), the European Union (EU) and the Organization for Economic Co-operation and Development (OECD). P21 is an organization focused on helping education leaders engage with their communities to redesign and transform their school systems, with a mission to realize the power and promise of 21st century learning in early learning at the national and international level for each student at or outside school (P21, 2022). Based on the results of various studies, P21 (2007) explained 21st century skills under 3 main headings and subheadings:

Learning and innovation skills: These skills are what separate students who are prepared for today's increasingly complex work and life environments from those who are unprepared. They include critical thinking and problem solving, creativity and innovation, communication, and collaboration.

Information, media, and technology skills: Today, there is a technology and media-oriented environment with access to information and the ability to collaborate and make individual contributions along with rapid technological developments. Effective individuals should be able to demonstrate a variety of functional and critical thinking skills such as media literacy, information literacy and information and communication technology literacy.

Life and career skills: Students are required to develop content knowledge, thinking skills, affective and social competencies to navigate complex life and work environments. These skills are listed as follows: entrepreneurship and self-direction, flexibility and adaptability, productivity and accountability, social and intercultural skills, leadership, and responsibility.

METHOD

Research Design

This research was conducted out with correlational survey model, one of the quantitative approaches, to determine school principals' TLS and 21st CTS. The relationship between two or more variables is examined in this model without trying to affect any variable (Fraenkel et al., 2012).

Participants

The universe of the research consists of school principals in public schools affiliated to the Ministry

of National Education in the city center of Kırşehir in Turkey in the fall semester of the 2021-2022 academic year. Participants were selected with the convenient sampling method. In this method, researchers choose an appropriate group that they can reach more easily due to the difficulty in choosing random or systematic non-random samples (Fraenkel et al., 2012). School principals working in kindergarten, primary, secondary, and high schools were included in the study on a voluntary basis. 102 school administrators participated in the research. Demographic information is included in Table 1.

Table 1. *School Principals' Demographic Information*

GENDER	**N**	**%**
Male	81	79.4
Female	21	20.6
Total	102	100
TITLE	**N**	**%**
Principal	47	46.1
Deputy Principal	55	53.9
Total	102	100
AGE	**N**	**%**
30 years or younger	1	1.0
Between 31-40	28	27.5
Between 41-50	48	47.1
51 tears or older	25	24.5
Total	102	100

According to Table 1, the majority of the school principals were male based on gender. Based on title, most of the school principals were deputy principals and in the 41-50 age range.

Research Instruments and Processes

Personal information form

This form was created considering the research questions and relevant variables in the literature by the researchers. The form asks questions about the school type, title, location of the school, seniority as an administrator and teacher, gender, age, educational status, etc.

Technological leadership self-efficacy scale for school administrators

The scale was adapted into Turkish by Hacıfazlıoğlu et al. (2011) by using ISTE (2009) technological leadership standards for school principals, was used to determine school principals' TLS. The 5-point Likert type scale rated the self-efficacy from 1=Very little to 5=Very sufficient. The scale includes 21 items in five factors. The scale was applied to 364 primary and secondary school principals and was found to be valid and reliable according to exploratory and confirmatory factor analysis and reliability coefficients. Permission was obtained from the researchers to use the scale in this study.

The 21st century teacher skills use scale

The scale developed by Orhan Göksün (2016). It was used to examine school principals' 21st century skills. The 5-point Likert-type scale has 27 items and five dimensions. The use of 21st CTS were rated from 1 = Never to 5 = Always for each item. Based on exploratory and confirmatory factor analysis and reliability coefficients, the scale was determined to be reliable and valid. Permission was obtained from the researcher to use the scale in this study.

Ethical permission and institutional permission were obtained for the collection of research data. The measurement tools were applied to school principals in public schools on a voluntary basis in the 2021-2022 academic year.

Data Analysis

The data showed normal distribution based on examining the skewness and kurtosis values of the data. In the research, descriptive analyzes such as frequency, arithmetic mean and standard deviation were

used to determine participants' TLS and 21st century skill levels, t-test was used to determine differences according to the binary variable, and ANOVA was performed to determine differences according to three or more variables. Pearson correlation analysis was conducted to determine the relationship between school principals' TLS and 21st century skill levels. Regression analysis was conducted to determine the predictive power of 21st CTS on TLS.

The lowest mean score that can be obtained from the scales is 1, and the highest mean score is 5. In this study, five different level ranges were determined as very low, low, moderate, high and very high. 5-1=4 and 4/5=0,8. While explaining the mean scores obtained after descriptive analysis of the data, the following scores were used: 1-1,80=very low, 1,81-2,60=low, 2,61-3,40=moderate, 3,41-4,20=high, 4,21-5,00=very high (Bars & Oral, 2017; Çalışkan et al., 2020; Günbayı & Yörük, 2014).

Ethic

Ethics committee approval was received from the Social and Human Sciences Scientific Research and Publication Ethics Committee of Kırşehir Ahi Evran University for this study, with the decision dated 14.10.2021 and numbered 2021/7/4.

FINDINGS

Findings Related to Technological Leadership Self-Efficacy

Table 2 presents school principals' TLS based on data analysis.

Table 2. *Findings on TLS*

SUB DIMENSIONS	N	$\bar{X}$	Ss
VL	102	3.94	.83
DALC	102	3.80	.83
EPP	102	4.05	.82
SD	102	3.76	.81
DC	102	4.00	.84
General	102	3.89	.72

According to Table 2, the participating school principals' technology leadership self-efficacy mean score was $\bar{X}$=3,89. It can be argued that school principals' TLS was high. It was found that the sub-dimension mean scores in the scale were also high. Table 3 presents whether school principals' TLS differed according to gender, educational status, and participation in in-service training.

Table 3. *t-test Results by Gender, Educational Status, and in-Service Training*

GENDER	N	$\bar{X}$	S	sd	t	p
Male	81	3.84	0.08	100	-1.597	.113
Female	21	4.12	0.12			
EDUCATIONAL STATUS	N	$\bar{X}$	S	sd	t	p
Undergraduate	88	3.91	0.71	100	0.683	.496
Graduate	14	3.77	0.79			
PARTICIPATION IN IN-SERVICE TRAINING	N	$\bar{X}$	S	sd	t	p
Yes	83	3.98	0.71	100	2.464	.015*
No	19	3.54	0.66			

p<.05*

According to Table 3, school principals' TLS scores didn't show statistically significant difference according to gender and educational status (p>.05). It was concluded that there was a statistically significant difference in favor of those who received in-service training on information technologies (p<.05). Table 4 presents whether school principals' TLS differed according to seniority, participation in in-service training and internet usage time.

Table 4. *ANOVA Results by Seniority and Internet Usage*

ADMINISTRATIVE SENIORITY	N	$\bar{X}$	S	sd	F	p
Between 1-5 years	27	4.06	0.66	101	1.766	0.159
Between 6-10 years	38	3.69	0.75			
Between 11-15 years	14	3.96	0.62			
16 years or more	23	4.00	0.75			
TEACHING SENIORITY	N	$\bar{X}$	S	sd	F	p
Between 1-5 years	8	4.30	0.66	101	1.998	0.119
Between 6-10 years	21	4.07	0.70			
11-15 years	22	3.69	0.74			
16 years or more	51	3.84	0.72			
DURATION OF INTERNET USE	N	$\bar{X}$	S	sd	F	p
Between 1-3 hours	49	3.83	0.72	101	0.675	.511
Between 3-5 hours	38	3.90	0.69			
More than 5 hours	15	4.08	0.81			

Table 4 shows that school principals' TLS scores did not differ statistically significantly according to administrative seniority, teaching seniority, and duration of internet use (p>.05).

Findings Related to Technological Leadership Self-Efficacy

Table 5 presents school principals' 21st CTS based on data analysis.

Table 5. *Findings Regarding 21st CTS*

SUB DIMENSIONS	N	$\overline{X}$	Ss
Administrative	102	4.39	0.51
Techno-pedagogical	102	3.98	0.46
Confirmative	102	4.65	0.43
Flexible teaching	102	4.14	0.84
Productive	102	4.16	0.82
General	102	4.26	0.46

According to Table 5, school principals' 21st CTS mean score was $\overline{X}$=4.26. It can be argued that school principals' 21st CTS were very high. The mean scores for the scale sub-dimensions show that while the administrative skills and confirmative skills sub-dimensions were at a very high level, the techno-pedagogical skills, flexible teacher skills and productive skills sub-dimensions were at a high level. Table 6 presents whether school principals' 21st CTS differed according to gender, educational status, and participation in in-service training.

Table 6. *t-test Results by Gender, Educational Status, and in-Service Training*

GENDER	N		S	sd	t	p
Male	81	4.22	0.48	100	-1.597	.093
Female	21	4.41	0.36			
EDUCATIONAL STATUS	N		S	sd	t	p
Undergraduate	88	4.29	0.45	100	1.473	.144
Graduate	14	4.09	0.51			
PARTICIPATION IN IN-SERVICE TRAINING	N		S	sd	t	p
Yes	83	4.31	0.44	100	2.205	.030*
No	19	4.05	0.50			

p<.05*

Table 6 confirms that school principals' 21st CTS scores didn't differ statistically by gender and educational status (p>.05). It was founded that there was a statistically significant difference in favor of those who received in-service training regarding information technologies (p<.05). Table 7 presents whether school principals' 21st CTS differed according to seniority, participation in in-service training and duration of internet use.

Table 7. *ANOVA Results by Seniority and Internet Use*

ADMINISTRATIVE SENIORITY	N	$\bar{X}$	S	sd	F	p	Significant difference
Between 1-5 years	27	4.25	0.50	101	3.974	0.01*	16 years or more > between 6-10 years
Between 6-10 years	38	4.13	0.52				
Between 11-15 years	14	4.21	0.29				
16 years or more	23	4.53	0.27				
TEACHING SENIORITY	N		S	sd	F	p	Significant difference
Between 1-5 years	8	4.49	0.36	101	0.835	0.478	-
Between 6-10 years	21	4.24	0.29				
11-15 years	22	4.19	0.66				
16 years or more	51	4.26	0.43				
DURATION OF INTERNET USE	N		S	sd	F	p	Significant difference
Between 1-3 hours	49	4.26	0.46	101	0.604	.548	-
Between 3-5 hours	38	4.31	0.43				
More than 5 hours	15	4.15	0.55				

p<.05*

Based on Table 7, it was concluded that school principals' 21st CTS scores didn't show statistically significant difference according to teaching seniority and daily internet use, but it showed statistically significant difference (p<.05) according to administrative seniority (p>.05). Post hoc tests (Scheffe) were conducted to determine the source of the difference based on administrative seniority. It was concluded that the 21st CTS of school principals with 16 or more years of administrative seniority were significantly higher than school principals with have 6-10 years administrative seniority.

Findings Related to Predictive Power of 21st Century Teacher Skills on Technological Leadership Self-Efficacy

Table 8 presents the relationship between school principals' TLS and their 21st CTS.

Table 8. *The Relationship Between TLS and 21st CTS*

	21st CTS
TLS	r=0.503
	p=0.000*

p<0.01*

According to Kalaycı (2010), Pearson correlation coefficient (r); -1 means full negative linear relationship, 0 means no relationship, and +1 means full positive linear relationship. Kalaycı (2010) also stated that the r value between 0.50 and 0.69 can be interpreted as a moderate level relationship. Table 6 points to a positive, moderate, significant relationship between school principals' TLS and their use of 21st CTS (r=0.503, p<.01).

Table 9 displays whether school principals' use of 21st CTS predicted their TLS.

Table 9. *Regression Analysis Results for the Predictive Power of 21st CTS on TLS*

MODEL	R	R2	Adjusted R2	F(1,100)	p
1	0.5	0.253	0.246	33.934	0.000

p<0.05*

Table 9 shows that school principals' use of 21st CTS significantly predicted their TLS (p<0.05). It can be argued that 21st CTS explained 25% of the total variance regarding technology leadership.

DISCUSSION, CONCLUSION, RECOMMENDATIONS

School principals' TLS was found to be high in this study. There are various studies on school principals' TLS in the literature. Similarly, Thannimalai and Raman (2018) concluded in their research that school

principals' technological leadership competence perceptions are high. However, Erden and Erden (2007) concluded in their research that school principals' technological leadership competencies are not at a high level based on teacher perceptions. As a different result, Aydın Güngör and Ayar (2022) found that school principals' technology leadership behaviors were inadequate by the teachers during the COVID-19 process.

No statistically significant difference was observed in this research when school principals' TLS was analyzed according to gender, seniority, education level and average daily internet use. There are studies in the literature that confirming that the gender variable doesn't make significant difference in technological leadership (Bülbül & Çuhadar, 2012; Çakır & Aktay, 2018; Düzgün, 2022). Banoğlu (2011) found that school principals' TLS differs in favor of female principals. Similarly, Çakır and Aktay (2018) found that school principals' TLS didn't show significant difference in terms of professional seniority, educational status and average daily internet use.

Based on research results, it can be argued that school principals' mean scores regarding the use of 21st CTS were very high. School principals' 21st CTS did not differ significantly by gender. Elekoğlu and Demirdağ (2020) and Helvacı and Yörük (2021) found that according to teacher perceptions, school principals have a high level of 21st century skills with no difference in 21st century skills according to gender. Orhan Göksün and Kurt (2017) concluded that pre-service teachers use of 21st CTS is above the medium level with difference according to gender.

Research results demonstrated a positive, moderate, significant relationship between school principals' TLS and their use of 21st CTS. In addition, 21st CTS were found to be significant predictor of TLS. The study conducted by Helvacı and Yörük (2021) identified high level, positive correlation between the competencies of school principals regarding 21st t century skills and their ability to manage change. Elekoğlu and Demirdağ (2020) pointed to a relationship between school principals' 21st century skills and leadership styles, according to teacher perceptions. Augspurger (2013) concluded that there was no relationship between teachers' use of 21st century teaching knowledge and skills and their principal's use of 21st century leadership knowledge and skills. When these research results were examined in general, relationships were observed between leadership and 21st century skills, similar to this research's result. However, the present research used self-assessment and the school principals evaluated themselves in regard to their TLS and use of 21st CTS. In addition, addressing the relationship between these two variables along with the predictive power of the 21st CTS will contribute to the literature.

Considering the results, school principals can be defined as individuals who are open to innovations, have sufficient skills regarding the use of technology, can use technology effectively in both administrative and educational areas, and possess and implement 21st century skills, a requirement of the new era. In addition, it can be argued that school principals with TLS display a high level of 21st century skills, and they have great responsibilities in using technology at school and encouraging other stakeholders in the school. High levels regarding 21st CTS and TLS in school principals are valuable for our education system and the quality of our schools.

Based on research results, it can be argued that participants' TLS mean scores were high. While there was significant difference in school principals' TLS in favor of the school principals who participated in in-service training on information technologies, there wasn't significant difference based on the variables of gender, administrative seniority, teaching seniority, education status and daily average internet use. It was concluded that school principals' mean scores regarding the use of 21st century teaching skills were very high. While school principals' use of 21st CTS significantly differed according to administrative seniority and participation in in-service training on information technologies, there wasn't significant difference in terms of the variables such as gender, teaching seniority, education level, and daily average internet use. A moderate, positive, significant relationship was found between school principals' TLS and their use of 21st CTS. In addition, school principals' use of 21st CTS was founded to be a significant predictor of TLS.

This research was carried out with school principals and deputy principals in public schools. Further

research can be conducted with the principals and deputy principals of private schools, or the administrators employed at different departments at the universities. In addition, this research solely focused on the relationship between school principals' TLS and their use of 21st century skills. Other studies can focus on the relationship between different leadership types and 21st century skills. There are international standards for school principals' technological leadership, self-efficacy and 21st century skills. By taking these standards into consideration, seminars can be provided to school principals on technological leadership and 21st century skills to increase school principals' skills and competencies.

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GENİŞLETİLMİŞ ÖZET

Giriş: Teknolojide yaşanan gelişmeler ekonomi, sağlık gibi birçok alana etki etmekte olduğu gibi eğitim sistemini de derinden etkilemektedir. Bu nedenle toplumlar eğitim kurumlarını bilgi çağının gereklerine göre yeniden düzenlemek durumundadırlar. 21. Yüzyılda yaşanan gelişmeler ve değişimlerin eğitim sistemleri üzerinde etkisi olmakta ve bireylere kazandırılacak bilgi, beceri ve yeterliklerin değişmesi gerekliliği ortaya çıkmaktadır (Cansoy, 2018). 21. yüzyılda başarılı bir okul yöneticisi olabilmek için okul liderlerinin, eğitim kurumlarındaki öğretim uygulamalarını dönüştürme sorumluluğunu üstlenmeleri ve öğrencileri dijital dünyada üretken vatandaşlar olmaya hazırlamaları gerekir (Fisher ve Waller, 2013). Günümüzde okul yöneticilerinden okuldaki örgütsel kararları, politikaları ve eğitim teknolojilerinin etkili kullanımını kolaylaştıran faaliyetler içeren teknoloji liderliği yapmaları beklenmektedir (Eren ve Kurt, 2011). Okul yöneticilerinin teknoloji liderliği yeterliklerini belirlemek için, en kapsamlı çalışmalardan biri, International Society for Technology in Education (ISTE)'nin hazırladığı "Yöneticiler İçin Ulusal Eğitim Teknoloji Standartları (NETS-A, National Educational Technology Standards for Administrators)'dır (Hacıfazlıoğlu vd. 2010). Okul müdürlerinin teknoloji hakkında bilmesi gerekenler ve rolleri hakkında öneri veren NETS-A (ISTE, 2002) teknoloji liderliği standartlarını altı boyut olarak açıklamıştır (Hacıfazlıoğlu vd. 2010). 2009 yılında ISTE tarafından yöneticiler için teknoloji liderliği özellikleri beş boyutta açıklanmıştır (ISTE, 2009). 21. yüzyıl becerileri, bilgi toplumunda bireylerin değişime uyum sağlaması, teknolojiye ayak uydurabilmeleri, hızla üretilen bilgi yığınları arasından bilgi seçip analiz edip değerlendirmeleri, bu bilgiyi ürüne dönüştürebilmeleri ve günlük hayatta kullanabilmeleri için sahip olmaları gereken üst düzey beceri ve yeterliklerdendir (Anagün vd., 2016). 21. Yüzyıl becerilerinin öğrencilere özgün bağlamlarda ilgi çekici öğrenme fırsatları sağlayarak öğretilmesi ve mevcut müfredata entegre edilmesi gerekir (Larson ve Miller, 2011). Partnership for 21st century skills (P21) (2007), yaptığı çalışmalar neticesinde 21. yüzyıl becerilerini 3 ana başlıkta açıklamışlardır: Öğrenme ve yenilik becerileri, bilgi, medya ve teknoloji becerileri, yaşam ve mesleki becerilerdir. Okul yöneticilerinin pandemi süreci de dahil tüm süreçleri başarı ile yürütmeleri ve liderlik etmeleri okuldaki eğitimin kalitesini ve başarısını artırmaktadır. Ayrıca çağa ayak uydurabilmek için yöneticilerin 21. yüzyıl becerilerine sahip olması gerekmektedir. Bu nedenle okul yöneticilerinin teknoloji liderliği öz-yeterliği yanında 21. yüzyıl öğreten becerilerine ne düzeyde sahip olduklarının belirlenmesi büyük önem taşımaktadır. Bu nedenle okullara etkili teknoloji entegrasyonunda okul yöneticilerinin teknoloji liderlikleri ile 21. yüzyıl öğreten becerilerinin ilişkisel olarak ortaya konmasının değerli olacağı düşünülmektedir. Bu araştırma, okul yöneticilerinin teknoloji liderliği öz-yeterliği ve 21. yüzyıl öğreten becerileri kullanımını ilişkisel olarak incelemeyi amaçlamaktadır.

Yöntem: Araştırma nicel yaklaşımlardan ilişkisel tarama modeli ile gerçekleştirilmiştir. Araştırmanın evreni 2021-2022 eğitim-öğretim yılında, güz döneminde Kırşehir ili merkezinde, Millî Eğitim Bakanlığına bağlı devlet okullarındaki okul yöneticileri oluşturmaktadır. Katılımcılar uygun örnekleme yöntemine göre seçilmiştir. Anaokulu, ilköğretim, ortaokul ve ortaöğretim düzeyinde okullarda görev yapan okul yöneticileri gönüllülük esasına göre araştırmaya dâhil edilmiştir. Araştırmaya 102 okul yöneticisi katılmıştır. Veri toplama araçları; kişisel bilgi formu, Hacıfazlıoğlu vd. (2011) tarafından ISTE (2009) okul yöneticileri için teknoloji liderliği standartlarını kullanarak Türkçe'ye uyarlanan "Eğitim Yöneticileri Teknoloji Liderliği Öz-Yeterlik Ölçeği" ve Orhan Göksün'un (2016) geliştirmiş olduğu "21. Yüzyıl Öğreten Becerileri Kullanım Ölçeği" dir. Araştırma verilerinin toplanması için etik izin ve kurum izni alınmıştır. Ölçme araçları 2021-2022 eğitim-öğretim yılında devlet okullarındaki okul yöneticilerine gönüllük esaslı uygulanmıştır. Verilerin çarpıklık ve basıklık değerleri incelenerek normal dağılım gösterdikleri tespit edilmiştir. Araştırmada frekans, aritmetik ortalama ve standart sapma gibi betimsel analizler, ikili değişkene göre farklılıkları belirlemek için t-testi, üç ve daha fazla değişkenlerdeki farklılıkları tespit etmek amacıyla da tek yönlü varyans analizi (ANOVA), Pearson korelasyon analizi ve regresyon analizi yapılmıştır.

Bulgular: Okul yöneticilerinin teknoloji liderlik öz-yeterlik puan ortalamaları $\bar{X}$=3,89'dur. Ölçeğin alt boyut puan ortalamalarının da yüksek olduğu bulgusuna ulaşılmıştır. Okul yöneticilerinin teknoloji liderliği öz-yeterlik puanları cinsiyete, eğitim durumuna, yöneticilik hizmet yılına, öğretmenlik hizmet yılına ve günlük ortalama internet kullanım süresi açısından anlamlı düzeyde bir farklılık göstermemektedir ($p>.05$). Ancak bilişim teknolojileri ile ilgili hizmet içi eğitim alma durumuna göre ise istatistiksel olarak hizmet içi eğitim alanların lehine anlamlı farklılık

gösterdiği sonucuna ulaşılmıştır (p<.05). Okul yöneticilerinin 21. yüzyıl öğreten becerileri puan ortalamalarının $\overline{X}$ =4,26'dır. Ölçek alt boyut ortalama puanları incelendiğinde yönetsel ve onamacı alt boyutları çok yüksek düzeyde iken, teknopedagojik, esnek öğretme ve üretimsel alt boyutları ise yüksek düzeydedir. Okul yöneticilerinin 21. Yüzyıl öğreten becerileri puanları cinsiyete, eğitim durumuna, öğretmenlik hizmet yılına ve günlük internet kullanım süresi açısından istatistiksel anlamlı farklılık olmadığı sonucuna ulaşılmıştır (p>.05). Bilişim teknolojileriyle ilgili hizmet içi eğitim alma açısından hizmetiçi eğitim alanların lehine anlamlı farklılık görülmüştür (p<.05). Yöneticilik hizmet yılına 16 yıl ve üzeri yöneticilik hizmet yılına sahip olan okul yöneticilerinin 21. yüzyıl öğreten becerilerinin, 6-10 yıl arası hizmet yılına sahip okul yöneticilerinden anlamlı olarak yüksek olduğu sonucuna ulaşılmıştır (p<.05). Okul yöneticilerinin teknoloji liderliği öz-yeterlikleri ile 21. Yüzyıl öğreten becerisi kullanımları arasında pozitif yönde, orta düzeyde, anlamlı bir ilişki olduğu sonucuna ulaşılmıştır (r=0.503, p<.01). Okul yöneticilerinin 21. yüzyıl öğreten becerileri kullanımları, teknoloji liderliği öz-yeterliklerinin anlamlı bir yordayıcısı olduğu tespit edilmiştir (p<0.05).

Sonuç, Tartışma ve Öneriler: Araştırmada okul yöneticilerinin teknoloji liderliği öz-yeterliklerinin yüksek olduğu bulgusuna ulaşılmıştır. Benzer olarak Thannimalai ve Raman (2018) araştırmasında okul yöneticilerinin teknoloji liderliği yeterliklerine ilişkin algıları yüksek tespit etmiştir. Ancak Erden ve Erden (2007) araştırmalarında okul müdürlerinin teknoloji liderliği yeterliklerinin öğretmen algılarına göre yüksek düzeyde olmadığı sonucuna ulaşmışlardır. Araştırma sonucunda, okul yöneticilerinin 21. yüzyıl öğreten becerileri kullanımı ortalama puanlarının çok yüksek olduğu söylenebilir. Elekoğlu ve Demirdağ (2020) ve Helvacı ve Yörük (2021) araştırmalarında öğretmen algılarına göre okul yöneticilerinin 21. yüzyıl becerilerine yüksek düzeyde sahip oldukları bulgusuna ulaşmışlardır. Araştırma sonucunda okul yöneticilerinin teknoloji liderliği öz-yeterlikleri ve 21. yüzyıl öğreten becerisi kullanımı arasında pozitif, orta düzeyde, anlamlı ilişki ortaya çıkmıştır. Ayrıca 21. yüzyıl öğreten becerilerinin teknoloji liderliği öz-yeterliklerinin anlamlı bir yordayıcısı olduğu görülmüştür. Helvacı ve Yörük (2021)'ün yaptığı çalışmada okul yöneticilerinin 21. yüzyıl becerileri yeterlikleri ve değişimi yönetme becerilerinin yüksek düzeyde pozitif ilişkili olduğu belirlenmiştir. Elekoğlu ve Demirdağ (2020) okul yöneticilerinin 21. yüzyıl becerileri ile liderlik stillerinin öğretmen algılarına göre ilişkili olduğu sonucuna ulaşmışlardır. Augspurger (2013) bir öğretmenin 21. yüzyıl öğretim bilgi ve becerileri kullanımı ile yöneticisinin 21. yüzyıl liderlik bilgi ve becerisi kullanımı arasındaki ilişki olmadığı sonucuna ulaşmışlardır. Bu araştırma devlet okullarında görevli okul müdürleri ve yardımcıları ile gerçekleştirilmiştir. Diğer araştırmalar özel okulda görevli okul müdürleri ve yardımcıları veya üniversitelerde farklı birimlerde görev yapan yöneticileri ile yapılabilir. Ayrıca bu araştırma okul yöneticilerinin teknoloji liderliği öz-yeterliği ve 21. yüzyıl becerileri arasındaki ilişkiye odaklanmıştır. Diğer araştırmalarda diğer liderlik türleri ile 21. yüzyıl becerisi arasındaki ilişkiye yönelik araştırma yapılabilir. Okul yöneticilerine teknoloji liderliği ve 21. yüzyıl becerilerine yönelik seminerler verilebilir.