**Technology Leadership Competencies of School Principals**

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| **Abstract**  The aim of this study is to investigate the technology leadership competencies of school principals. According to the opinions of school principals and teachers working in public kindergartens, primary schools, secondary schools and high schools in Düzce province center and districts, technology leadership competencies used by school principals were examined in terms of various demographic variables.  In this research, principals (149) and teachers (373) in state kindergartens, primary schools, secondary schools and high schools working in Düzce province in the 2018-2019 academic year were taken as sampling by using stratified sampling method. Perceptions of school principals and school principals about technology leadership competencies were measured by Technology Leadership Competence Scale of Educational Administrators covering NETS-A standards. According to the results of the study, it is seen that the technology leadership competencies on a total scale provide a great deal in the perception of school principals. Managers' perceptions, the highest in the field of digital citizenship; In the field of systematic development, they have the lowest average. There was a significant difference in school principals' attitudes towards technology leadership competence according to gender. In the perception of visionary leadership, digital age learning culture, digital citizenship and technology leadership competence in total scale, it is seen that the male school principals' perception of competence is higher than female school principals. According to the variable, the level of technology leadership of kindergarten principals was found to be low. According to the teachers, the technology leadership competencies of the principals are provided at a medium level, there is no significant difference in the gender variable and it can be said that the technology leadership competencies of the 31-40 age group managers are at a higher level. There is no significant difference between demographic variables such as seniority, education level and institution variables.  **Key words:** School principals, technology, leadership, competencies |

**Introduction**

In today's world, which is described as an information society, it has become imperative to follow the current trends emerging in traditional education and training understanding and to train the individuals in need, by shaping the information technologies with the educational dimension (Bülbül and Çuhadar, 2011). This situation occurs as a result of the increase in information and skills of individuals as a result of developments in information technologies. Aksoy (2003) states that there is a mass of students who use computers, mobile phones, and social media in daily life. The teaching-learning and management process is moved to the network environment with information systems such as E-school, Mebbis, and there are changes in the access of teachers, students and parents to information resources. With this change, the importance of educational technologies is increasing day by day (Brooks-Young, 2002). For this reason, in order for today's education system to adapt to the information society, it is necessary to provide up-to-date and re-setting the goals to meet the needs of the age (Genç, 2000).

The aim of education is to train creative and innovative people. Çalık and Sezgin (2005) emphasizes not to transfer information directly to the individual, but what ways the individual should be taught to reach the information he / she needs. According to Numanoğlu (1999), educational institutions should have a multifunctional structure that aims to develop an original and creative thinking in the student, a safe environment in which information is processed, includes teamwork, is open to use at all hours of the day, and where the new information needs of the society are met. Therefore, schools need to be equipped with information and communication technologies in order to achieve the goals of the information society. When the relevant literature is examined, it is seen that school principals have great responsibilities in using educational technologies effectively in educational environments. Especially Deryakulu and Olkun (2009) of existing resources in developing countries like Turkey to be integrated with the educational technology leadership of school administrators’ technology to fulfill their responsibilities extremely important that they express. With the integration of technology in education in all areas, it is stated by school administrators that they should have some competencies (Afshari, Bakar, Luan, Samah and Fooi, 2009) and it is emphasized that school administrators should lead technology use in management and teaching related practices in technology use. In addition, it has been stated that school administrators do not include formal educational activities called "Integration of Information Technologies (IT) into Education" in which they can fulfill their duties and responsibilities in the process of integrating technology with education (MEB, 2004). This situation reveals the need for school administrators to be trained on technology leadership. The fact that school administrators do not have sufficient education, knowledge and skills in the field of technology leadership is an important problem for them to fully fulfill their duties within the scope of technology leadership. For this reason, according to Şişman-Eren (2010), it is necessary to prepare standards for the relevant field in order to determine and develop the technology leadership skills of school administrators and to demonstrate their competence in technology leadership.

It has become compulsory to put information technologies into practice by shaping them with the educational dimension (Bülbül and Çuhadar, 2011). This situation occurs as a result of the increase in information and skills of individuals as a result of developments in information technologies. Aksoy (2003) states that in everyday life there is a mass of students who use computers, mobile phones, and social media. The teaching-learning and management process is moved to the network environment with information systems such as E-school, Mebbis, and there are changes in the access of teachers, students and parents to information resources. With this change, the importance of educational technologies is increasing day by day (Brooks-Young, 2002). For this reason, in order for today's education system to adapt to the information society, it is necessary to provide up-to-date and re-setting the goals to meet the needs of the age (Genç, 2000).

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It is the Educational Technology Standards, called NETS (National Educational Technology Standards), which emerged in the United States, which is widely used among the standards developed in technology leadership. These standards have three important features; the first one is the federal state system in the USA and the standards developed are designed for a wide audience and different education systems. The second important feature is that, unlike other educational technology standards, different standards have been determined regarding the use of educational technology in the form of teachers, students and administrators. Another feature of NETS is the standards developed, developed and implemented in the USA as a result of a project, which are implemented, implemented and monitored. For these reasons, according to Çoklar (2008), NETS standards developed in the USA have been accepted by many countries. Turkey has observed that school administrator’s technology leadership competencies of is the research conducted within the framework of NETS-A standard for determining (Akbaba-Altun, 2008; Banoğlu, 2011; Hacifazlioglu, Karadeniz and Dalgıç, 2010, 2011; Şişman-Eren, 2011).

In this study, the national educational technology standards and performance indicators (NETS-A), updated in 2009 for school principals, are presented in the following technological leadership competencies (ISTE, 2009).

1. Visionary leadership: The educational leader leads the development and implementation of the common vision for a comprehensive integration of technology in achieving organizational transformation and excellence across the organization.
2. Digital age learning culture: The education leader creates, develops and maintains the environment that is relevant to the needs of students, engaging, dynamic, and brings the learning culture of the digital age to all students.
3. Excellence in professional development: The educational leader supports students' learning through digital technologies and digital resources by creating an innovative and professional learning environment that empowers educators.
4. Systematic development: The education leader provides digital age leadership by constantly improving its institutions through the use of effective information and technology resources.
5. Digital citizenship: The education leader helps to understand social, ethical and legal issues, and to develop responsibility for changing digital culture.

The aim of this study is to identify the technology usage status within the school, the methods and techniques required by the school principal to integrate the technology used in school with education, and the awareness of the use of technology as innovation efforts in the educational environment. Turkey made about the adequacy of the related technology leadership of school principals shows that various studies. Findings, comments and results obtained from this research will contribute to researchers in school principals 'technology leadership levels, competencies and their principals' leadership in technology in educational institutions. In addition, it will provide information about the technology leadership of school principals in schools in the universe where the research was conducted. It is thought that the results to be obtained from the research will provide some practical data on technology leadership for school principals, teachers, policy makers and researchers who are among the most important components of the education system. It creates, develops and maintains the environment necessary to bring the learning culture of the dynamic, digital age to all students.

### The problem of the research is as follows; According to the opinions of school principals and teachers working in Düzce province, what is the level of technology leadership competence of school principals? In this study, research was conducted to determine the level of technology leadership qualifications of school principals working in Düzce province and to evaluate various demographic variables. In this context, answers to the following questions are sought:

1. What are the opinions of school principals and teachers on school principals' technology leadership competence sub-dimensions (visionary leadership, digital age learning culture, professional development excellence, systematic development and digital citizenship)?
2. Is there a significant difference in terms of institutional variables where school principals work on their technology leadership competencies?
3. Is there a significant difference in terms of institutional variables where teachers work with the opinions of teachers about technology leadership competencies?
4. Is there any difference between the school principals and teachers working in their institutions regarding the technology leadership qualifications of school principals?

**Method**

**Research Model**

### The general purpose of the research is to explain the data obtained by measuring the perceptions of teachers and their perceptions about the technology leadership levels of the school principals working in the public kindergarten, primary school, middle school and high schools in Düzce province, and the literature reopinion has been tried to explain. The research was carried out using descriptive scanning model.

**Research Sample**

### This study universe of Düzce, Turkey's research center in the province and district kindergarten, elementary school, middle school and high forms of school principals and the teachers working in these institutions. According to the statistics of Düzce Provincial Directorate of National Education and MEBBİS across the province of Düzce, 225 school principals and 4189 teachers work in kindergarten, primary, secondary and high schools in 2018-2019 academic year (Mebbis, 2019). According to Büyüköztürk and others (2012), the number of data to be collected for the school principals between 0-500 for school principals (for α = 0.05) is 142 and the number of data to be collected for the teachers between 0-5000 for teachers (for α = 0.05) is 352. However, when the difficulties to be encountered in the data collection process of the research were also calculated and in order not to fall below the determined sample size, a total of 149 school principals and 373 teachers were sampled.

### The sample size at the level of the universe and representation rate of the study is given in Table 1 below.

### Table 1. Distribution of School Principals and Teachers Who Constituted the Universe of the Research and Number of Required Samples

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | Kindergarten | Primary school | Secondary School- Religious Secondary School | High School-Religious High School | Total |
| Distribution of Teachers | | | | 143 | 1244 | 1532 | 1270 | 4189 |
| Sample Representation Rate | | | | %3 | %30 | %37 | %30 | %100 |
| Required Sample Size | | | | 10 | 106 | 130 | 106 | 352 |
| Number Assessed | | | | 10 | 112 | 128 | 123 | 373 |
| Distribution of School Principals | | | | 28 | 103 | 49 | 45 | 225 |
| Sample Representation Rate | | | | %12 | %46 | %22 | %20 | %100 |
| Required Sample Size | | | | 18 | 65 | 30 | 29 | 142 |
| Number Assessed | | | | 18 | 69 | 32 | 30 | 149 |

In the research, the proportion of stratified sampling method was determined by determining the distribution of the principal and the teacher who wanted to apply the measurement tool.

In the selection of proportional stratified sampling used in the research, the rates of each of the substrates forming the universe in the universe were determined, and the sampling of each layer was determined in proportion to the level of representation in the universe. Level ratios were determined, and sample sizes were calculated in line with this ratio.

Distribution of school principals according to demographic variables is given in Table 2.

Tablo 2. Distribution of School Principals According to Demographic Variables

|  |  |  |
| --- | --- | --- |
| **Variables** | **N** | **%** |
| **Gender** |  |  |
| Male | 22 | 14,8 |
| Female | 127 | 85,2 |
| **Age group** |  |  |
| 21-30 age | 9 | 6,0 |
| 31-40 age | 56 | 37,6 |
| 41-50 age | 54 | 36,2 |
| 50+ age | 30 | 20,1 |
| **Professional seniority** |  |  |
| 1-5 yıl | 9 | 6,0 |
| 6-10 yıl | 24 | 16,1 |
| 11-15 yıl | 42 | 28,2 |
| 16-20 yıl | 37 | 24,8 |
| 21-25 yıl | 18 | 12,1 |
| 25+ yıl | 19 | 12,8 |
| **Education status** |  |  |
| License | 130 | 87,2 |
| Master | 19 | 12,8 |
| **Management period** |  |  |
| 1-5 year | 64 | 43,0 |
| 6-11 year | 41 | 27,5 |
| 12-15 year | 25 | 16,8 |
| 16-20 year | 14 | 9,4 |
| 21-25 year | 5 | 3,4 |
| **Institution** |  |  |
| Kindergarten | 18 | 12,1 |
| Primary school | 69 | 46,3 |
| Middle School | 32 | 21,5 |
| High school | 30 | 20,1 |
| **Total** | 149 | 100,0 |

Distribution of teachers according to demographic variables is given in Table 3.

Tablo 3. Distribution of Teachers According to Demographic Variables

|  |  |  |
| --- | --- | --- |
| **Variables** | **N** | **%** |
| **Gender** |  |  |
| Female | 202 | 54,2 |
| Male | 171 | 45,8 |
| **Age group** |  |  |
| 21-30 age | 103 | 27,6 |
| 31-40 age | 192 | 51,5 |
| 41-50 age | 58 | 15,5 |
| 50+ age | 20 | 5,4 |
| **Mesleki kıdem** |  |  |
| 1-5 year | 90 | 24,1 |
| 6-10 year | 106 | 28,4 |
| 11-15 year | 101 | 27,1 |
| 16-20 year | 43 | 11,5 |
| 21-25 year | 16 | 4,3 |
| 25+ year | 17 | 4,6 |
| **Education status** |  |  |
| Associate degree | 20 | 5,4 |
| License | 304 | 81,5 |
| Master | 49 | 13,1 |
| **Institution** |  |  |
| Kindergarten | 111 | 2,7 |
| Primary school | 112 | 30,0 |
| Middle School | 128 | 34,3 |
| High school | 123 | 33,0 |
| **Total** | **373** | **100,0** |

**Data Collection Tools**

Likert scale type was used in order to reveal different dimensions of the situation that is aimed to be measured. The Technology Leadership Competencies Scale of Educational Managers published in Banoğlu (2012) was applied to the sample group. In the research, it was concluded that the scale developed by Banoğlu (2012) was a valid and reliable measurement tool in determining the technology leadership competencies of school principals, and it was measured with the “Technology Leadership Competencies Scale of Educational Administrators” that covers NETS-A standards. The scale consists of 32 items and 5 dimensions in total. The scale's "visionary leadership" dimension consists of 12 items, the "digital age learning culture" dimension consists of 3 items, the "excellence in professional development" dimension consists of 8 items, the "digital citizenship" dimension consists of 6 items and the "systematic development" dimension consists of 3 items. In the measurement tool, research was conducted on school principals and teachers taken as samples according to gender, age, educational status, professional seniority, duration of management, and institutional variables.

Data collection tool for the visionary leadership dimension of internal consistency reliability levels according to sub-dimensions. .869 is .758 for digital age learning culture dimension, .902 for excellence in professional development, .875 for digital citizenship dimension, .769 for systematic development dimension. Corrected item-total correlation values ​​of the scale. It varies between .449 and .675 (Banoğlu, 2012). The lowest score that can be obtained from the scale is 32, the highest score is 160.

Cronbach Alpha internal consistency coefficients regarding the sub-dimensions of the scale applied to the Principal, visionary leadership (, 953), digital age learning culture (, 869), excellence in professional development (, 923), systematic development (, 706), digital citizenship (, 907) was found as total scale (,976). Cronbach Alpha internal consistency coefficients regarding the sub-dimensions of the scale in the questionnaires applied to teachers, respectively, visionary leadership (, 962), digital age learning culture (,889), excellence in professional development (, 953), systematic development (, 896), digital citizenship (,920) was found as total scale (, 981). These values ​​show that the scales applied to both principals and teachers are reliable.

**Data Analysis**

In the research, data obtained from school principals and teachers were analyzed using SPSS 22.0 program. Scale sub-dimensions and total scores were subjected to analyzes by taking the arithmetic average. Before comparing scale scores according to demographic variables, whether the data are suitable for normal distribution was examined with the Kolmogorov-Smirnov test.

As a result of the analysis, it was determined that the data showed normal distribution according to several independent variables both in the scale applied to school principals and in the scale applied to teachers, but the data in other sub-variables of the same variable did not show normal distribution and therefore the data was not suitable for normal distribution (p <0.05). Since the data are not suitable for normal distribution, non-parametric analysis methods were used for the data related to scale scores.

Mann Whitney U test and Kruskal Wallis H test were used to examine the sub-dimensions of the scale according to demographic variables. The Mann Whitney U test was used when the demographic variables were in two groups, and the Kruskal Wallis H test in the case of three or more groups.

**Findings**

Descriptive statistics regarding the perceptions of school principals participating in the research on technology leadership competence dimensions are given in Table 4 below.

**Table 4.** Descriptive Statistics on School Principals’ Technology Leadership Adequacy Scale Total and Sub-Dimension Scores

|  |  |  |  |
| --- | --- | --- | --- |
| **Sub- Dimension** | **N** |  | **Ss** |
| Visionary leadership | 149 | 3,89 | ,809 |
| Digital age learning culture | 149 | 3,88 | ,873 |
| Excellence in professional development | 149 | 3,91 | ,785 |
| Systematic development | 149 | 3,71 | ,832 |
| Digital citizenship | 149 | 4,13 | ,736 |
| Total scale | 149 | 3,92 | ,742 |

When Table 4 is examined, visionary leadership = 3.89 points, digital age learning culture = 3.88 points, excellence in professional development = 3.91 points, systematic development = 3.71 points, digital, which are the sub-dimensions of perceptions of school principals about technology leadership competence. citizenship = 4.13 points and total scale = 3.92 points. It is seen that school principals have achieved the technology leadership competence in all sub-dimensions and on a total scale. According to the findings, the general average of school administrators' opinions on technology leadership competencies = 3.92. Accordingly, school administrators greatly demonstrate their technological leadership competencies. When the average of technological leadership competencies of school administrators is examined within the scope of standard fields; the highest of school administrators in the field of digital citizenship; it is seen that they have the lowest average in the field of systematic development. Accordingly, it can be said that school administrators consider themselves more adequate in the field of “Digital Citizenship” than other fields.

When the visionary leadership subtitle is examined, it can be said that school administrators show the behaviors stated in this field to a great extent. According to the findings, school principals; In order to integrate their institutions into the digital age and unite their stakeholders in a common vision in order to provide technological synergy, they are often used to promote a common-purpose change vision that supports technology practices, enhances the use of digital era resources, at the point of planning education and achieving goals. The institution can be interpreted as supporting their stakeholders. It can be said that they mostly support the development of corporate, local and national policies, programs and budgeting for the implementation of the vision and strategic plans of the institution, which are integrated with the technology, which are often participated in the creation and sharing of strategic plans consistent with the common vision of the institution and compatible with technological applications.

When the subtitle of digital age learning culture is examined, it can be said that school administrators show the behaviors in this field to a great extent. According to the findings obtained; they provide a dynamic digital age learning culture that provides detailed, appropriate and effective education, which they often provide in their institutions, often support and maintain innovations for the continuous development of digital age learning in education and training activities, and that all students plan for the efficient and effective use of technology in education. It can be said that they provide student-centered environments and learning resources equipped with technology that meets their needs. Resources for implementing the technology implementation vision and the school strategic plan at school, where they provide effective implementation of technology planning in their institutions and associate them with the curriculum, greatly support and participate in local, national and global learning communities that promote innovation, creativity and digital age collaboration for effective technology practices can be interpreted as researched

When the subtitle of excellence in professional development is examined, it can be said that school administrators show the behaviors in this field to a great extent. According to the findings, school principals; an exemplary model for continuous, efficient and effective use of technology in learning, to support the learning and innovation-based environments that empower students and stakeholders to enhance the learning of students through the integration of digital age technologies and digital resources, and strengthen institutional stakeholders. It can be evaluated that they are and support the stakeholders of the institution in applications, they support and participate in the professional development of managers, teachers and employees for the use of technology. It can be interpreted that they greatly design and support the effective communication and collaboration process in stakeholders by using digital age tools in their institutions, and that they encourage the learning of all students by following the educational researches and innovations for the effective use of digital technology.

When the systematic development subtitle is examined, it can be said that school administrators show the behaviors in this field to a large extent. According to the findings, school principals; To improve the performance of the stakeholders in the institution and effective learning of the students, by ensuring the effective use of digital and technological resources, they provide technology leadership to a large extent to ensure continuous development and innovation in the organization, they manage the change in a planned way to maximize their learning goals through the use of technological materials in accordance with their purpose and efficiently. It can be said that they collaborate by collecting, analyzing data, interpreting the results and sharing the findings.

In the strategic plan of the institution, in order to maintain the systematic functionality and integrity of different technology systems, where they provide the employment of personnel who can use technology efficiently and effectively to develop goals for the digital age, establish and mobilize strategic partnerships that support systematic development; management, operation, teaching and learning processes that support a solid technology infrastructure and sustainability.

When digital citizenship subtitle is examined, it can be said that school principals demonstrate the behaviors in this field to a great extent. According to the findings, school principals; developing and designing policies for the ethical, legal and safe use of digital information and technology, in which their institutions design and develop a perspective on social, ethical and legal issues and responsibilities that support the development of digital culture, provide equal access to appropriate digital tools and resources to meet the individual needs of all students. And it can be said that they support modeling and creating rules. It can be interpreted that they support social interactions based on trust in using technology and information, and that they are a model by providing a great deal of development of common cultural understanding on global issues with innovative communication and cooperation tools.

**Findings related to teachers' opinions**

Descriptive statistics regarding the perceptions of teachers, school principals, and technology leadership competence dimensions are given in Table 5.

**Table 5.** Descriptive Statistics on School Principals’ Technology Leadership Sufficiency Scale Total and Sub-Dimension Scores According to Teachers

|  |  |  |  |
| --- | --- | --- | --- |
| **Sub- Dimension** | **N** |  | **Ss** |
| Visionary leadership | 373 | 3,40 | ,983 |
| Digital age learning culture | 373 | 3,31 | ,995 |
| Excellence in professional development | 373 | 3,33 | 1,014 |
| Systematic development | 373 | 3,27 | 1,044 |
| Digital citizenship | 373 | 3,52 | ,947 |
| Total scale | 373 | 3,38 | ,917 |

When Table 3 is examined, visionary leadership  = 3.40, digital age learning culture = 3.31, excellence in professional development = 3.33, systematic development = 3.27, digital citizenship = sub-dimensions in the perceptions of teachers 'school administrators' perceptions about technology leadership competence. = 3.52 and total scale = 3.38. It is seen that teachers' perceptions towards managers in their institutions in the digital citizenship sub-dimension are high, and their perceptions about visionary leadership, digital age learning culture, excellence in professional development, systematic development and managers in their institutions of total scale are moderate.

According to the findings, the general average of teachers' opinions about the technology leadership competence competencies of school principals = 3.38. Accordingly, teachers think that school principals demonstrate their technology leadership competencies at an intermediate level. When the average of technology leadership qualifications to the findings is analyzed within the scope of standard fields; highest in digital citizenship; it is seen that they have the lowest average in the field of systematic development. It has been determined that the perceptions of school principals about technology leadership competencies are significantly higher than teachers' perceptions of school principals.

**Findings regarding the variable of institution where school principals work.**

The results of the Kruskal Wallis H test regarding the technology leadership adequacy scale total and sub-dimension levels of school principals participating in the research according to the institution variable studied are given in Table 6 below.

**Table 6**. Kruskal Wallis H Test Results Regarding the Total and Sub Dimension Levels of School Principals’ Technology Leadership Adequacy Scale According to Institution Variable

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Sub- dimension** | **Working institution** | **N** | **Rank average** | **Sd** | ***X*2** | **P** | **Difference** |
| Visionary leadership | Kindergarten | 18 | 42,94 | 3 | 13,523 | ,004\* | 1-2, 1-3, 1-4 |
| Primary school | 69 | 78,62 |
| Secondary School | 32 | 88,03 |
| High School | 30 | 72,02 |
| Digital age learning culture | Kindergarten | 18 | 40,28 | 3 | 16,933 | ,001\* | 1-2, 1-3, 1-4 |
| Primary school | 69 | 78,71 |
| Secondary School | 32 | 90,41 |
| High School | 30 | 70,87 |
| Excellence in professional development | Kindergarten | 18 | 44,47 | 3 | 12,182 | ,007\* | 1-2, 1-3, 1-4 |
| Primary school | 69 | 79,91 |
| Secondary School | 32 | 85,50 |
| High School | 30 | 70,82 |
| Systematic development | Kindergarten | 18 | 52,17 | 3 | 7,032 | ,071 | - |
| Primary school | 69 | 78,09 |
| Secondary School | 32 | 83,84 |
| High School | 30 | 72,15 |
| Digital citizenship | Kindergarten | 18 | 41,25 | 3 | 16,598 | ,001\* | 1-2, 1-3, 1-4 |
| Primary school | 69 | 79,14 |
| Secondary School | 32 | 90,47 |
| High School | 30 | 69,23 |
| Total scale | Kindergarten | 18 | 42,64 | 3 | 14,392 | ,002\* | 1-2, 1-3, 1-4 |
| Primary school | 69 | 79,09 |
| Secondary School | 32 | 88,81 |
| High School | 30 | 70,28 |

\*There is a significant difference (p<0,05)

When Table 6 is examined, the systematic development of the technology leadership adequacy scale according to the institutional variable studied by school principals [X2 (3) = 7,032; There was no statistically significant difference in p =, 071] sub-dimension (p> 0.05), visionary leadership [X2 (3) = 13,523; p =, 004], digital age learning culture [X2 (3) = 16,933; p =, 001], excellence in professional development [X2 (3) = 112,182; p =, 007], digital citizenship [X2 (3) = 16,598; p =, 001] and on the total scale [X2 (3) = 14,392; p =, 003], it is seen that there is a statistically significant difference (p <0.05) according to the institution variable studied.

The results of the Mann Whitney U test regarding the total and sub-dimension levels of the school principals participating in the research, according to the institutional variable of the school principals whose technology leadership adequacy scale has a significant difference are given in Table 7 below.

**Table 7.** Mann Whitney U Test Results Regarding the Total and Sub-Dimension Levels with Significant Differences in Technology Leadership Adequacy Scale of School Principals According to the Institution Variable Worked

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sub- dimension** | **Working institution** | **N** | **Rank average** | **Rank Total** | **U** | **P** |
| Visionary leadership | Kindergarten | 18 | 27,28 | 491,0 | 320,0 | ,002 |
| Primary school | 69 | 48,36 | 3337,0 |
| Visionary leadership | Kindergarten | 18 | 16,22 | 292,0 | 121,0 | ,001 |
| Secondary School | 32 | 30,72 | 983,0 |
| Visionary leadership | Kindergarten | 18 | 18,44 | 332,0 | 161,0 | ,020 |
| High School | 30 | 28,13 | 844,0 |
| Digital age learning culture | Kindergarten | 18 | 25,86 | 465,5 | 294,5 | ,001 |
| Primary school | 69 | 48,73 | 3362,5 |
| Digital age learning culture | Kindergarten | 18 | 15,42 | 277,5 | 106,5 | ,000 |
| Secondary School | 32 | 31,17 | 997,5 |
| Digital age learning culture | Kindergarten | 18 | 18,00 | 324,0 | 153,0 | ,011 |
| High School | 30 | 28,40 | 852,0 |
| Excellence in professional development | Kindergarten | 18 | 27,78 | 500,0 | 329,0 | ,002 |
| Primary school | 69 | 48,23 | 3328,0 |
| Excellence in professional development | Kindergarten | 18 | 16,86 | 303,5 | 132,5 | ,002 |
| Secondary School | 32 | 30,36 | 971,5 |
| Excellence in professional development | Secondary School | 18 | 18,83 | 339,0 | 168,0 | ,029 |
| High School | 30 | 27,90 | 837,0 |
| Digital citizenship | Kindergarten | 18 | 26,44 | 476,0 | 305,0 | ,001 |
| Primary school | 69 | 48,58 | 3352,0 |
| Digital citizenship | Kindergarten | 18 | 15,11 | 272,0 | 101,0 | ,000 |
| Secondary School | 32 | 31,34 | 1003,0 |
| Digital citizenship | Kindergarten | 18 | 18,69 | 336,5 | 165,5 | ,024 |
| High School | 30 | 27,98 | 839,5 |
| Total scale | Kindergarten | 18 | 27,25 | 490,5 | 319,5 | ,002 |
| Primary school | 69 | 48,37 | 3337,5 |
| Total scale | Kindergarten | 18 | 16,11 | 290,0 | 119,0 | ,001 |
| Secondary School | 32 | 30,78 | 985,0 |
| Total scale | Kindergarten | 18 | 18,28 | 329,0 | 158,0 | ,017 |
| High School | 30 | 28,23 | 847,00 |

Primary school according to the institution variable studied by school principals [U = 320,0; p =, 002], secondary school [U = 121,0; p =, 001] or high school [U = 161,0; p =, 020] the visionary leadership perception of working school principals is statistically significantly higher than the school principals working in kindergarten (p <0.05). Primary school [U = 294.5; p =, 001], secondary school [U = 106.5; p =, 000] or high school [U = 153; p =, 011] the perception of the digital age learning culture of the working school principals is statistically significantly higher than the principals working in the kindergarten (p <0.05). Primary school according to the institution variable studied by school principals [U = 329,0; p =, 002], secondary school [U = 132.5; p =, 002] or high school [U = 168.0; p =, 029] statistically significantly higher perception of excellence of working school principals in professional development than school principals working in kindergarten (p <0.05). Primary school according to the variable of school principals studied [U = 305,5; p =, 001], secondary school [U = 101.0; p =, 000] or high school [U = 165.5; p =, 024] statistically significantly higher perception of digital citizenship of working school principals than school principals working in kindergarten (p <0.05). Primary school [U = 319.5; p =, 002], secondary school [U = 119.0; p =, 001] or high school [U = 158,0; p =, 017] the perception of technology leadership competence (total scale) of working school principals is statistically significantly higher than school principals working in kindergarten (p <0.05).

When the findings are analyzed, the technology leadership qualifications of school principals on a total scale; the highest value of the principals working in secondary school; It can be said that the kindergarten principals have the lowest value. In the visionary leadership sub-dimension, which has a significant difference, it is seen that the secondary school principals are the highest value and the kindergarten principals are the lowest. In the digital age learning culture learning sub-dimension, it can be said that middle school principals have the highest value and kindergarten principals have the lowest value. It can be interpreted that the highest value secondary school principals in the sub-dimension of excellence in professional development are the kindergarten principals with the lowest value and the secondary school principals with the highest value in the digital citizenship sub-dimension are the kindergarten principals with the lowest value. In the systematic development sub-dimension, there was no significant difference as school principals showed similar leadership competencies.

**Findings regarding the institutional variable where teachers work**

The results of the Kruskal Wallis H test regarding the technology leadership adequacy scale total and subdimension levels of school principals according to the institution variable of the teachers participated in the research are given in Table 8.

**Table 8.** Kruskal Wallis H Test Results Regarding the Total and Sub-Dimension Levels of School Leaders 'Technology Leadership Scale According to Teachers' Institution Variable

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sub- dimension** | **Working institution** | **N** | **Rank average** | **Sd** | ***X*2** | **P** |
| Visionary leadership | Kindergarten | 10 | 158,15 | 3 | ,776 | ,855 |
| Primary school | 112 | 187,34 |
| Secondary School | 128 | 189,28 |
| High School | 123 | 186,67 |
| Digital age learning culture | Kindergarten | 10 | 153,15 | 3 | 1,644 | ,650 |
| Primary school | 112 | 193,63 |
| Secondary School | 128 | 188,06 |
| High School | 123 | 182,61 |
| Excellence in professional development | Kindergarten | 10 | 170,55 | 3 | ,742 | ,863 |
| Primary school | 112 | 193,27 |
| Secondary School | 128 | 183,73 |
| High School | 123 | 186,03 |
| Systematic development | Kindergarten | 10 | 200,70 | 3 | 1,256 | ,740 |
| Primary school | 112 | 178,26 |
| Secondary School | 128 | 188,30 |
| High School | 123 | 192,49 |
| Digital citizenship | Kindergarten | 10 | 178,45 | 3 | 1,262 | ,738 |
| Primary school | 112 | 188,24 |
| Secondary School | 128 | 194,02 |
| High School | 123 | 179,26 |
| Total scale | Kindergarten | 10 | 164,15 | 3 | ,641 | ,887 |
| Primary school | 112 | 189,74 |
| Secondary School | 128 | 188,97 |
| High School | 123 | 184,31 |

When Table 8 is examined, the visionary leadership of the technology leadership adequacy scale of the principals in their institutions according to the institutional variable where the teachers work [X2(3) =, 776; p =, 855], digital age learning culture [X2(3) = 1.644; p =, 650], excellence in professional development [X2(3) =, 742; p = 863], systematic development [X2(3) = 1,256; p =, 740], digital citizenship [X2(3) = 1,262; p =, 738] and total leadership in technology leadership perception [X2(3) =, 641; p =, 887] there is no statistically significant difference (p> 0.05).

According to teachers, according to the perceptions of school principals about technology leadership, it can be said that they have similar opinions in sub-dimensions and there is no significant difference. According to the research, it can be said that the institutions where teachers work do not affect their perception of competence towards school principals.

According to teachers, it can be interpreted that school principals show their behaviors in visionary leadership, digital age learning culture, excellence in professional practice, systematic development and digital citizenship, which are sub-dimensions related to technology leadership competencies.

**Comparison of School Principal and Teacher Opinions on Technology Leadership**

The results of the Mann Whitney U test regarding the technology leadership competence perceptions of teachers and teachers' opinions according to the duty type variable of the school principals and teachers participating in the research are given in Table 9 below.

**Table 9.** Technology Leadership Competency Perceptions of School Principals According to Task Type Variable and Mann Whitney U Test Results Regarding Teachers' Opinions

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sub- dimension** | **Task type** | **N** | **Rank average** | **Rank total** | **U** | **P** |
| Visionary leadership | Principal | 149 | 314,47 | 46856,0 | 19896,0 | ,000 |
| Teacher | 373 | 240,34 | 89647,0 |
| Digital age learning culture | Principal | 149 | 324,57 | 48361,0 | 18391,0 | ,000 |
| Teacher | 373 | 236,31 | 88142,0 |
| Excellence in professional development | Principal | 149 | 322,49 | 48050,5 | 18701,5 | ,000 |
| Teacher | 373 | 237,14 | 88452,5 |
| Systematic development | Principal | 149 | 305,67 | 45545,0 | 21207,0 | ,000 |
| Teacher | 373 | 243,86 | 90958,0 |
| Digital citizenship | Principal | 149 | 328,89 | 49004,0 | 17748,0 | ,000 |
| Teacher | 373 | 234,58 | 87499,0 |
| Total scale | Principal | 149 | 324,79 | 48393,5 | 18358,5 | ,000 |
| Teacher | 373 | 236,22 | 88109,5 |

When Table 9 is examined, visionary leadership of the technology leadership adequacy scale of school principals [U= 19896,0; p =, 000], digital age learning culture [U= 18391,0; p =, 000], excellence in professional development [U= 18701,5; p =, 000], systematic development [U= 21207,0; p =, 000], digital citizenship [U= 17748,0; p =, 000] and on a total scale [U= 18358.5; p =, 000] perceptions seem to be significantly higher than teachers.

According to the data, based on the findings regarding the technological leadership behaviors that school principals can exhibit, teachers' perceptions will increase positively as the total level of technological leadership behaviors exhibited by school principals in the use of technology increases.

**Conclusion and Discussion**

According to the general average of their opinions on technology leadership competencies, school principals largely demonstrate their technology leadership competencies. When the average of the technological leadership competencies of school principals are analyzed within the scope of sub-dimensions; the highest level of school citizenship in digital citizenship; it is seen that they have the lowest average in the field of systematic development. Accordingly, it can be said that school principals consider themselves more adequate in the field of “Digital Citizenship” than other fields. In the context of school principals taking part in the research to exhibit these behaviors to a large extent, MoNE's students, teachers, various statistics etc. such as E-School and MEBBİS. It can be concluded that the applications developed for their work and operations can be widely used by teachers. The impact of technology leadership of school principals in the functioning of schools, institutional climate and institutional cultures can be mentioned. Integrating technology with education carried out projects in Turkey, Turkey Education System in the largest and most comprehensive manner FATİH purpose of the project activities on the integration of technology in education can be interpreted as performed at a certain level.

The finding obtained that school principals fulfill their technological leadership competencies “to a large extent”, in the researches carried out by Seay (2004), T. Can (2008), Bostancı (2010), Banoğlu (2011), Görgülü (2013), “Substantially” is similar to the findings they obtained regarding their possession. In the study, the finding that school principals fulfilled their technology leadership competencies “most of the time” was the finding that Erden and Erden (2007) 's school principals showed low level of technological leadership skills and Persaud (2006)' s inability to use educational technologies of school principals differs with.

The finding that school principals fulfill technological leadership behaviors in the field of visionary leadership “most of the time” is similar to the research findings made by Can (2008), Şişman-Eren (2010) and Cantürk (2016). Nevertheless, Persaud's (2006) study differs from the finding that the researchers' attempts to determine the leadership roles in the integration of schools do not have clear visions about the roles of school principals.

It is seen that the average of the leadership behaviors shown by school principals in the field of systematic development has the lowest average compared to other sub-fields of technological leadership. This finding is similar to that in the study of Hacıfazlıoğlu and others (2010), educational administrators think that there are many financial, structural and cultural obstacles in the field of systematic development. Based on this, it can be interpreted that the obstacles faced by school principals negatively affect their perceptions about the field of systematic development.

The research also included teachers' opinions on technology leadership competencies of school principals. Teachers' opinions were evaluated within the scope of "visionary leadership, digital learning culture, excellence in professional development, systematic development and digital citizenship" based on NETS-A standards.

When the average of teachers' opinions about technological leadership competencies of school principals are analyzed within the scope of standard fields; the highest level of school citizenship in digital citizenship; In the "systematic development" field, it is seen that they have the lowest average. Çakır and Aktay (2018) found that school administrators were at the highest level in terms of digital citizenship in terms of their technological leadership, and that systematic development competencies of Sayracı and Gündüz (2018) are in a high level of technological leadership. When their competencies are examined in terms of sub-dimensions; On the other hand, reaching the findings that systematic development is the least adequate dimension is similar to the research result. In Gültekin's (2013) study, school administrators found that they considered themselves sufficient in the field of "systematic development", and this situation can be said to be similar to the result of the research.

When the data is evaluated, it can be interpreted that according to the teachers' opinions, school principals are at a medium level according to the general average of their technology leadership competencies. Sincar's (2009) “classroom and branch teachers think that primary school administrators“partially ”exhibit their technology leadership roles” and that Chang and others (2008) teachers' perceptions about school principals are high and Görgülü's (2013) technological leadership competencies. It differs in general and in dimensions by its finding that it often shows.

**Results and discussion according to the institution variable they work with**

According to the findings, the technology leadership competencies of school principals are on a total scale; the highest value of the principals working in secondary school; It can be said that the kindergarten principals have the lowest value. In the visionary leadership sub-dimension, which has a significant difference, it is seen that the secondary school principals are the highest value and the kindergarten principals are the lowest. In the digital age learning culture learning sub-dimension, it can be said that middle school principals have the highest value and kindergarten principals have the lowest value. It can be interpreted that the highest value secondary school principals in the sub-dimension of excellence in professional development are the kindergarten principals with the lowest value and the secondary school principals with the highest value in the digital citizenship sub-dimension are the kindergarten principals with the lowest value. In the systematic development sub-dimension, it was determined that there was no significant difference since school principals showed similar leadership competencies.

It is observed that the technology competence of Ergişi (2005) is higher than the administrators of the secondary education institutions, who make primary education institutions. Ulukaya (2015) aimed to analyze the relationship between the technology leadership self-efficacy and the level of realization of education and training affairs of managers. While vocational high schools are the school level where the self-efficacy perception is the highest in technology leadership, the finding that there is a significant difference between the school type and technology competence with the finding that the principals working in primary school have the lowest perception of perception, and the school principals' technology leadership and school type It can be said that it has a similarity with the result of the difference.

In Çakır and Aktay (2018) and Görgülü (2013) studies, the differences in the perceptions of the school administrators regarding their technology leadership competencies sub-dimensions were examined, and the fact that they found that there was no significant difference at the end of the study may be interpreted as differing with the findings of the research conducted.

The technology leadership competence of kindergarten principals have lower competence in visionary leadership, digital age learning culture, professional development excellence and digital citizenship sub-dimensions compared to school principals at other levels, as stated earlier in research, lower technology leadership of female principals as women. It can be said that they have a parallelism with the result of examining the competence of technology leadership according to gender variable. It can be argued that reaching the finding that directors at other levels have more technology leadership, accessing interactive materials within the scope of Fatih Project, more scientific activities in schools, more technological equipment in institutions and more frequent research and development studies.

**Results and discussion about the variable of the institution in which teachers work**

According to the teachers working in different institutions, it can be said that the school principals have similar opinions in the sub-dimensions according to their perceptions about technology leadership and there is no significant difference. According to the research, it can be said that the institutions where teachers work do not affect their perception of competence towards school principals.

Teachers' behaviors related to technology leadership competencies can be interpreted as showing middle level behaviors in the fields of "visionary leadership, digital age learning culture, professional development excellence, systematic development and digital citizenship".

As a result of examining whether Görgülü (2013) differentiates according to school type, professional seniority and gender status, secondary school teachers; concluding that their perceptions about visionary leadership, digital age learning perceptions, excellence in professional development, digital citizenship and systematic development are significantly higher than the perceptions of general high school teachers, and their perceptions about digital citizenship are significantly higher than the perceptions of primary and general high school teachers, Sincar and Aslan (2011) found that there was a significant difference between the opinions of class and branch teachers regarding technology leadership roles, according to the results of the research

**Comparison of school principals and teacher perceptions about technology leadership of school principals**

According to the research findings, the perceptions of the technology leadership adequacy scale "visionary leadership, digital age learning culture, professional development excellence, systematic development, digital citizenship" and total scale are significantly higher than the teachers' perceptions.

In Can's (2003) study, primary school administrators mostly fulfill their technological leadership duties in their schools; According to teachers 'perceptions, Technological leadership sees that school principals are higher than primary school principals' perceptions of teachers, with the aim of determining the technology leadership levels of primary school principals by Scale (2014). principals often show their technological leadership competencies in general and in sub-dimensions, and school administrators' self-perception of technological leadership competence is similar to the results of the research, according to teachers, the emergence of school administrators to be significantly higher than their perception of technological leadership competencies.

According to the opinions of the teachers, the technology leadership competencies of the school principals are lower, and the teachers' observation of the points that the school principals cannot detect by themselves in the technology leadership competencies sub-dimensions is better observed by the teachers. Education and training activities require teamwork with a total understanding of quality. School principals should pay attention to the opinions of institution stakeholders in the preparation of the school technology plan.

Cantürk (2016) between perceptions of manager and teacher; While there was a significant difference in the dimensions of visionary leadership, systematic improvement, professional development excellence, "digital citizenship and digital age learning culture", teachers' opinions were found to be less in all dimensions compared to their opinions, while administering opinions that administrators show high technological leadership behaviors, The opinions of teachers evaluating school administrators to appear at a low level can be evaluated as differing with the research.

The technology leadership competencies of school principals are generally at a good level when the research result and research in the field are examined in general. School principals consider themselves more adequate to have technology competencies than teachers' perceptions. In addition, the technology leadership competencies of school principals can be examined by carrying out studies on a larger scale in the future.

**Recommendations**

* In order to be successful in the age when digital developments are increasing rapidly and educational technologies are developing, awareness of the leadership characteristics of the school principal is very effective as well as the technology leadership qualification dimensions can be added in the selection of school principals.
* Bureaucratic obstacles should be reduced in accessing and supplying schools with technological equipment, and funds allocated to institutions should be increased.
* While planning the trainings for the professional development of teachers who are the implementers of educational activities, the dimensions related to the implementation of the concepts of leadership, management and technology in schools can also be made and plans can be made.
* The school principal should be included in a separate class, the job description forms of the school principals should be renewed, and for this purpose, necessary studies and researches can be carried out by universities and other MEB affiliated institutions for the development of school management.
* Technology leadership is associated with elements in other leadership typologies, especially transformational leadership elements, as a typology. In this context, this subject can be read comparatively with other leadership theories in order to better understand the technology leadership issue.
* Increasing the motivation of teachers and principals to access technology to their efforts to increase the level of behaviors exhibited by the school principals to the level of displaying them to the level of displaying them at all times can help to further develop the technological climate and culture of schools.
* It may be beneficial for school principals to follow the visual and audio broadcasts regarding the levels of achievement of technology leadership qualifications.

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