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High school administrators' perceptions of their technology leadership preparedness

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The interaction between schools and technology forges the school leaders to transform their practices to support 21st century paradigm skills. Schools have the complicated mission of incorporating technologies to enhance effective management practices in their schools. A project known as FATIH was launched to enhance the opportunities and to improve technology in schools in Turkey. This project aimed to establish interactive boards in classrooms to make the learning environment more effective in schools. In the first and expanded pilot phase, 49000 tablet PCs have been distributed to both students and teachers in 81 provinces in Turkey. The tablets and interactive boards have been delivered to 150 high schools of the total 1704 in Izmir Province. The school administrators and teachers who delivered the project have had a technological preparation course during the implementation of the pilot project. A quasi-experimental quantitative study was used as a research design to determine school administrators' views of technology leadership preparedness and to investigate the impact of this technological preparation course. The technological leadership survey developed by Hacıfazlıoğlu et al. (2011) from ISTE, 2009 *International Society for Technology in Education,* standards for administrator was used and 618 principals and vice principals were surveyed in İzmir during the second term of 2013/2014 educational year. Descriptive statistics and a one-way multivariate analysis of variance were applied to analyze the data. The findings revealed that the high school administrators' highest perceptions of technology leadership preparedness were in subscale of visionary leadership whereas the subscale digital citizenship had the lowest mean score. There was a statistically significant difference of technology leadership preparedness perceptions between the high school administrators who delivered the technology preparation course and non-course participants, where the course participants perceived higher levels of preparedness on all five subscales of visionary leadership, digital age learning culture, excellence in professional practice, systemic improvement and digital citizenship.

Key words: Technology leadership, visionary leadership, digital age learning culture, excellence in professional practice, systemic improvement and digital citizenship.

INTRODUCTION

Educational leadership in this era was faced with strategic decisions for dealing with the competition and recruiting students. In the final wave, which includes the present, the internet and affordable computing are

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creating a globalized environment in which educational leaders are faced not only with more competition, but with competition from outside of their own localities. In other words, schools have changed from relatively closed systems in which one leader was responsible and accountable for producing predetermined outcomes, to dynamic systems that must adopt and respond to rapid societal changes on a global level (Franciosi, 2012). This kind of technological leadership is a key element in management processes necessary for guiding today's teachers and students of the 21st century. Leadership, especially from the principal, is generally acknowledged as an important influence on a school's effectiveness, a belief that is supported by empirical evidence (Hallinger and Heck, 1996; Leithwood and Riehl, 2003). Studies of school improvement also point to the importance of principals' leadership in such efforts (Fullan, 2001; Fullan and Stiegelbauer, 1991; Louis, 1994).

Education reform is an important topic to review in relationship to educational technology as one will not really come full circle without the other and implementing them both will require strong leaders who can lead in a culture of change. New competencies that school-based administrators need to develop in order to be effective in their new roles as technology leaders are described in the context of a five-part model. An argument is made that technology leadership is much more than resource acquisition and management. Instead, we argue that technology leadership has multiple dimensions given the complexity of schools as learning organizations (Flanagan and Jacobsen, 2003). The traditional role of the school administrators have been managing and keeping the day to day events of the school running smoothly. The distinction of leader versus manager is of importance as it is the leader in an organization that creates a vision for change and the manager that can plan and implement the details of that change. There are a small number of administrators who consider themselves technology leaders. Few will admit that they know all there is to know about technology leadership. The quest for understanding technology leadership and technology integration appears to be a lifelong rather than a short journey. Slowly but surely, we are accumulating a critical mass of information which describes the roles and functions of the superintendent, principal, and technology coordinator when weaving technology into the fabric of schools (Bailey, 1996).

On the other hand, today's educational approach requires shaping school administrators to be not only educational leaders but also leaders of technology by the use of new information technologies and practices. Administrators need a host of skills. One of the most important involves understanding change and the change process. Technology integration at the district, building, and classroom level involves second order changes. One cannot bring about massive change if one does not understand the nature of change and the change process. Before introducing technology into the classroom, the technology leader must have a good grasp of the dynamics of change and how people react to change. Three essential aspects of the change process need to be understood: personal change, organizational change and cultural change. The goal of a technology leader is to motivate teachers to integrate technology into their curriculum and become proficient with technology. How a technology leader accomplishes this goal requires more than just expertise with technology. Technology leaders must be familiar with educational technology goals and standards. They must understand the benefits of how technology should be integrated into education and be able to develop staff development programs for teachers. A major component of technology leadership is how they will motivate teachers to learn, use and implement technology into their curriculum (Speed and Brown, 2014).

Standards for technology leadership

The National Educational Technology Standards for Administrators (International Society for Technology in Education, 2009) are the most recent set of suggestions in the literature about what school leaders, especially principals, should know and be able to do with educational technology. The International Society for Technology in Education (ISTE) (iste.org) has put together standards for educational technology leaders. These standards are revised on a regular basis, with the latest version having been updated in 2009 as of this writing. The purpose of the core standards, titled National Education Technology Standards for Administrators (NETS-A), is to provide guidance to the educational technology leader. The NETS-A includes transformational leadership themes such as communicating a vision and empowering subordinates to act on their own (Franciosi, 2012). The ISTE standards are grouped into five categories as follows (ISTE, 2009):

1. Visionary leadership: Educational Administrators inspire and lead development and implementation of a shared vision for comprehensive integration of technology to promote excellence and support transformation throughout the organization.

a. Inspire and facilitate among all stakeholders a shared vision of purposeful change that maximizes use of digital-age resources to meet and exceed learning goals, support effective instructional practice, and maximize performance of district and school leaders.

b. Engage in an ongoing process to develop, implement, and communicate technology-infused strategic plans aligned with a shared vision.

c. Advocate on local, state and national levels for policies, programs, and funding to support implementation of a technology-infused vision and strategic plan.

2. Digital age learning culture: Educational Administrators create, promote and sustain a dynamic, digital-

age learning culture that provides a rigorous, relevant, and engaging education for all students.
a. Ensure instructional innovation focused on continuous improvement of digital- age learning.
b. Model and promote the frequent and effective use of technology for learning.
c. Provide learner-centered environments equipped with technology and learning resources to meet the individual, diverse needs of all learners.
d. Ensure effective practice in the study of technology and its infusion across the curriculum.
e. Promote and participate in local, national, and global learning communities that stimulate innovation, creativity, and digital age collaboration.

3. Excellence in professional practice: Educational Administrators promote an environment of professional learning and innovation that empowers educators to enhance student learning through the infusion of contemporary technologies and digital resources.
a. Allocate time, resources, and access to ensure ongoing professional growth in technology fluency and integration.
b. Facilitate and participate in communities that stimulate, nurture and support administrators, faculty, and staff in the study and use of technology.
c. Promote and model effective communication and collaboration among stakeholders using digital age tools.
d. Stay abreast of educational research and emerging trends regarding effective use of technology and encourage evaluation of new technologies for their potential to improve student learning.

4. Systemic improvement: Educational Administrators provide digital age leadership and management to continuously improve the organization through the effective use of information and technology resources.
a. Lead purposeful change to maximize the achievement of learning goals through the appropriate use of technology and media-rich resources.
b. Collaborate to establish metrics, collect and analyze data, interpret results, and share findings to improve staff performance and student learning.
c. Recruit and retain highly competent personnel who use technology creatively and proficiently to advance academic and operational goals.
d. Establish and leverage strategic partnerships to support systemic improvement.
e. Establish and maintain a robust infrastructure for technology including integrated, interoperable technology systems to support management, operations, teaching and learning.

5. Digital citizenship: Educational Administrators model, facilitate understanding of social, ethical and legal issues and responsibilities related to an evolving digital culture.
a. Ensure equitable access to appropriate digital tools and resources to meet the needs of all learners.
b. Promote, model and establish policies for safe, legal, and ethical use of digital information and technology.
c. Promote and model responsible social interactions related to the use of technology and information.
d. Model and facilitate the development of a shared cultural understanding and involvement in global issues through the use of contemporary communication and collaboration tools (ISTE, 2009).

According to Bailey and Lumley (1997), technology leaders have to possess several skills. They include:

(1) Technology skills; leaders must be able to model the technology.
(2) People skills; leaders must be able to get along with other people as we learn to use the new technologies
(3) Curriculum skills; leaders must understand how to integrate the technology into all disciplines
(4) Staff development skills; leaders must understand the important of training to those people using the technology.
(5) Learning leadership; leaders must understand the "big picture" (systems thinking) as they work with others to use technology to transform teaching and learning. Changes in the educational system, leadership and pedagogy are all needed for education reform to come full circle and incorporate technology as a seamless tool for teaching and learning. The arrival of digital technologies in schools has impacted the roles and responsibilities of principals in significant ways. Information and communication technology (ICT) has triggered demands for systemic changes in public schools necessitated by the shift from the industrial age to the knowledge economy. Inevitably, teachers and principals feel the pressure to change, and must find ways of implementing and sustaining technological innovations in classrooms (Flanagan and Jacobsen, 2003). As a result, many of today's administrators are novice technology users and have very little experience necessary to be effective technology leaders (Redish and Chan, 2007; Riedl et al, 1998).

METHODOLOGY

Research design

This quasi-experimental study was guided by the main question: "What is the perceived technology leadership preparedness level of school administrators on the 2009 ISTE NETS-A standards?" and the following sub-question was "How do technology leadership preparedness perceptions differ between principals who attended the technology preparation course and those who did not". The themes of NETS-A 2009 were visionary leadership, digital age culture, excellence in professional practice, systemic improvement and digital citizenship. In other words, this quantitative research was designed to examine the perceptions of school administrators regarding their technology leadership preparedness and the impact of technology preparation course on those perceptions.

Participants

This study was conducted in 300 public high schools of Izmir City in

Table 1. Descriptive statistics for the school administrators.

Technology leadership subscales	N	Min	Max	Mean	Std. Dev.
Visionary leadership	618	2	5	4.30	.702
Digital age learning culture	618	1	5	4.01	.814
Excellence in professional practice	618	1	5	3.90	.834
Systemic improvement	618	1	5	4.20	.710
Digital citizenship	618	1	5	3.84	.874

Turkey. The technology leadership survey developed by Hacıfazlıoğlu et al. (2011) from ISTE, 2009 *International Society for Technology in Education,* standards for administrator was used and 640 principals and vice principals who attended the technology preparation course and non-course participants were surveyed in İzmir during the second term of 2013/2014 educational year. The 22 surveys with missing data were excluded in inferential analysis resulting in 618 surveys used for calculations.

Instrumentation

The technological leadership survey developed by Hacıfazlıoğlu et al. (2011) from ISTE (2009)*International Society for Technology in Education,* standards for administrator was used and the overall reliability of the instrument is high with a Chronbach's alpha (a)= .97. The survey intended to indicate the preparedness levels of principal and vice-principals on the subscales of visionary leadership, digital age culture, excellence in professional practice, systemic improvement and digital citizenship. An additional demographic question was included in the survey to support the research question based on participation in the technology preparation course. Both surveys used the same rating scale for participant responses. Principals were asked to indicate their perception of preparedness on technology leadership skills. Each question had a 5-point scale where 1 represented *not at all* prepared, 2 represented *minimally* prepared, 3 represented *somewhat* prepared, 4 represented *significantly* prepared, and 5 indicated *fully* prepared. Subscale ratios were calculated to account forvariances in the number of questions in each subscale.

Data analysis

The descriptive statistics including frequency, mean, range, and standard deviation level was applied using SPSS 19.0. Next, a multivariate analysis of variance (MANOVA) was applied to evaluate the effect of the independent variable across the five technology leadership subscales: visionary leadership, digital age culture, excellence in professional practice, systemic improvement and digital citizenship. The independent variable was participation in the technology preparation course and the dependent variables were the five technology leadership subscales. The results compared the perception of preparedness based on whether or not the principal participated in the preparation program. Further analysis using a one-way analysis of variance was performed to reveal any subscale statistical significance.

FINDINGS

The data was analyzed to search the perceived technology leadership preparedness level of school administrators. The mean range was from a low score of 3.84 on a scale of 5 to a high score of 4.30 on a scale of 5 (Table 1). Among technology leadership dimensions school administrators considered themselves the most efficient in visionary leadership and followed by systemic improvement, digital age learning culture, excellence in professional practice and the least one was digital citizenship (Table 1).

The next level of analysis used descriptive statistics for the five technology leadership subscales: visionary leader, digital age culture, excellence in professional practice, systemic improvement and digital citizenship (Table 2) related to technology course participation. The five subscales had unequal associated indicators which accounted for additional variation in mean scores. Therefore, subscale ratios were included for comparison. A multivariate analysis of variance (MANOVA) was used to search the differences between technology course participation and perceived technology leadership preparedness level across the five subscales (Table 3). For this analysis a Wilks' Lambda value of .81 was generated. A Wilks' Lambda value of 1 indicates no difference in the means; therefore, this analysis showed a difference in means. The F ratio calculated for this MANOVA was 3.24. This value indicated that the variability between groups is 3.24 times greater than the variability within the groups. The F ratio of 3.24 exceeded the statistical significance level with alpha level .05. Further analysis showed that the probability of the responses being attributed to chance is 1 in 100 (p=.01) or a 1% chance. Finally, the eta square value (n2 =.16) indicated that the effect size is large, which further indicated a difference between the course and non-course participants.

Analysis of the individual subscales was performed to determine which subscales differed with statistical significance. An analysis of variance (ANOVA) for each subscale was performed to provide this information (Table 4). A Bonferroni adjustment generated an alpha level of .01 (.05/5). This adjustment was made to reduce Type I errors that can be generated by repeated ANOVA tests. The subscale with the least variance between course and non-course participants was visionary leadership with an eta square of .00. An effect size of n2 =.05 was calculated for excellence in professional practice. Subscales, digital age culture and systemic improvement,

Table 2. Mean scores of perceived technology preparedness by technology course participation.

Dependent Variable	Course	Mean	Std. Dev.	N
Visionary leadership	Participate	20.1483	2.89043	306
	Non Participate	19.6538	2.35140	312
Digital age learning culture	Participate	18.7312	2.87622	306
	Non Participate	12.9872	2.76652	312
Excellence in professional practice	Participate	16.1132	2.13734	306
	Non Participate	12.3421	2.81891	312
Systemic improvement	Participate	20.2341	2.09872	306
	Non Participate	18.6322	3.98872	312
Digital citizenship	Participate	14.5438	2.09181	306
	Non Participate	11.8862	3.72625	312

Table 3. Multivariate Analysis of Variance

Effect	^	f	df1	df2	p	n2
Group	.81	3.24*	5	85	.01	.16

*p<.05

had a .06 effect size. The largest effect size of .12 was for digital citizenship. Additionally, large effect size for digital citizenship, the level of significance, p =.00 rounded from .002, was the only subscale to reach statistical significance of variance. This level indicated that there is no probable chance that the difference between groups is random. Approaching statistical significance was the subscale systemic improvement with a significance level of p =.05.

DISCUSSION AND CONCLUSION

In this study, among technology leadership dimensions school administrators considered themselves the most efficient in visionary leadership and followed by systemic improvement, digital age learning culture, excellence in professional practice and the least one was digital citizenship. High school administrators reported their highest level of technology leadership preparedness as visionary leadership. This subscale called for leaders to inspire and lead development and implementation of a shared vision for comprehensive integration of technology to promote excellence and support transformation throughout the organization. It guides leaders to inspire a shared vision with stakeholders to maximize positive instructional change. A visionary leader is expected to advocate technology efforts by committing time and resources to support change. This finding was particularly interesting in that one session specifically targeted technology leadership and vision.

Previous studies in Turkey and in other countries have also found that school administrators have positive attitudes towards technology (Cakir, 2012; Akbaba-Altun, 2008; Bailey, 1997; Dawson and Rakes, 2003; Flanagan and Jacobsen, 2003; Maxwell, 2001; Serhan, 2007). Conversely, principals reported their lowest level of technology leadership preparedness as digital citizenship. Digital citizenship expected leaders to promote, model, and establish policies that ensured safe, legal, and ethical use of technology. Responsible use of technology and social interactions in a digital environment were also expected. As this finding indicates, school administrators as technological leaders must develop their digital citizenship skills and encourage the technological development and training of teachers, provide sufficient technological infrastructure support, and develop an effective school-evaluation plan. This findings of this study also indicated school administrators technology leadership skills have to be improved. However, although school leaders may have formally mandated technology leadership responsibilities this can be problematic since they often do not have the training or background to feel confident in dealing with technology (Stuart et al., 2009).

Differences in technology leadership preparedness perceptions among school administrators who attended the technology course and those non-participants were also examined. There was a statistically significant difference between technology leadership preparedness perceptions of participants and non-participants. These findings show that this kind of technology courses are effective for their management practices cause leaders who participated in the course perceived that they were better prepared to lead technologically to their schools than that those who had not participated. Technological leadership is emerging within the increasingly diversified educational leadership world. Schools striving to excel in the information age need leaders that are well versed in

Table 4. Analysis of variance.

Effect	Digital citizenship	*F*	*df1*	*df2*	*p*	*n2*
Visionary leadership	.00	.00	1	89	.99	.00
Digital age learning culture	36.24	3.36	1	89	.06	.06
Excellence in professional practice	11.28	2.28	1	89	.13	.05
Systemic improvement	38.32	3.54	1	89	.05	.06
Digital citizenship	72.16	9.82*	1	89	.00	.12

the potential and in the pitfalls of information and communication technology (Chang, 2012). Rapid technical change and highly uneven distribution of expertise make technological leadership particularly challenging. Such work should incorporate leaders' ability to cope with complex change (Fullan and Stiegelbauer, 1991). However, administrators and other practitioners should understand that while technology infrastructure is important, for educational technology to become an integral part of a school, technology leadership is even more necessary. Such educational leaders not only make teachers more effective but also directly affect students' academic achievement.

Conflict of Interests

The author has not declared any conflict of interest.

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