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The Development of the Self-Efficacy Form for School Administrators' Use of Information and Communication Technologies in Education

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Abstract

The purpose of this study was to develop an up-to-date, valid and reliable instrument to measure school administrators' self-efficacy for the use of information and communication technologies in education. To achieve this, we formed a pool of items based on the technology standards for education leaders issued by ISTE in 2018. The items in the pool were examined by field experts and then some items were revised. Further, we have added some new items. We recruited a total of 162 school administrators for exploratory factor analysis, whereas a total of 167 participants took part in the confirmatory factor analysis. Based on the exploratory and confirmatory factor analyses, we have developed the Self-Efficacy for Use of Information and Communication Technologies in Education - School Administrator Form, which includes such scales as "Equity and Citizenship Advocate (7 items", "Visionary Planner (4 items)", "Empowering Leader (5 items)", "Systems Designer (5 items)" and "Connected Learner (8 items)". We performed the Cronbach's Alpha internal consistency coefficients, item discrimination indexes in the lower and upper groups and the item total correlations to reliability levels of the scales. We have concluded that the instruments are valid and reliable data collections tools.

Keywords: Information and communication technologies, self-efficacy, technology standards in education, school administrators.

Okul Yöneticilerinin Eğitimde Bilgi ve İletişim Teknolojileri Kullanımına Yönelik Öz-Yeterlik Formunun Geliştirilmesi

Öz

Bu araştırmanın amacı okul yöneticilerinin eğitimde bilgi ve iletişim teknolojileri öz yeterliklerini belirlemeye yönelik güncel, geçerli ve güvenilir bir ölçme aracı geliştirmektir. Öncelikle, ISTE'nin 2018 yılında eğitim liderleri için belirlemiş olduğu standartlarda yer alan başlıklar baz alınarak madde havuzu oluşturulmuştur. Maddeler alan uzmanlarının görüşlerine sunulmuş ve uzmanların dönütleri doğrultusunda bazı maddeler revize edilmiş ve madde havuzuna yeni maddeler eklenmiştir. Açımlayıcı Faktör Analizi için 162 , Doğrulayıcı Faktör Analizi ve güvenilirlik analizleri için 167 okul yöneticisinden veri toplanmıştır. Açımlayıcı ve Doğrulayıcı Faktör Analizleri sonunda "Eşitliği ve Vatandaşlığı Koruma (7 madde)", "Vizyoner Planlayıcı (4 madde) ", "Güçlendirici Lider (5 madde)", "Sistem Tasarımcısı (5 madde)" ve "Bağlantılı Öğrenen (8 madde)" ölçeklerinden Eğitimde Bilgi ve İletişim Teknolojileri Kullanımı Öz Yeterlikleri - Okul Yöneticisi Formu'nun son haline ulaşıldı. Formda yer alan ölçeklerin güvenilirlik düzeylerini belirlemek amacıyla Cronbach's Alpha iç tutarlılık katsayısı, alt ve üst gruplardaki madde ayırt edicilik indeksleri ve madde toplam korelasyonu analizleri gerçekleştirildi. Analizlerden elde edilen bulgular formda yer alan ölçeklerin geçerli ve güvenilir olduklarını gösterdi.

Anahtar kelimeler: Bilgi ve iletişim teknolojileri, öz yeterlik, eğitimde teknoloji standartları, okul yöneticileri .

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1 | Introduction

Technological developments have led to considerable changes and transformations in almost every sphere of the society. Technology first affects individuals and then transforms virtually all fields in which people are central. Today's young individuals, considered as digital natives by Prensky (2001), have different learning and thinking styles when compared with those older ones (Bilgiç, Duman, & Seferoğlu, 2011; Lei, 2009; Prensky, 2004). Digital natives are comfortable with high level of technology use, are able to adapt themselves when encountering a new technology, spend much time using technological devices, can use multiple devices at once, have frequent interactions in the digital world, and do detailed searches for topics in which they are interested (Günther, 2007; Helsper & Eynon, 2010; Muchsini & Siswandari, 2018; Prensky, 2001). Developments in technology and transformations in learning styles have led to changes in instructional methods and techniques and curriculums. For the effectiveness of technology use to boost learning quality, such stakeholders as students, teachers, and school administrators must have the necessary skills for technology use in education.

One of the most important tasks of a school principal is to guide the future vision of the school organization and to manage human resources as well as other resources to achieve it (Çelik, 2000; Turan, 2002). The changes and transformations in education are achieved based on the visions and abilities of school administrators. Technology use has deeply penetrate into in almost every sphere of education. Accordingly, school administrators are expected to lead the use of technology in managerial and instructional processes (Afshari, Bakar, Luan, Samah, & Fooi, 2009). One of the roles of school administrators who are the pioneers of innovations and transformation is the role of technology leadership (Anderson & Dexter, 2005). The deficiencies in technological leadership skills of school administrators decelerate technology integration in schools, whereas those with higher levels of technological leadership skills accelerate the use of technology in education (Flanagan & Jacobsen, 2003; Hacıfazlıoğlu, Karadeniz, & Dalgıç, 2011)

The role of technology leadership is a school administrator role that encompasses planning and implementing the activities related to technology use (Hamzah, Juraime, & Mansor, 2016). Technology leadership roles of school administrators are of utmost importance for teachers and students to keep up with the latest developments in teaching and learning. In the absence of technology leadership in schools, all types of teaching and learning activities may be in jeopardy (Anderson & Dexter, 2005).

Past studies revealing the positive effect of technology use in education have highlighted the necessity of determining the standards of technology use in education and defining the competencies in technology-related skills by stakeholders in education. For this purpose, researchers in educational sciences (Anderson & Dexter, 2005; Kearsley, 1994) and international organizations (ISTE, 2002, 2009, 2018) have carried out studies on the standards and the competencies for teachers and school administrators to teach and to lead in the digital age.

International Society for Technology in Education (ISTE) is a nonprofit organization that serves educators and school administrators in the use of information and computer technologies (ICT) in education. ISTE has been established to promote innovations in learning processes in the United States of America and to encourage the use of technology for the problems arising in education. Not only does ISTE determine technology standards for school administrators and teacher, but it also has technology standards for students, coaches, and computer science educators. This is important for a comprehensive technology integration (Şişman Eren & Kurt, 2011).

The first focus of ISTE on the educational technology standards for administrators dates back to 2002. The International Society for Technology in Education adopted standards for school administrators in six dimensions with a total of thirty-one performance indicators such as "Leadership and Vision", "Learning and Teaching", "Productivity and Professional Practice", "Support, Management, and Operations", "Assessment and Evaluation", and "Social, Legal, and Ethical Issues" (ISTE, 2002). ISTE set the standards for school administrators' technology competence, entitled "National Educational Technology Standards (NETS•A) and

Performance Indicators for Administrators" in 2009 and determined the subdimensions as "Visionary Leadership", "Digital-Age Learning Culture", "Excellence in Professional Practice", "Systematic Improvement" and "Digital Citizenship" (ISTE, 2009). ISTE, on the other hand, updated the technology standards for school administrators in 2018. The updated version of the technology standards, entitled "ISTE Standards for Education Leaders", has five subdimensions such as "Equity and Citizenship Advocate", "Visionary Planner", "Empowering Leader", "Systems Designer" and "Connected Learner" (ISTE, 2018). It is seen that several performance indicators such as enabling students to have equal technological opportunities, collaborating with stakeholders to develop a strategy for technology integration and using technology for professional development have been added to the standards issued in 2018.

Previous literature has revealed that there have been several attempts to develop scales for school administrators' technology competences (Banoğlu, 2012; Cantürk, 2016; Hacıfazlıoğlu et al., 2011) and all of them were based on the ISTE Standards issued in 2002 and 2009. Further, the scales developed by Banoğlu (2012), Cantürk (2016) and Hacıfazlıoğlu et al., (2011) were employed in the studies on focusing on school administrators' technology competences (Akın-Mart & Tulunay-Ateş, 2021; Beytekin, 2014; Bülbül & Çuhadar, 2012; Çalık, Çoban, & Özdemir, 2019; Doğan, 2018; Görgülü, Küçükali, & Şükrü, 2013; Kör, Erbay, & Engin, 2016; Sisman Eren & Kurt, 2011; Ünal, Uzun, & Karataş, 2015; Yahşi, 2020; Yıldız, Tüysüz & Öztürk, 2021; Yorulmaz & Can, 2016). Considering the fact that technological developments have been accelerating at an unprecedented pace and new ones have been continuously taking place in the world, it can be noted that there needs an up-to-date scale for technology standards for school administrators. This present study is expected to fill this void by developing information and technology self-efficacy form for school administrators which draws on the ISTE Standards issued in 2018.

2 | METHOD

STUDY GROUP

We recruited two different study groups to carry out exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) for the developed instruments. We recruited school administrators working in public schools affiliated to the Ministry of National Education and located in the province of Amasya. We collected the data during the 2020-2021 academic year. We used Google Forms to obtain data as schools were closed due to the COVID-19 pandemic. A total of 162 school administrators responded in the first group in which EFA was performed, while there were 167 participants in the second group in which CFA was performed. Table 1 presents the information on demographic variables.

Table 1. Information on Demographic Variables of Participants

		First Study Group (EFA)		Second Study Group (CFA)	
		N	%	N	%
Gender	Female	18	11,1	17	10,2
	Male	144	88,9	150	89,8
	Total	162	100	167	100
Professional Experience	0-5 years	4	2,5	4	2,4
	6-10 years	7	4,3	16	9,6
	11-15 years	27	16,7	25	15,0
	16 years or more	124	76,5	122	73,1
	Total	162	100	4	2,4
Educational Level	Bachelor	114	70,4	139	83,2
	Postgraduate	47	29,0	27	16,2

	Doctorate	1	0,6	1	0,6
	Total	162	100	167	100
School Type	Nursery School	3	1,9	9	5,4
	Primary School	47	29,0	55	32,9
	Secondary School	50	30,9	49	29,3
	Vocational High School	47	29,0	40	24,0
	General High School	15	9,3	14	8,4
	Total	162	100	167	100

When the demographic characteristics of the participants in the first study group (EFA) are examined, it is seen that the majority of them are male (88,9%), those with 16 years or more of experience (76,5%) and those with undergraduate education (70,4%). 30,9% of them work in secondary school.

As shown in Table 1, 89,8% of second study group (CFA) are male. 73.1% of them have 16 years or more experience. In addition, 83.2% of the participants in the second study group received undergraduate education and 32,9% of them work in primary school.

Data Collection Instruments

In the standards published for educational leaders in 2018, ISTE has classified the competencies that education leaders should have under five main headings. In the current study, five scales were separately developed for these five main topics in order to determine the information and communication technologies self-efficacy of school administrators in education. Validity and reliability studies were separately carried out for each scale. The Self-Efficacy for the Use of Information and Communication Technologies in Education - School Administrator Form consists of these five scales.

The Self-Efficacy for the Use of Information and Communication Technologies in Education - School Administrator Form

This form consists of separate scales including “Equity and Citizenship Advocate”, “Visionary Planner”, “Empowering Leader”, “Systems Designer” and “Connected Learner”, which are the subdimensions of the ISTE Standards for Education Leaders issued in 2018. For each scale, we followed the scale development steps by DeVellis (2016). First, we identified the competencies we intended to measure and generated an item pool based on the related literature and the standards issued by ISTE (2018). There was an item pool including a total of thirty-three items (11 items in the Equity and Citizenship Advocate Scale, 4 items the Visionary Planner Scale, 5 items in the Empowering Leader Scale, 5 items in the Systems Designer Scale and 8 items in the Connected Learner Scale). Scales are structured as a 5-point Likert type scale.

The items were examined by six field experts. Based on the comments of the field experts, some items were revised. Further, we have added two items to the Equity and Citizenship Advocate Scale and one item to the Connected Learner scale. In the end, the Self-Efficacy for the Use of Information and Communication Technologies in Education - School Administrator Form had 36 items. Three school administrators were asked to examine the scale and the concepts which were difficult to understand were revised. Further, some explanations were added to the expressions considered to be difficult to understand for administrators.

In order to carry out validity and reliability studies, data were collected from 162 school administrators at the EFA stage and 167 at the CFA stage. Finally, the results of the analyzes performed for validity and reliability are reported.

Data Analysis

Before the analysis, the collected data were examined in terms of identifying and removing responses from participants who did not answer thoughtfully or who are straight liners. Accordingly, we removed 11 cases out of 173 while conducting the EFA, and 15 cases out of 182 during the CFA. To test whether the data were suitable for factor analysis, we conducted the Kaiser-Meyer-Olkin (KMO) test and Bartlett’s test of

sphericity (Bryman & Cramer, 1999). To investigate the factorial structure of the Self-Efficacy for the Use of ICT in Education - School Administrator Form, we conducted exploratory factor analysis (Büyüköztürk, 2018). Further, we considered the item factor loads and item-total correlations during the validity studies.

In terms of validity, we examined the standardized item factor loads and found that item factor loads were above 0.70. Following this, we carried out confirmatory factor analysis and examined the Chi- Square Goodness (X2/df), the Root Mean Square Error of Approximation (RMSEA), the Goodness of Fit Index (GFI), the Comparative Fit Index (CFI) and the Non-normed Fit Index (NNFI) (a.k.a. Tucker–Lewis index, TLI). When the values are not acceptable ranges, we examined the Standardized Residual Covariances (SRC) values as well as Modification Indices (MI) values. We removed the items whose SRC values are above 2,58. The fit indexes were reexamined. Table 2 presents the information on goodness of fit indexes (Hu & Bentler, 1999; Kline, 2011; McDonald & Marsh, 1990).

Table 2. Goodness of Fit Indexes

Goodness of fit measures	Good fit	Acceptable fit
X2/df	$0 \leq \chi 2 / df \leq 3$	$3< \chi 2 / df \leq 5$
RMSEA	$0 \leq RMSEA \leq .05$	$.05 < RMSEA \leq .08$
GFI	$0,95 \leq GFI \leq 1$	$0,90 \leq GFI \leq 0,95$
CFI	$0,95 \leq CFI \leq 1$	$0,90 \leq CFI \leq 0,95$
TLI	$0,95 \leq TLI \leq 1$	$0,90 \leq TLI \leq 0,95$

3 | Findings

Analysis of Validity Studies

Validity refers to the extent to which the scores from a measure represent the variable they are meant (Büyüköztürk, 2005; Karasar, 2016). The scales in this present study were examined by four field experts in the instructional technology department, one language expert and one expert from the educational measurement and evaluation department in terms of content validity and comprehensibility of items. Based on the comments of the experts, some items were splitted, some of them were removed, and some of them were revised. Three school administrators were asked to examine the scale and the concepts which were difficult to understand were revised. Further, some explanations were added to the expressions considered to be difficult to understand for administrators.

Equity and Citizenship Advocate Scale

To test whether the data collected via the Equity and Citizenship Advocate Scale were suitable for factor analysis, we conducted the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity. The KMO value of the study group was found to be 0.893. The Bartlett's test of sphericity result was $p<0,001$. That the Kaiser-Meyer-Olkin was valued at higher than 0,6 and that the Bartlett's test of sphericity result was statistically significant at the 0.001% level indicate the sampling is adequate and the data were suitable for factor analysis (Field, 2013; Kalaycı, 2010). The items 7, 6 and 5 in the Equity and Citizenship Advocate Scale were removed since they were distributed across over more than one factors. Following the last exploratory factor analysis, the scale items were distributed across three factors, but we repeated exploratory factor analysis by forcing the one-factor structure because of the fact that a one-factor structure seemed to fit the data (above 50%) and the fact that the other factors explained the variance at less than 50%. Table 3 presents the results of EFA.

Table 3. Exploratory Factor Analysis for Equity and Citizenship Advocate Scale

Scale	N of Item	Item Factor Load	Item-Total Correlation
Equity and Citizenship Advocate Scale	8	,776	,730
	1	,769	,719
	10	,766	,725
	3	,763	,709
	13	,757	,712
	9	,743	,701
	2	,734	,676
	12	,708	,656
	11	,670	,606
	4	,651	,580
	% of Variance: 53,74		

As shown in Table 3, the loads of the items included in the scale ranged between ,651 and ,776. According to Büyüköztürk (2018), the factor loadings between 0,30 and 0,59 are at moderate level and those higher than 0,60 are at high level. In this sense, the results showed that all scale items measure the same construct and load onto the same factor.

The item total correlation ranged between ,580 and ,730. Based on the fact that the item total correlation values were higher than 0,30, it can be noted that all items in the scale are suitable for measuring the same construct (Büyüköztürk, 2018; Tavşancıl, 2002).

According to the exploratory factor analysis, the Equity and Citizenship Advocate Scale consisted of 8 items, and the total variance explained was % 53,74. There is evidence that if the total variance is above 30%, then it is acceptable (Büyüköztürk, 2018). In this sense, it can be noted that a one-factor structure seemed to fit the data.

Based on the confirmatory factor analysis for the Equity and Citizenship Advocate Scale, it was revealed that all items' factor loadings were higher than 0,70. However, some values of goodness-of-fit indexes were not satisfactory. First, we examined SRC (Standardized Residual Covariances) values and removed "the item 12" and "the item 13" whose values were higher than 2,58. We repeated CFA and found that the SRC value of the item 8 were above 2,58. We removed the item 8 and repeated CFA. We examined the modification indices values to get the satisfactory goodness-of-fit indexes and combined the coefficient errors between the items 4 and 11 as well as the items 9 and 10. Following this, we re-examined the goodness-of-fit indexes of the rest 7 items. The results show that the Equity and Citizenship Advocate Scale's overall fitting results were acceptable values (X2/df = 4,320; RMSEA = 4,320) and were satisfactory values (GFI=,978), (CFI = ,990) ve (TLI =,980) (Hu & Bentler, 1999; Kline, 2011; McDonald & Marsh, 1990).

Visionary Planner Scale

To test whether the data collected via the Visionary Planner Scale were suitable for factor analysis, we conducted the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity. The KMO value of the study group was found to be 0.847. The Bartlett's test of sphericity result was p<0,001. That the Kaiser-Meyer-Olkin was valued at higher than 0,6 and that the Bartlett's test of sphericity result was statistically significant at the 0.001% level indicate the sampling is adequate and the data were suitable for factor analysis (Field, 2013; Kalaycı, 2010). According to the EFA results of the Visionary Planner Scale, the one-factor structure seemed to fit the data. Table 4 presents the results of EFA.

Table 4. Exploratory Factor Analysis for Visionary Planner Scale

Scale	N of Item	Item Factor Load	Item-Total Correlation
Visionary Planner Scale	1	,906	,821
	3	,902	,816
	2	,897	,807
	4	,838	,724
	% of Variance: 78,55		

As shown in Table 4, the loads of the items included in the scale ranged between ,838 and ,906. According to Büyüköztürk (2018), the factor loadings between 0,30 and 0,59 are at moderate level and those higher than 0,60 are at high level. In this sense, the results showed that all scale items measure the same construct and load onto the same factor.

The item total correlation ranged between ,724 and ,821. Based on the fact that the item total correlation values were higher than 0,30, it can be noted that all items in the scale are suitable for measuring the same construct (Büyüköztürk, 2018; Tavşancıl, 2002).

According to the exploratory factor analysis, the Visionary Planner Scale consisted of 4 items, and the total variance explained was % 78,55. There is evidence that if the total variance is above 30%, then it is acceptable (Büyüköztürk, 2018). In this sense, it can be noted that a one-factor structure seemed to fit the data.

Based on the confirmatory factor analysis for the Visionary Planner Scale, it was revealed that all items' factor loadings were higher than 0,70. There were no items with Standardized Residual Covariances values were higher than 2,58. The results show that the Visionary Planner Scale's overall fitting results were satisfactory values (X2/df = ,944), (RMSEA = ,000), (GFI= ,997), (CFI = 1,000) and (TLI=1,000) (Hu & Bentler, 1999; Kline, 2011; McDonald & Marsh, 1990).

Empowering Leader Scale

To test whether the data collected via the Empowering Leader Scale were suitable for factor analysis, we conducted the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity. The KMO value of the study group was found to be 0.845. The Bartlett's test of sphericity result was p<0,001. That the Kaiser-Meyer-Olkin was valued at higher than 0,6 and that the Bartlett's test of sphericity result was statistically significant at the 0.001% level indicate the sampling is adequate and the data were suitable for factor analysis (Field, 2013; Kalaycı, 2010). According to the EFA results of the Empowering Leader Scale, the one-factor structure seemed to fit the data. Table 5 presents the results of EFA.

Table 5. Exploratory Factor Analysis for Empowering Leader Scale

Scale	N of Item	Item Factor Load	Item-Total Correlation
Empowering Leader Scale	1	,903	,844
	2	,894	,828
	3	,884	,815
	4	,875	,804
	5	,871	,797
	% of Variance: 78,41		

As shown in Table 5, the loads of the items included in the scale ranged between ,871 and ,903. According to Büyüköztürk (2018), the factor loadings between 0,30 and 0,59 are at moderate level and those higher than 0,60 are at high level. In this sense, the results showed that all scale items measure the same construct and load onto the same factor.

The item total correlation ranged between ,797 and ,844. Based on the fact that the item total correlation values were higher than 0,30, it can be noted that all items in the scale are suitable for measuring the same construct (Büyüköztürk, 2018; Tavşancıl, 2002).

According to the exploratory factor analysis, the Empowering Leader Scale consisted of 5 items, and the total variance explained was % 78,41. There is evidence that if the total variance is above 30%, then it is acceptable (Büyüköztürk, 2018). In this sense, it can be noted that a one-factor structure seemed to fit the data.

Based on the confirmatory factor analysis for the Empowering Leader Scale, it was revealed that all items' factor loadings were higher than 0,70.

However, some values of goodness-of-fit indexes were not satisfactory. First, we examined SRC (Standardized Residual Covariances) values and found that the SRC value of the items were not above 2,58. We examined the modification indices values to get the satisfactory goodness-of-fit indexes and combined the coefficient errors between the items 4 and 5. The results show that the Empowering Leader Scale's overall fitting results were acceptable values (X2/df = 3,442; RMSEA = ,078) and were satisfactyory values (GFI = ,981; CFI = ,993; TLI =,980) (Hu & Bentler, 1999; Kline, 2011; McDonald & Marsh, 1990).

Systems Designer Scale

To test whether the data collected via the Systems Designer Scale were suitable for factor analysis, we conducted the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity. The KMO value of the study group was found to be 0.837. The Bartlett's test of sphericity result was p<0,001. That the Kaiser-Meyer-Olkin was valued at higher than 0,6 and that the Bartlett's test of sphericity result was statistically significant at the 0.001% level indicate the sampling is adequate and the data were suitable for factor analysis (Field, 2013; Kalaycı, 2010). According to the EFA results of the Systems Designer Scale, the one-factor structure seemed to fit the data. Table 6 presents the results of EFA.

Table 6. Exploratory Factor Analysis for Systems Designer Scale

Scale	N of Item	Item Factor Load	Item-Total Correlation
Systems Designer Scale	2	,892	,813
	5	,871	,772
	3	,864	,759
	4	,808	,685
	1	,704	,577
	% of Variance: 68,95		

As shown in Table 6, the loads of the items included in the scale ranged between ,704 and ,892. According to Büyüköztürk (2018), the factor loadings between 0,30 and 0,59 are at moderate level and those higher than 0,60 are at high level. In this sense, the results showed that all scale items measure the same construct and load onto the same factor.

The item total correlation ranged between ,577 and ,813. Based on the fact that the item total correlation values were higher than 0,30, it can be noted that all items in the scale are suitable for measuring the same construct (Büyüköztürk, 2018; Tavşancıl, 2002).

According to the exploratory factor analysis, the Systems Designer Scale consisted of 5 items, and the total variance explained was % 68,95. There is evidence that if the total variance is above 30%, then it is acceptable (Büyüköztürk, 2018). In this sense, it can be noted that a one-factor structure seemed to fit the data.

Based on the confirmatory factor analysis for the Systems Designer Scale, it was revealed that all items' factor loadings were higher than 0,70. However, some values of goodness-of-fit indexes were not

satisfactory. First, we examined SRC (Standardized Residual Covariances) values and found that the SRC value of the items were not above 2,58. We examined the modification indices values to get the satisfactory goodness-of-fit indexes and combined the coefficient errors between the items 1 and 3 as well as the items 4 and 5. The results show that the Systems Designer Scale's overall fitting results were acceptable values (RMSEA = ,079) and were satisfactory values (X2/df = 2,945; GFI = ,988; CFI = ,994; TLI =,989) (Hu & Bentler, 1999; Kline, 2011; McDonald & Marsh, 1990).

Connected Learner Scale

To test whether the data collected via the Connected Learner Scale were suitable for factor analysis, we conducted the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity. The KMO value of the study group was found to be 0.942. The Bartlett's test of sphericity result was p<0,001. That the Kaiser-Meyer-Olkin was valued at higher than 0,6 and that the Bartlett's test of sphericity result was statistically significant at the 0.001% level indicate the sampling is adequate and the data were suitable for factor analysis (Field, 2013; Kalaycı, 2010). According to the EFA results of the Connected Learner Scale, the one-factor structure seemed to fit the data. Table 7 presents the results of EFA.

Table 7. Exploratory Factor Analysis for Connected Learner Scale

Scale	N of Item	Item Factor Load	Item-Total Correlation
Connected Learner Scale	3	,893	,861
	8	,880	,844
	2	,875	,836
	4	,874	,837
	6	,866	,828
	1	,854	,813
	5	,849	,806
	9	,848	,805
	7	,783	,728
	% of Variance: 73,72		

As shown in Table 7, the loads of the items included in the scale ranged between ,783 and ,893. According to Büyüköztürk (2018), the factor loadings between 0,30 and 0,59 are at moderate level and those higher than 0,60 are at high level. In this sense, the results showed that all scale items measure the same construct and load onto the same factor.

The item total correlation ranged between ,728 and ,861. Based on the fact that the item total correlation values were higher than 0,30, it can be noted that all items in the scale are suitable for measuring the same construct (Büyüköztürk, 2018; Tavşancıl, 2002).

According to the exploratory factor analysis, the Connected Learner Scale consisted of 9 items, and The total variance explained was % 73,72. There is evidence that if the total variance is above 30%, then it is acceptable (Büyüköztürk, 2018). In this sense, it can be noted that a one-factor structure seemed to fit the data.

Based on the confirmatory factor analysis for the Connected Learner Scale, it was revealed that all items' factor loadings were higher than 0,70. However, some values of goodness-of-fit indexes were not satisfactory. First, we examined SRC (Standardized Residual Covariances) values found that the SRC value of the items were not above 2,58. We examined the modification indices values to get the satisfactory goodness-of-fit indexes and found that the corrected item-total correlation of the item 8 were at higher level. Therefore, the item 8 was removed to the satisfactory goodness-of-fit indexes. We combined the coefficient errors between the items 2 and 5 as well as the items 7 and 9. The results show that the Connected Learner

Scale's overall fitting results were acceptable values (RMSEA = ,060) and were satisfactory values (X2/df = 2,078; GFI = ,971; CFI = ,992; TLI =,990) (Hu & Bentler, 1999; Kline, 2011; McDonald & Marsh, 1990).

Analysis of Reliability Studies

Reliability of a scale refers to how consistently the scale measures something in different times (Balcı, 2001). In this sense, to test the reliabilities of the scales, we calculated the Cronbach's Alpha internal consistency coefficients, item distinctiveness in the lower and upper groups and the item total correlations. Table 8 presents the results of the reliability analyses.

Table 8. Cronbach's Alpha and Item Analyses

Scale	Cronbach's Alpha	N of Item	Item-Total Correlation	Item Distinctiveness %27 Lower and Upper Group	
				t	p
Equity and Citizenship Advocate	,927	1	,719	17.698	.000
		2	,676	16.994	.000
		3	,709	14.512	.000
		4	,580	13.915	.000
		5	,701	16.711	.000
		6	,725	18.787	.000
		7	,606	12.979	.000
Visionary Planner	,906	1	,821	10.208	.000
		2	,807	10.982	.000
		3	,816	11.475	.000
		4	,724	9.114	.000
Empowering Leader	,931	1	,844	10.208	.000
		2	,828	9.292	.000
		3	,815	10.229	.000
		4	,804	11.320	.000
		5	,797	11.475	.000
Systems Designer	,879	1	,577	8.681	.000
		2	,813	13.475	.000
		3	,759	9.125	.000
		4	,685	10.328	.000
		5	,772	11.191	.000
Connected Learner	,955	1	,813	14.052	.000
		2	,836	12.765	.000
		3	,861	18.932	.000
		4	,837	20.916	.000
		5	,806	20.258	.000
		6	,828	19.497	.000
		7	,728	15.066	.000
		8	,805	10.308	.000

As shown in Table 8, the Cronbach's Alpha internal consistency coefficients of the scales were as follows: the Equity and Citizenship Advocate Scale (.927), the Visionary Planner Scale (.906), the Empowering Leader Scale (.931), the Systems Designer Scale (.879) and the Connected Learner Scale (.955). There is evidence that if the Cronbach's Alpha internal consistency coefficient is higher than .70, a scale is accepted as reliable data collection instrument (Büyüköztürk, 2018). Further, all items' total correlations were found as higher than .30 and the mean scores of the lower and upper groups differed significantly.

4 | Discussion & Conclusion

The widespread use of technology in education has brought new duties and responsibilities on school administrators. The effective management of the technology integration process in schools is directly related to the information and communication technology competencies of school administrators. Determining the information and communication technology competencies of school administrators and organizing educational studies to develop these competencies are of great importance for an effective technology integration. In this study, we developed a measurement tool including current skills to determine the information and communication technology competencies of school administrators in education.

We have sought to develop the Self-Efficacy Scale for the Use of Information and Communication Technologies in Education: School Administrator Form in this present study. The School Administrator Form consists of the scales based on the ISTE Standards for Education Leaders such as "Equity and Citizenship Advocate", "Visionary Planner", "Empowering Leader", "Systems Designer" and "Connected Learner". Before conducting EFA and CFA, we tested test whether the data were suitable for factor analysis through the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity. The EFA results for each scale were as follows: the Equity and Citizenship Advocate Scale 53,74%, the Visionary Planner Scale 78,55%, the Empowering Leader Scale 78,41%, the Systems Designer Scale and 68,95% and the Connected Learner Scale 73,72%. While conducting DFA, three items from the Equity and Citizenship Advocate Scale and one item from the Connected Learner Scale were removed since their Standardized Residual Covariances' values were higher than 2.58. According to DFA, the overall fitting results were acceptable values and were satisfactory values (X2/df, RMSEA, GFI, CFI and TLI).

There is evidence that if the Cronbach's Alpha internal consistency coefficient is higher than .70, a scale is accepted as reliable data collection instrument (Büyüköztürk, 2018). Based on this, the scales developed in this present study can be accepted as reliable instruments. Further, we concluded that all items' total correlations were found as higher than .30 and the mean scores of the lower and upper groups differed significantly.

According to the findings of this present study, we conclude that we have developed an up-to-date, valid and reliable scale for measuring the administrators' self-efficacy for the use of ICT in education. This instrument can be used by researchers to measure and develop ICT competences of school administrators.

This present study was subjected to several limitations, as well. Due to the COVID-19 pandemic, there were some restrictions in terms of data collection to reach larger participants. We were able to recruit a total 329 school administrators for the validation and reliability analyses. Future research could be conducted on larger populations and the validity and the reliability of the scale could be tested again.

Considering the fact that previous scales for measuring the ICT competences of school administrators were also based on the ISTE standards issued in 2002 and 2009 (e.g. (Banoğlu, 2012; Cantürk, 2016; Hacıfazlıoğlu et al., 2011), there should be new inquiries in time to delve into current competences needed. Thanks to this, comparisons could be made between this present study and future studies.

Statements of publication ethics

Conflict of interest

The authors declare that there is no conflict of interest.

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Eğitimde Bilgi ve İletişim Teknolojileri Kullanımı Öz Yeterlikleri - Okul Yöneticisi Formu

Aşağıda Eğitim sürecine liderlik ederken bilgi ve iletişim teknolojilerini kullanımınıza yönelik 30 madde yer almaktadır. Aşağıdaki ifadelerle ilgili yeterliklerinizi 1 ve 5 rakamları (1 en düşük ve 5 en yüksek) arasında derecelendirerek, seçeneğin altındaki kutuya "X" sembolü ile işaretleme yapınız. Lütfen her maddeyi dikkatli okuyarak bütün maddeleri işaretleyiniz.

Eşitlik ve Vatandaşlığı Koruyucu					
Madde	1	2	3	4	5
1. Okulumda teknolojik alt yapının eşit şartlarda kullanılmasını sağlayabilirim.					
2. Öğrencilerimin bilgi ve iletişim teknolojilerinin amaca uygun kullanımı açısından eşit şartlarda eğitim almasını sağlayabilirim					
3. Okulumda teknolojik imkanların eşit bir şekilde kullanılması ve dağıtılmasını sağlayabilirim.					
4. Teknolojik araçlar kullanırken etik unsurlara dikkat edebilirim. (Örn: Teknolojiyi doğru olmayan bilgilerin yayılması için kullanmamak)					
5. Öğrencilerimin kişisel bilgilerinin korunması için gereken sistemsel önlemleri alabilirim.					
6. Öğretmenlerimin kişisel bilgilerinin korunması için gereken sistemsel önlemleri alabilirim.					
7. Sosyal medyada başkalarını rahatsız edecek içerikler paylaşmamam gerektiğini bilirim.					
Vizyoner Planlayıcı					
Madde	1	2	3	4	5
1. Okulumda teknoloji kullanımının yaygınlaştırılması konusunda planlamalar yapabilirim.					
2. Okulumda teknoloji kullanımının yaygınlaştırılması ile ilgili planlamaları ilgili paydaşlarımla (öğretmen, diğer yöneticiler vb.) birlikte yapabilirim.					
3. Okulumda teknoloji kullanımının yaygınlaştırılması ile ilgili planların etkililiğini denetleyebilirim.					
4. Okul stratejik planı hazırlanırken teknolojik ihtiyaçların giderilmesini sağlayabilirim					
Güçlendirici Lider					
Madde	1	2	3	4	5
1. Öğretmen ve öğrencilerimin teknolojik gelişmeleri araştırmaları için imkân sağlayabilirim					
2. Öğretmen ve öğrencilerimin teknolojiyi kullanmaları için imkân sağlayabilirim					
3. Öğretmen ve öğrencilerimin eğitim süreçlerinde teknoloji kullanımı yeterliliklerini geliştirmelerini destekleyebilirim					
4. Eğitimde teknoloji entegrasyonu sürecini yürütmek için bir ekip kurabilirim					
5. Eğitimde teknoloji entegrasyonu sürecini yürütmek için kurduğum ekibin çalışmalarını takip edebilirim					
Sistem Tasarımcısı					
Madde	1	2	3	4	5
1. Eğitimde teknoloji entegrasyonu için geleceğe yönelik maddi kaynaklar oluşturabilirim					
2. Çalıştığım kurumun teknolojik altyapısının iyileştirilmesi için hedefler belirleyebilirim.					
3. Okulumdaki teknolojik araçların kullanılabilir durumda olup olmadığını takip edebilirim					

4. Öğrenci ve personelin bilgi gizliliği ve güvenliği konusundaki kurallara uymalarını sağlayabilirim					
5. Eğitimde teknoloji kullanımına yönelik gelişmeleri takip etmesi için bir ekip oluşturabilirim					
Bağlantılı Öğrenen					
Madde	1	2	3	4	5
1. Kişisel ve mesleki gelişimimi desteklemek için teknolojiyi kullanabilirim.					
2. Eğitim teknolojileri alanındaki gelişmeleri takip edebilirim.					
3. Diğer eğitim yöneticileriyle iş birliği yapmak için teknolojiyi kullanabilirim					
4. Eğitimde teknoloji kullanımını yaygınlaştırmak adına gerçekleştirdiğim iyi örnekleri ilgi duyan diğer yöneticilerle paylaşabilirim.					
5. Eğitime dair yeniliklerden haberdar olmak için teknolojiyi kullanabilirim.					
6. Eğitimde teknoloji kullanımı konusunda öğretmenlerime öncülük edebilirim.					
7. Mesleki gelişimime yönelik sosyal medya gruplarını takip edebilirim.					
8. Teknolojideki değişimlere kolaylıkla uyum sağlayabilirim.					

The Self-Efficacy Scale for the Use of Information and Communication Technologies in Education: School Administrator Form

This form has 30 items towards your information and communication technology use while leading in education. Please read each item thoroughly and choose the best rate that best describes each statement (1 the lowest – 5 the highest).

Equity and Citizenship Advocate					
Items	1	2	3	4	5
1. I can ensure the even use of the technological facilities in my school.					
2. I can provide my students with equal learning opportunities in purposeful using of information and communication technologies					
3. I can ensure the even distribution of the technological resources in my school.					
4. I can pay attention to ethical considerations while using technological devices (e.g. not using technology to disseminate incorrect information).					
5. I can take necessary systematic precautions to protect my students' privacy.					
6. I can take necessary systematic precautions to protect my teachers' privacy.					
7. I know that I must not share improper content that may disturb others.					
Visionary Planner					
Items	1	2	3	4	5
1. I can make arrangements the widespread use of technology in my school.					
2. I can make arrangements the widespread use of technology in my school with my stakeholders (e.g. teachers, other administrators etc.).					
3. I can supervise the effectiveness of the arrangements towards the widespread use of technology in my school					
4. I can ensure to satisfy the technological needs while preparing the strategic plan of the school.					
Empowering Leader					
Items	1	2	3	4	5
1. I can provide my teachers and students with opportunities to search for technological developments.					
2. I can provide my teachers and students with opportunities to use technology.					
3. I can support my teachers and students to develop their competences towards using technology in educational activities.					
4. I can build a team to run the technological integration process in education.					
5. I can follow the activities of the team running the technological integration process in education					
Systems Designer					
Items	1	2	3	4	5
1. I can ensure financial resources for the technology integration in education to satisfy future demand.					
2. I can define goals to develop the technological facilities in my school.					
3. I can follow whether technological devices in my school are usable or not.					
4. I can ensure that staff and students pay attention to privacy and security while using technology.					
5. I can build a team to follow the latest developments in technology use in education.					
Connected Learner					
Items	1	2	3	4	5

1. I can use technology for my personal and professional development.					
2. I can follow the latest developments in educational technology.					
3. I can use technology to collaborate with other administrators.					
4. I can share my best practices towards the widespread use of technology in education with other administrators interested.					
5. I can use technology to follow the latest developments in education.					
6. I can model for my teachers for using technology in education.					
7. I can follow social networking sites for my professional development.					
8. I can easily adapt to changes and innovations in technology					