Journal of Theoretical Educational Science, 13(1), 65-77, January 2020
Kuramsal Eğitimbilim Dergisi, 13(1), 65-77, Ocak 2020
[Online]: http://dergipark.gov.tr/akukeg
DOI number: http://dx.doi.org/10.30831/akukeg.535491

The Relationship between 21st Century Learning Skills and Educational Technology Competencies of Secondary School Students*

Ortaokul Öğrencilerinin 21. Yüzyıl Öğrenme Becerileri ile Eğitim Teknolojisi Yeterlikleri Arasındaki İlişki

Zehra ÖNÜR** **İshak KOZİKOĞLU*****

Received: 4 March 2019 **Research Article** **Accepted:** 22 November 2019

ABSTRACT: The purpose of this study is to reveal the relationship between 21st century learning skills and educational technology competencies of secondary school students. The population of this correlational research consists of 37.904 secondary school students in central districts (Ipekyolu, Tuşba, and Edremit) of Van province. This study was carried out with 920 secondary school students determined by stratified sampling method. As data collection tools, "21st Century Learning Skills Scale" and "Educational Technology Standards Scale" were used. Pearson Product Moment Correlation Coefficient and simple linear regression analysis were used in the analysis of research data. As a result of the study, it was concluded that there is a moderate, positive and significant relationship between students' 21st century learning skills and educational technology competencies. In addition, it was determined that students' educational technology competencies are a significant predictor of their 21st century learning skills and can explain approximately one quarter (25.1%) of their 21st century learning skills. In teacher education and in-service training programs, teachers should be well-educated in that they can contribute to the students' development of 21st century and technological skills.

Keywords: secondary school students, 21th century learning skills, educational technology competencies.

ÖZ: Bu araştırmanın amacı, ortaokul öğrencilerinin 21. yüzyıl öğrenme becerileri ile eğitim teknolojisi yeterlikleri arasındaki ilişkiyi incelemektir. İlişkisel araştırma modelinin kullanıldığı bu çalışmanın evrenini, Van ili İpekyolu, Tuşba ve Edremit merkez ilçelerinde öğrenim görmekte olan 37.904 ortaokul öğrencisi oluşturmaktadır. Araştırma, tabakalı örnekleme yöntemi ile belirlenen toplam 920 ortaokul öğrencisi ile yürütülmüştür. Araştırmada, veri toplama araçları olarak "21. Yüzyıl Öğrenme Becerileri Ölçeği" ve "Eğitim Teknolojisi Standartları Ölçeği" kullanılmıştır. Araştırma verilerinin analizinde, Pearson Çarpım Momentler Korelasyon Katsayısı ve basit doğrusal regresyon analizi kullanılmıştır. Araştırmanın sonucunda, öğrencilerin 21. yüzyıl öğrenme becerileri ile eğitim teknolojisi yeterlikleri arasında orta düzeyde, pozitif ve anlamlı bir ilişkinin olduğu belirlenmiştir. Ayrıca, öğrencilerin eğitim teknolojisi yeterliklerinin, 21. yüzyıl öğrenme becerilerinin anlamlı bir yordayıcısı olduğu ve yaklaşık olarak dörtte birini (%25.1) açıklayacak güçte olduğu belirlenmiştir. Öğretmen eğitimi ve hizmet içi eğitim programlarında öğretmenlerin, öğrencilerin 21. yüzyıl ve teknoloji becerilerinin gelişimine katkı sağlayabilecek şekilde yetiştirilmeleri gerekmektedir.

Anahtar kelimeler: Ortaokul öğrencileri, 21. yüzyıl öğrenme becerileri, eğitim teknolojisi yeterlikleri.

* This study was produced from the master's thesis of the first author entitled as "The Relationship between 21st Century Learning Skills and Educational Technology Competencies of Secondary School Students" and was supported by the Scientific Research Projects Coordination Unit of Van Yüzüncü Yıl University under the project number SYL-2018-7360.
** *Corresponding Author*: Teacher, Van, Turkey, zehra1onur@gmail.com, https://orcid.org/0000-0001-9249-6266
*** Asst. Prof. Dr., Van Yüzüncü Yıl University, Faculty of Education, Van, Turkey, ishakkozikoglu@yyu.edu.tr, https://orcid.org/0000-0003-3772-4179

Citation Information
Önür, Z., & Kozikoğlu, İ. (2020). The relationship between 21st century learning skills and educational technology competencies of secondary school students. *Kuramsal Eğitimbilim Dergisi [Journal of Theoretical Educational Science], 13*(1), 65-77. http://dx.doi.org/10.30831/akukeg.535491

ISSN: 1308-1659

Introduction

The 21st century is not just a time expression because of scientific developments, technological innovations, new thinking styles and different perspectives experienced by human beings. Living in the 21st century is considered as taking part in a global change involving terms such as science, development, production, innovation and technology. This global change refers to a situation in which human beings are generating information very rapidly and human life is becoming more complex every day. In today's age, education is not limited to the school. It has become a necessity for the individuals to keep up with the times, modernize and be successful in academic/professional areas. Adaptation of the societies to the developments in science, technology and education is possible with educating the individuals accordingly (Cerit, 2002). 21st century learning skills in the curriculum are not only useful for students, they are also a necessity to prepare students for their future life (Alismail & McGuire, 2015). For this reason, it is very important for individuals to acquire some basic skills such as reading, writing and problem solving so that they can develop themselves and extend their knowledge. In line with these developments, today's education approach aims to equip the individuals with skills such as active learning, learning to learn, problem solving and critical thinking. In this way, it is aimed to educate individuals who can search, question, think, produce, criticize, interpret, develop solutions and specialize in more than one area.

The amazingly complex era in which we live comprises a huge amount of information alternatives and formats. Those who know, compare, analyze, synthesize, evaluate and transfer information to the others effectively are seen in high esteem (Rockman, 2019). The ability of an individual to reach this high esteem means adapting to the changes, choosing the right and useful knowledge among the ones that increase every second, analyzing the developments, using the acquired knowledge in daily life and being productive. Individuals need to develop higher-order thinking skills and competencies in order to transfer of knowledge to everyday practices. These skills and competencies, which are deemed necessary for individuals to have, are named in the literature as "*21st Century Learning Skills*" (Anagün, Atalay, Kılıç, & Yaşar, 2016). 21st century learning skills are not only about individuals having sufficient knowledge or only about the skills they possess. 21st century learning skills include the development of an individual's abilities such as questioning, thinking, understanding, problem solving and the reflection of this development on the performance of the individual in his/her academic and social life. In this case, it can be said that 21st century learning skills, which include individuals' higher order thinking skills, abilities and performances, have an important effect in upbringing of students who can keep up with the age and provide social development.

How to develop 21st century learning skills comes with the question of how to organize learning environments for 21st century individuals (Dağhan, Kibar, Çetin, Telli, & Akkoyunlu, 2017). This situation raises the question concerning the role of school in students' development of these skills. There is too much debate about how to teach these skills (Häkkinen et al., 2017). Technology is accepted as one of the necessary elements to provide a learning environment in accordance with the teaching-learning concept of our age and one of the 21st century learning skills. 21st century learning skills emphasize the importance of information and media literacy as required

in information age (Kurudayıoğlu & Tüzel, 2010). Although 21st century technological skills are considered as crucial in today's age, the digital aspect combined with 21st century skills is not adequately defined yet (Van Laar, Van Deursen, Van Dijk, & De Haan, 2017). It is important to support students to utilize the power of technology for developing 21st century learning skills (Alismail & McGuire, 2015). In this respect, the course of "information technologies and software" is taught in 5th and 6th grades, the course of "technology and design" is taught in 7th and 8th grades in our country. The information technology and software course is of great importance in terms of getting the students familiar with current technology at an early age. Nowadays, most of the discipline areas benefit from technology and it is emphasized that individuals should be exposed to technological facilities at an early age. Furthermore, if the students learn how to benefit from technology, it will contribute both their educational lives and professional experiences. It is stated that Turkey cannot reach a sufficient level in both economic and technological areas without effective use of information technology in education (Barut & Kuzu, 2017). In this respect, some of the basic objectives for the students in information technologies and software course curriculum include knowing how to access and use internet-based systems, knowing technological concepts, systems and operations, acquiring cooperation skills as part of learning process, sharing what they have learned by social environments and gaining awareness about lifelong learning (Ministery of National Education [MONE], 2018a).

In today's educational systems, technological devices are increasingly integrated in learning environments on the assumption that usage of these technologies will support student learning and motivation (Aagaard, 2015). Especially for children and young people, the use of technology not only involves learning, but also entertainment. The use of technology in education enables students to find activities more fun, and therefore they are more willing to be active in these activities (Aktay & Aktay, 2015). The technology and design course, which is the continuation of the above mentioned information technologies and software course, aims to educate individuals as the ones who can adapt to the information society (Becel, 2013). Some of the basic objectives for students in technology and design course curriculum are gaining the basic knowledge and skills concerning the development of technology, taking responsibility for how to solve the problems encountered in daily life by using the technology, being aware of the technology's benefits for the development of society (MONE, 2018b). In this case, it is seen that students are expected to have the competencies to use technology in education and daily life through these courses taught in secondary school.

The use of technology in learning environments will shape the individuals' understanding of knowledge, research and inquiry skills, self-directed learning and capacity to utilize technology from an early age, and also contribute to their vital and professional skills (Boyraz, 2008; Rashid & Asghar, 2016). Therefore, it is considered that there is a relationship between secondary school students' educational technology competencies and 21st century learning skills. In this study, it is aimed to examine the relationship between 21st century learning skills and educational technology competencies of secondary school students. For this purpose, the following questions were addressed in this study:

1. Is there a significant relationship between secondary school students' educational technology competencies and their use of 21st century learning skills?

2. Do secondary school students' educational technology competencies significantly predict their use of 21st century learning skills?

In various studies in the literature (Boyraz, 2008; Bozkurt & Çakır, 2016; Eryılmaz & Uluyol, 2015; Gelen, 2017; Miller, 2009), it is emphasized that the technological elements are very important for individuals to gain 21st century learning skills and at the same time, the competency of technology use is one of the 21st century learning skills. Therefore, it is considered that there is a relationship between secondary school students' educational technology competencies and 21st century learning skills. However, no correlational research has been reached concerning the relationship between educational technology competencies and 21st century learning skills. In a study conducted by Van Laar, Van Deursen, Van Dijk and De Haan (2017), the relationship between 21st century skills and digital skills were analyzed with systematic literature review of 75 articles. They concluded that 21st century skills are broader than digital skills and they are interrelated. In this respect, it is thought that this study will contribute to the related literature in terms of revealing the relationship between the educational technology competencies and 21st century learning skills of secondary school students.

Method

Research Model

In this study, correlational research model was used. In correlational research, existing relationships between two or more variables are analyzed without influencing them (Fraenkel, Wallen, & Hyun, 2012). In this study, it is considered that correlational research is appropriate for the purpose of this study as it is aimed to determine the relationships between 21st century learning skills and educational technology competencies of secondary school students.

Population and Sample

The population of this study consists of the 6th, 7th and 8th grade students of secondary schools affiliated to the Ministry of National Education in İpekyolu, Tuşba and Edremit districts of Van province in 2017-2018 academic years. According to data obtained from Van Provincial Directorate of National Education, a total of 37.904 6th, 7th and 8th grade secondary school students are attending schools affiliated to the Ministry of National Education in the three central districts of Van province, namely 19.284 in İpekyolu, 10.295 in Tuşba and 8.325 students in Edremit.

Stratified sampling method was used in this study. In stratified sampling method, the population is subdivided according to the variables that may be effective in the study and the sample is determined by using simple random sampling method from each subgroup (Büyüköztürk et al., 2016). In this study, the schools were determined according to the socio-economic development level, thus the schools were divided into three subgroups as high, moderate and low socio-economic development level by taking expert opinion. While determining socio-economic development level of the schools; the experts were asked to consider the economic conditions of the school, socio-cultural characteristics and education level. The schools in each ssubgroup were determined by

consensus among experts. Then, a certain number of secondary schools were randomly selected from each subgroup.

While determining the sample size in a study, it is very important to determine a sample that is as large as possible in terms of time and possibilities and to represent the whole population (Fraenkel, Wallen, & Hyun, 2012). While determining the size of the sample, it is accepted that 920 students as sample size are enough at .05 significance level if the number of the population is 30.000 (Çıngı, 1994; Cited in, Büyüköztürk et al., 2016). In this case, it can be said that the sample of this study is large enough to represent the population. A total of 920 students from three districts were reached in this study. Table 1 presents the distribution of the 6th, 7th and 8th grade secondary school students according to the gender, grade level, districts where they study and socio-economic development levels of their schools.

Table 1

The Distribution of Secondary School Students According to the Gender, Grade Level, Districts Where They Study and Socio-Economic Development Levels of Schools

Feature	Category	Number (N)	Percentage (%)
Gender	Female	493	54
	Male	427	46
Grade Level	6th Grade	296	32
	7th Grade	306	33
	8th Grade	318	35
Districts Where They Study	İpekyolu	365	40
	Tuşba	268	29
	Edremit	287	31
Socio-Economic Development Levels Of Schools	High	310	34
	Moderate	343	37
	Low	267	29
	Total	920	100

When Table 1 is examined, it is seen that more than half (493; 54%) of the 6th, 7th and 8th grade students in the sample are female and approximately half (427; 46%) are male. Concerning the grade levels, it is seen that 296 (32%) of the participants are 6th grade, 306 (33%) are 7th grade and 318 (35%) are 8th grade students. 365 (40%) of the students are studying in İpekyolu district, 268 (29%) are in Tuşba and 287 (31%) are in Edremit. In terms of socio-economic development level of the schools, 310 (34%) students are studying at schools with high socio-economic development level, 343 (37%) students are studying at schools with moderate socio-economic development level and 267 (29%) students are studying at schools with low socio-economic development level**.**

Data Collection Tools

In this study, "21st Century Learning Skills Scale" was used to determine the 21st century learning skills of secondary school students and "Educational Technology Standards Scale" was used to determine students' educational technology competencies as data collection tools. Information on data collection tools is presented below.

21st century learning skills scale. The five-point Likert-type scale developed by Gülen (2013) and ranging from "never" to "always" consists of 33 items. Gülen (2013) performed exploratory factor analysis (EFA) and it confirmed four sub-dimensions that are “active learning (8 items)", "learning to learn (13 items)", "problem solving (6 items)", "cooperation and communication (6 items)". Explained variance of sub-dimensions in EFA results confirms the validity of the scale. The Cronbach Alpha internal reliability coefficients of the sub-dimensions of the scale were calculated as .82 for active learning, .87 for learning to learn, .74 for problem solving and .83 for cooperation and communication. The total reliability coefficient of the scale is .87 (Gülen, 2013). In this study, Cronbach Alpha internal reliability coefficients for the sub-dimensions of the scale were calculated as .75, .85, .79 and .77, respectively. Total reliability coefficient of the scale was calculated as .93. These values indicate that the data obtained from this scale is reliable.

Educational technology standards scale. The five-point Likert-type scale developed by Mısırlı (2015) consists of 21 items. Mısırlı (2015) performed exploratory factor analysis (EFA) and it confirmed four sub-dimensions as "technology literacy", "creativity", "digital citizenship and participation" and "innovation". According to EFA results, it was determined that four sub-dimensions can explain %51.18 of the variance in total scale. Then, confirmatory factor analysis (CFA) was performed to test the accuracy of the sub-dimensions resulting from EFA, and the resulting structure was verified. Thus, EFA and CFA results confirm the validity of the scale. The Cronbach Alpha internal reliability coefficient was found to be .87 for technology literacy sub-dimension, .72 for creativity sub-dimension, .57 for digital citizenship and participation sub-dimension, and .62 for innovation sub-dimension. Total internal reliability coefficient of the scale was calculated as .88 (Mısırlı, 2015). In this study, Cronbach Alpha internal reliability coefficients were calculated as .87, .74, .70 and .65, respectively. Total internal reliability coefficient of the scale was calculated as .91. The calculated values indicate that the data obtained from this scale is reliable.

Data Analysis

In this study, Pearson Product Moment Correlation Coefficient (*r*) was used to determine the relationship between the 21st century learning skills and educational technology competencies of secondary school students. These values were interpreted as a high level of relationship between "0.70-1.00", as moderate level of relationship between "0.30-0.69 " and as low level of relationship between 0.00-0.29 (Büyüköztürk, 2017).

In this study, simple linear regression analysis was used to determine the predictive power of students' educational technology competencies of secondary school students on their 21st century learning skills. In simple linear regression analysis, two or more variables that are related to each other are determined as dependent variables and others as independent variables and the relationship between dependent variable and

independent variable (s) is analyzed by regression model (Büyüköztürk, 2017). In this study, dependent (21st century learning skills) and independent variables (educational technology competency) were analyzed according to the assumptions of simple linear regression before the analysis and the variables were found to be at normal distribution.

Results

Pearson Product Moment Correlation Coefficients concerning the relationship between educational technology competencies and 21st century learning skills of the secondary school students are presented in Table 2.

Table 2

Pearson Product Moment Correlation Coefficients Concerning Secondary School Students' Educational Technology Competencies and 21st Century Learning Skills

Scales and sub-dimensions	(1)	(2)	(3)	(4)	(5)	(6)
A. Educational Technology Standards Scale						
1. Educational technology competencies	1.00					
B. 21st Century Learning Skills Scale						
2. 21st century learning skills (total)	0.50**	1.00				
3. Active learning	0.46**	0.64**	1.00			
4. Learning to learn	0.39**	0.63**	0.61**	1.00		
5. Problem solving	0.46**	0.66**	0.64**	0.66**	1.00	
6. Cooperation and communication	0.46**	0.68**	0.55**	0.60**	0.62**	1.00

When Table 2 is examined, it is seen that there is a moderate level, positive and significant relationship between the total score of educational technology competencies of secondary school students and the total score of 21st century learning skills scale (r=0.50; p<.01). Similarly, it is seen that there is a moderate level, positive and significant relationship between the educational technology competencies of the students and sub-dimensions of the 21st century learning skills scale as active learning, learning to learn, problem solving, collaboration and communication.

Furthermore, this study aims to determine whether secondary school students' educational technology competencies significantly predict their use of 21st century learning skills. For this purpose, total score was obtained for each scale of educational technology competencies and 21st century learning skills rather than predicting sub-dimensions separately. The results of the simple linear regression analysis are presented in Table 3.

Table 3

Results of Simple Linear Regression Analysis for the Prediction of 21st Century Learning Skills of Secondary School Students

Predictive Variable	*B*	Prediction Power (*R*)	Explained variance (R^2)
Educational Technology Competencies	.501	.501	.251

According to the data in Table 3, it is seen that educational technology competencies of secondary school students explain 25.1% of the variance in 21st century learning skills. The results of the variance analysis of the simple linear regression analysis in Table 3 are presented in Table 4.

Table 4

The Results of Variance Analysis for the Prediction of 21st Century Learning Skills of Secondary School Students

Source of Variance	Sum of Squares	*sd*	Mean of Squares	*F*	*P*
Regression	108.181	1	108.181	306.592	.000
Residual	323.565	917	.353		

In the simple linear regression analysis in Table 4, the predictive power obtained was found to be significant ($F_{(1,917)} = 306.592$, $p<.05$). The results of the analysis show that students' educational technology competencies are a significant predictor of 21st century learning skills and can explain approximately one quarter of students' 21st century learning skills (25.1%).

Discussion and Conclusion

In this study, it was determined that there is a moderate level, positive and significant relationship between secondary school students' 21st century learning skills (in total scale) and educational technology competencies. Similarly, it was determined that there is a moderate level, positive and significant relationship between students' educational technology competencies and 21st century learning skills' sub-dimensions of active learning, learning to learn, problem solving, cooperation and communication skills. In other words, it was concluded that there is a positive relationship between educational technology competencies and 21st century learning skills of the students, thus it was determined that 21st century learning skills of the students' increased as their educational technology competencies increased. In parallel with the results of this study, Van Laar, Van Deursen, Van Dijk, and De Haan (2017) concluded that digital skills are needed to help the individuals be responsible for their own learning and participate in active learning. Similarly, Rashid and Asghar (2016) concluded that the use of technology has a positive relationship with students' self-directed learning. In the study conducted by Ahonen and Kinnunen (2015), it was concluded that the students mostly believed that they would need technology related technical skills in the year 2020. That

is to say, students are expected to take advantage of technological competences in order to support 21st century skills.

Active learning involves the use of various technological tools such as the internet in order to realize and organize their own learning (Aydede & Kesercioğlu, 2012). Nascimento, Moreira, and Welker (2019) concluded that the use of active learning strategies and technology enhanced students' learning. In this case, it can be said that educational technology competencies are an important variable in the students' ability to gain active learning skills. Similarly, learning to learn is defined as a process in which the learner reviews the necessary resources by identifying his/her own needs and with his/her own efforts (Kemp, Goodman, & Tenenbaum, 2010). An individual who has "learning to learn" ability is aware of the ways of accessing information and constructs the information itself. One of the most widely used ways of reaching information in today's age is undoubtedly technology. As Longworth (2019) emphasized, technology is one of the key competencies for lifelong learning. Therefore, it is possible to say that students with educational technology competencies have more opportunities to organize their own learning and access to information, and as a result, they have higher level of learning to learn skills. Problem solving ability involves achieving a goal and using various methods to overcome the difficulties (Chiang & Lee, 2016; Yalçın, Tetik, & Açıkgöz, 2010). In this case, it is possible to say that problem solving skills of the students, who have educational technology competencies, are more advanced. In their study; Huang, Chiu, and Hong (2016) concluded that students' problem solving attitude is positively interrelated to thinking-skill enhancement as a result of participating in a technology-based contest. It is considered that the students who use technology as a source of research and learning are ahead of the other students in solving the problems they face. In addition, students use technology as a tool to communicate with other people or to provide collaboration. Communication is defined as the transfer of emotions, thoughts or information to others by means of various ways (Turkish Language Association [TLA], 2018). The cooperation that can be made thanks to communication in adapting to the globalization in 21st century is very important. Therefore, it can be said that educational technology competencies are a facilitating factor in the communication and cooperation skills of secondary school students.

Based on the results of this study, it is possible to say that individuals' having educational technology competencies is an important factor for the students to acquire 21st century skills and be able to use these skills effectively. In fact, Boyraz (2008) states that using technology in learning environments will help individuals to formulate their knowledge, develop research and inquiry skills, increase capacity to benefit from technology. Similarly, Alismail and McGuire (2015) suggest students' taking advantage of technology for developing necessary learning skills in 21st century. Therefore, it contributes to their vital and professional skills. Siddiq, Scherer, and Tondeur (2016) emphasized that students should be prepared with technological knowledge and skills due to the rapid developments of knowledge and technology in 21st century. In this respect, FATİH Project (The Act of Increasing Opportunities and Improvement of Technology) was developed in Turkey for the students to meet technology in the classroom and acquire skills that they can adapt to the era of learning in the presence of technology. It aims to contribute to the students' 21st century learning skills by

developing their information, media and technology literacy (MONE, 2018). In this case, as students' educational technology competencies increase, it is expected that their 21st century learning skills will increase. Because, thanks to the educational technology competencies, it is possible to say that students interact more with the learning material, become more active in the process, they can access the information more easily and their problem solving, cooperation and communication skills develop more.

In addition, it was found that secondary school students' educational technology competency is a significant predictor of their 21st century learning skills and can explain approximately one quarter (25.1%) of 21st century learning skills. In other words, it is concluded that students' educational technology competences can explain their 21st century skills significantly. When 21st century learning skills and educational technologies are considered in terms of content, it is understood that these two elements are directly related. Many studies in the literature (Bozkurt & Çakır, 2016; Eryılmaz & Uluyol, 2015; Gelen, 2017; Miller, 2009) emphasized that technological elements are very important for individuals to gain 21st century learning skills and at the same time using technology is one of the 21st century learning skills. It is also a necessity for individuals to utilize technological elements in order to use 21st century learning skills (Eryılmaz & Uluyol, 2015). Effective inclusion of technology in education is seen as fundamental for 21st century learning (Henriksen, Mishra, & Fisser, 2016), because integrating educational technologies into education have basic goals such as developing students who possess basic knowledge and skills to become lifelong learners in 21st century (Natividad, Mayes, Choi, & Spector, 2015). In other words; 21st century learning skills such as research, inquiry, learning to learn require technology to be utilized. Therefore, it is possible to say that individuals need to benefit from educational technology in order to use and develop 21st century learning skills, or that educational technology competencies of individuals make it easier to develop 21st century learning skills.

In this study, it was concluded that there is a positive relationship between 21st century learning skills and educational technology competencies of secondary school students. In this case, it is advisable to ensure that the use of technological elements, which are one of the most necessary elements for achieving 21st century learning skills, is not only limited to schools in the central regions, but also provide necessary opportunities for students in rural areas to benefit from the same technological opportunities. In addition, it is thought that teachers' ability to master 21st century skills and technological elements is very important in guiding students in the teaching-learning environment. Therefore, in pre-service and in-service teacher training programs, teachers should be educated to contribute to the development of students' 21st century skills and use the necessary technological elements effectively in their lessons. Village schools can be examined in terms of technological possibilities, and deficiencies can be reported. Thanks to the studies to be done, it is possible to improve the technological opportunities by drawing attention to the impossibilities in these schools. In future studies, the relationship between students' 21st century learning skills, educational technology competencies and academic achievement can be examined.

References

Aagaard, J. (2015). Drawn to distraction: A qualitative study of off-task use of educational technology. *Computers & Education, 87*, 90-97.

Ahonen, A. K., & Kinnunen, P. (2015). How do students value the importance of twenty-first century skills?. *Scandinavian Journal of Educational Research, 59*(4), 395-412.

Aktay, E., & Aktay, S. (2015). İlkokullarda teknoloji eğitimi. *Adıyaman Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 19,* 17-44.

Alismail, H. A., & McGuire, P. (2015). 21st century standards and curriculum: Current research and practice. *Journal of Education and Practice*, *6*(6), 150-154.

Anagün, Ş., Atalay, N., Kılıç, Z., & Yaşar, S. (2016). Öğretmen adaylarına yönelik 21. yüzyıl becerileri yeterlilik algıları ölçeğinin geliştirilmesi: Geçerlik ve güvenirlik çalışması. *Pamukkale Üniversitesi Eğitim Fakültesi Dergisi, 40,* 160-175.

Aydede, M. N., & Kesercioğlu, T. (2012). Aktif öğrenme uygulamalarının öğrencilerin kendi kendine öğrenme becerilerine etkisi. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 43,* 37-49.

Barut, E., & Kuzu, A. (2017). Türkiye ve İngiltere bilişim teknolojileri öğretim programlarının amaç, kazanım, etkinlik, ölçme ve değerlendirme süreçleri açısından karşılaştırılması. *Trakya Üniversitesi Eğitim Fakültesi Dergisi*, *7(2)*, 721-745.

Becel, A. (2013). Bilişim teknolojileri ekseninde yazarlık ve yazma becerileri dersine yönelik bir değerlendirme. *Turkish Studies, 8(3),* 61-81.

Boyraz, Z. (2008). *Türk eğitim sisteminde eğitim teknolojisinin eğitim-öğretim kalitesine etkisi* (Yayımlanmış Yüksek Lisans Tezi). Beykent Üniversitesi, Sosyal Bilimler Enstitüsü, İstanbul.

Bozkurt, Ş. G., & Çakır, H. (2016). Ortaokul öğrencilerinin 21. yüzyıl öğrenme beceri düzeylerinin cinsiyet ve sınıf seviyesine göre incelenmesi. *Pamukkale Üniversitesi Eğitim Fakültesi Dergisi, 39,* 69-82.

Büyüköztürk, Ş. (2017). *Sosyal bilimler için veri analizi el kitabı*. Ankara: Pegem Akademi.

Büyüköztürk, S., Çakmak, E., Akgün, Ö. E., Karadeniz, S., & Demirel, F. (2016). *Bilimsel araştırma yöntemleri (21. baskı).* Ankara: Pegem Akademi Yayıncılık.

Cerit, Y. (2002). 21. Yüzyılda okula ilişkin öğretmen adaylarının algıları. *Abant İzzet Baysal Üniversitesi Eğitim Fakültesi Dergisi, 2*(2), 45-52.

Chiang, C. L., & Lee, H. (2016). The effect of project-based learning on learning motivation and problem-solving ability of vocational high school students. *International Journal of Information and Education Technology*, *6*(9), 709-712.

Dağhan, G., Kibar, P. N., Çetin, N. M., Telli, E., & Akkoyunlu, B. (2017). Bilişim teknolojileri öğretmen adaylarının bakış açısından 21. yüzyıl öğrenen ve öğretmen özellikleri. *Eğitim Teknolojisinde Kuram ve Uygulama, 7*(2), 215-235.

Eryılmaz, S., & Uluyol, Ç. (2015). 21. Yüzyıl becerileri ışığında FATİH Projesi değerlendirmesi. *Gazi Üniversitesi Gazi Eğitim Fakültesi Dergisi, 35*(2), 209-229.

Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2012). *How to design and evaluate research in education*. New York: McGraw-Hill.

Gelen, İ. (2017). P21-Program ve öğretimde 21. yüzyıl becerileri çerçeveleri (ABD uygulamaları). *Disiplinlerarası Eğitim Araştırmaları Dergisi, 1*(2),15-29.

Gülen, Ş. B. (2013). *Ortaokul öğrencilerinin 21. yüzyıl öğrenme becerileri ve bilişim teknolojileri ile destekleme düzeylerinin cinsiyet ve sınıf seviyesine göre incelenmesi* (Yayımlanmış Yüksek Lisans Tezi). Gazi Üniversitesi, Eğitim Bilimleri Enstitüsü, Ankara.

Häkkinen, P., Järvelä, S., Mäkitalo-Siegl, K., Ahonen, A., Näykki, P., & Valtonen, T. (2017). Preparing teacher-students for twenty-first-century learning practices (PREP 21): A framework for enhancing collaborative problem-solving and strategic learning skills. *Teachers and Teaching, 23*(1), 25-41.

Henriksen, D., Mishra, P., & Fisser, P. (2016). Infusing creativity and technology in 21st century education: A systemic view for change. *Journal of Educational Technology & Society, 19*(3), 27-37.

Huang, N. T. N., Chiu, L. J., & Hong, J. C. (2016). Relationship among students' problem-solving attitude, perceived value, behavioral attitude, and intention to participate in a science and technology contest. *International Journal of Science and Mathematics Education, 14*(8), 1419-1435.

Kemp, C., Goodman, N. D., & Tenenbaum, J. B. (2010). Learning to learn causal models. *Cognitive Science, 34,* 1185-1243.

Kurudayıoğlu, M., & Tüzel, S. (2010). 21. Yüzyıl okuryazarlık türleri, değişen metin algısı ve Türkçe eğitimi. *Türklük Bilimi Araştırmaları Dergisi, 18,* 283-298.

Longworth, N. (2019). *Making lifelong learning work.* Routledge Publications.

Mısırlı, Z. A. (2015). Ortaokul öğrencilerinin eğitim teknolojisi standartlarına ilişkin yeterliklerinin incelenmesi. *Uluslararası Türk Eğitim Bilimleri Dergisi, 5,* 311-337.

Miller, R. D. (2009). *Developing 21st century skills through the use of student personal learning networks.* Northcentral University, Prescott Valley, Arizona.

Ministery of National Education [MONE] (2018). *Eğitimde FATİH Projesi Hakkında* http://fatihprojesi.meb.gov.tr/proje-hakkinda/ adresinden alınmıştır. Erişim tarihi: 3 Temmuz 2018.

Ministery of National Education [MONE] (2018a). *Bilişim teknolojileri ve yazılım dersi öğretim programı.* http://mufredat.meb.gov.tr/ProgramDetay.aspx?PID=374 adresinden alınmıştır. Erişim tarihi: 3 Temmuz 2018.

Ministery of National Education [MONE] (2018b). *Teknoloji ve tasarım ders öğretim programı.* http://mufredat.meb.gov.tr/ProgramDetay.aspx?PID=380 adresinden alınmıştır. Erişim tarihi: 4 Temmuz 2018.

Nascimento, G. P., Moreira, D. C., & Welker, A. F. (2019). A controlled study on an instrument that couples active learning with technology: student video creation. *F1000Research, 8*(1107), 1107.

Natividad, G., Mayes, R., Choi, J. I., & Spector, J. M. (2015). Balancing stable educational goals with changing educational technologies: challenges and opportunities. *E-mentor*, *1*(58), 83-94.

Rashid, T., & Asghar, H. M. (2016). Technology use, self-directed learning, student engagement and academic performance: Examining the interrelations. *Computers in Human Behavior*, *63*, 604-612.

Rockman, I. F. (2019). Integrating information literacy into the learning outcomes of academic disciplines: A critical 21st-century issue. *College & Research Libraries News*, *64*(9), 612-615.

Siddiq, F., Scherer, R., & Tondeur, J. (2016). Teachers' emphasis on developing students' digital information and communication skills (TEDDICS): A new construct in 21st century education. *Computers & Education*, *92*, 462-472.

Turkish Language Association [TLA] (2018). http://www.tdk.gov.tr/index.php?option=com_gts&kelime =iletişim adresinden alınmıştır. Erişim tarihi: 6 Eylül 2018.

Van Laar, E., Van Deursen, A. J., Van Dijk, J. A., & De Haan, J. (2017). The relation between 21st-century skills and digital skills: A systematic literature review. *Computers in Human Behavior*, *72*, 577-588.

Yalçın, B. Tetik, S., & Açıkgöz, A. (2010). Yüksekokul öğrencilerinin problem çözme becerisi algıları ile kontrol odağı düzeylerinin belirlenmesine yönelik bir araştırma. *Organizasyon ve Yönetim Bilimleri Dergisi, 2*(2), 19-27.