An Investigation on the Relationship Between Learner's Skills and Perceptions to Use Information and Communication Technologies (Ict) and 21st Century Skills (C21 Skills) in Education

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Abstract

This research was conducted to reveal the relationship between learner's skills and their perceptions of efficacy in using ICT and C21 skills in Education. Research data were collected from 456 teacher candidates studying at a state university in 2021. As the data collection tools, C21Learner Skills Usage Scale and The Efficacy Perception Scale of Using Information and Communication Technologies were used. As a result of the research, it was highlighted that the scores of the candidate teachers from both scales are medium-high. A moderately positive (r=509) relationship was found between the scales. In addition, ICT Usage Competencies in Education predicts C21 learner skills at (R=259) level.

Keywords*:* C21 Skills, Information and Communication Technologies, Teacher Candidates

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INTRODUCTION

From past to present, the world has been changing and developing. The discovery of the power of scientific knowledge, starting from the Renaissance period, led to the Industrial Revolution. With the Industrial Revolution, the importance of education was well understood, and the period called the Information Age began. On the one hand, developments in ICT in the last 30-40 years have accelerated global competition. On the other hand, this situation made cooperation necessary in order to be successful in this competitive environment. In order to have a word in the Information Age integrated with technology, individuals are expected to have various skills. These skills, which are also called C21skills, include the cognitive features required by the age. C21 skills include the blending of knowledge and expertise, the skills needed to be successful in daily life and business life (Ledward & Hirata, 2011). OECD (The Organization for Economic Cooperation and Development) defines C21 skills as the skills and competencies that young people need to be effective workers and citizens in the C21information society. Similarly, the Partnership for C21 skills (P 21) defines the content, knowledge, special skills, expertise and literacy that students need to acquire in a blended way to be successful in business and life.

The P21 formation revealed C21 skills as follows:

- Learning and innovation skills

- Information, media and technology skills

- Life and career skills.

Furthermore, topics, in other words the basic disciplines, on which these skills are based, interdisciplinary cooperation, interdisciplinary themes, measurement and evaluation of skills were also revealed by P21 (Gelen, 2017).

Similarly, AASL (American Association of School Librarians, 2017) puts C21 skills as 81 different skills under 4 main headings. The main headings are as follows:

- Research, critical thinking and acquiring knowledge (25 sub-standards)

- Identifying results, making decisions, adapting knowledge to new situations and creating new knowledge (17 sub-standards)

- Ethical and productive participation, sharing of knowledge as a part of a democratic society (19 sub-standards)

- Learners' use of skills, resources and tools for personal and aesthetic development (20 sub-standards)

In 2003, the North Central Regional Educational Laboratory (NCREL) examined C21 skills in four groups with a new perspective in the light of recent historical events, globalization and digital age, after completing a two-year study.

- Digital Age Literacy: basic, scientific, economic and technological literacy, visual and information literacy, multicultural literacy and global awareness

- Creative Thinking: Adaptability, coping with complexity and self-management, curiosity, creativity, risk taking, high-level thinking and valid reasoning

- Effective Communication: Team, cooperation and interpersonal adaptation skills, personal, social and social responsibility, effective communication

- High Efficacy: Ability to prioritize, planning and dealing with results, using real-world tools effectively, creating relevant and high-quality products.

Furthermore, similar to the abovementioned definitions, the Assessment and Teaching of C21 skills (ATC 21) group classified C21 skills into four subgroups (Binkley et al., 2010):

1. Ways of thinking; creativity and innovation; critical thinking, problem solving and decision making; metacognition or learning to learn

2. Ways of working; communication and cooperation or teamwork

3. Tools for studying; information literacy and information and communication technology (ICT) literacy

4. Life in the world; citizenship, life and career skills, personal and social responsibility.

In line with the abovementioned definitions of C21skills, it can be said that the emphasis on technology stands out. It is possible to claim that technology-related skills are among the most basic skills that today's people need to acquire. Information and communication technologies have also been the common point of almost all humanity in the context of technology. UNESCO (2017) defines ICT as technologies used to transmit, store, create, share or exchange information. ICT is a concept that is constantly developing, and it has already become a part of people's daily lives in all areas of society.

Particularly, with the Covid 19 pandemic, ICT has taken part an indispensable place in all areas of life. One of these areas is undoubtedly the field of education. UNESCO (2017) stated that information and communication technologies are general competences for all teachers. In addition, teachers have the most important role in both providing students with basic skills related to ICT and effectively integrating technology into the learning-teaching processes of different courses (Şad & Nalçacı, 2015). In the light of abovementioned research, teachers need to be equipped with the knowledge of productivity applications, web, communication, presentation softwares and management applications along with basic hardware and software skills. Teachers are also expected to be educators and leaders to adapt ICT-enriched learning environments and innovations to their schools; meanwhile, they also need the knowledge and skills to use technology and gain pedagogical knowledge that will support their professional development (Gökçearslan, Karademir Coşkun, & Şahin, 2019).

On the other hand, with the integration of ICT into the educational environment, numerous contributions have been made to teachers, students and the learning-teaching process. Though it was predicted that the use of ICT applications in education would be beneficial before the pandemic period (Şengül, 2017), nobody would think of a pandemic period in those days. Educational activities have been carried out entirely through ICT applications during the pandemic period. For months, teachers have been broadcasting lessons on TV or on the internet, and students from all levels followed the lessons. Thus, ICT applications have become an integral part of education. It is expected that ICT applications will continue to be implemented in an integrated way with face-to-face education in the post-pandemic period. Therefore, ICT applications have become an indispensable part of life recently. In this respect, it is thought that there is a relationship between C21 skills and ICT applications. Based on this main purpose, this study tried to answer the following questions:

1. What is the level of C21 Learner Skills of candidate teachers?

2. What is the level of perception for candidate teachers' competence in using ICT in education?

3. Do pre-service teachers' scores on the C21 Learner Skills Scale differ according to gender and year of study?

4. Do pre-service teachers' perceptions of using ICT in education differ according to gender and grade level?

5. Is there a relationship between candidate teachers' C21Learner Skills and Perceptions of Using ICT?

6. Do Perceptions of Using ICT in Education predict C21Learning Skills?

METHOD

Research Model

The present study, which examines the relationship between teacher candidates' C21Learner Skills and their perceptions of using ICT in Education, was conducted in the relational survey model that is one of the quantitative research methods. In the relational survey model, the aim is to reveal the relationship between two or more variables (Karasar, 2003).

Participants

The data of the research were collected from teacher candidates studying at a state university in the 2020-2021 Spring semester. 477 pre-service teachers participated in the research. As a result of the normality test, the data of 21 candidates outside the normal distribution were extracted, and the analyses were made on 456 data. Information about the participants in the research is presented in Table 1.

Table 1: Participants

	1st year	2nd year	3rd year	4th year	Total
Female	81	72	121	62	336
Male	32	34	37	17	120
Total	113	106	158	79	456

According to the data presented in Table 1, it can be said that when the gender distribution of the participants is examined, 336 (73.7%) of the participants are female, and 120 (23.6%) are male. When the grade level is examined, the distribution is 113 (24.8%) for the 1st year, 106 (23.2%) for the 2nd year, 158 (34.6%) for the 3rd year and 79 (17.3%) for the 4th year.

Data Collection Tools

The first data collection tool of the research was developed by Orhan-Göksün (2016). It was collected by using the Learner Skills Usage Scale developed by the author, and the second data collection tool "The Efficacy Perception Scale of Using Information and Communication Technologies" was developed by Şad and Nalçacı (2015).

C21Learner Skills Usage Scale was developed by Orhan-Göksün (2016). The scale consists of 31 items on four factors: cognitive skills, autonomous skills, cooperation and flexibility skills and innovation skills. The cognitive skills chosen for the first factor describe the processing and coding of information in mental processes and being aware of the products that occur as a result of the processes taking place in mental processes. Autonomous skills describe autonomous learning skills that emerge with the integration of self-management, self-control and ability to work individually or in groups. Collaboration and flexibility skills indicate the success of collaborative activity and making learning environments flexible by expanding them. On the other hand, innovation skills are used in terms of adapting to new technologies. As the scores obtained from the scale increase, it can be said that C21learner skills of candidate teachers increase. The total explained variance of the scale was

calculated as 34.75%, and the internal consistency coefficient as .892 (Orhan-Göksün, 2016). For the study, the internal consistency coefficient was calculated as .817.

The Efficacy Perception Scale of Using Information and Communication Technologies was developed by Şad and Nalçacı (2015) to measure pre-service teachers' competencies in using ICT in education. The scale consists of one dimension. The total explained variance of the scale is 48.03%. The Cronbach Alpha internal consistency coefficient calculated for the overall scale was calculated as .962. It is possible to assert the idea that when the scores obtained from the measurement are high, the pre-service teachers' perceptions of efficacy in information and communication technologies defined within the scope of General Competencies for Teaching Profession are also higher. As the scores decrease, the efficacy perceptions also decrease.

Data Analysis

Research data were collected over the internet and analyzed with the SPSS 23 Package program. The data were first subjected to normality analysis, and 21 data outside the normal distribution were extracted. After that, the analyses were started after the conditions of normality were met. Descriptive statistical analysis was applied to find out the average scores obtained from the scales and sub-dimensions. In terms of the other numerical data, the t-test was used to measure whether the gender variable made a difference in the scores obtained from the scales. For the study year of the student variable, ANOVA test was used. Correlation analysis was used to understand the relationship between the variables, and regression analysis was used to grasp the level of prediction.

FINDINGS

Findings related to the research questions are presented in this section.

Table 2: Teacher Candidates' 21st Century: Average Scores from the Learner Skills Use Scale and the The Efficacy Perception for using ICT in Education

	N		Ss.
Cognitive Skills	456	4,22	,40
Autonomous Skills	456	3,54	,53
Collaboration and Flexibility	456	3,50	,57
Innovation	456	3,78	,73
Usage of C21 skills	456	3,81	,58
Efficacy Perceptions Regarding Using ICT in Education	456	3,76	,42

Examining the data presented in Table 2, it can be understood that the average score they got from the Learner Skills Use Scale was (x=3.81) for teacher candidates' C21skills. Hence, it can be said that the usage skills are at medium-high level. Furthermore, when the sub-dimensions of the scale are examined, it was revealed that the sub-dimension with the highest average is Cognitive Skills ((x=4.22). Other sub-dimensions are Autonomous Skills (x=3.54), Collaboration and Flexibility (x50=3.50) and Innovation. (x=3.78).

The scores of the pre-service teachers from the scale "The Efficacy Perception for using ICT in Education" are similarly at medium-high level (x=3.76). Therefore, the scores of the pre-service teachers from both scales are close to each other and at the middle-high level.

The t-test results a significant difference according to gender, and the results are presented in Table 3.

Table 3: T-test Results of Candidate Teachers According to the Scores They Get and Gender

Obstacles for Career	Gender	N		Sd	T	df	p
C21Learner Skills Usage Scale	Female	336	3,74	,43	-1,545	454	,123
	Male	120	3,81	,40			
Efficacy Perceptions Regarding Using ICT in Education	Female	336	3,78	,57	-1,701	454	,090
	Male	120	3,88	,62			

*P<0.05

According to the results of the t-test conducted to find out whether the gender variable made a difference in the scores of the teacher candidates from both scales, it was revealed that the gender variable did not make a significant difference for both scales. Much as the mean scores of male teacher candidates in both scales were higher than female teacher candidates, the difference was not statistically significant.

ANOVA test was conducted to find out whether the scores of the pre-service teachers made a difference according to the year of the student. The results are presented in Table 4.

Table 4: ANOVA Results of Pre-service Teachers' Scores According to Year of Study Variable

	Year of Study	N	$\overline{X}$	Ss	df	F	p	Meaningful Difference
C21Learner Skills Usage Scale	1st year	113	3,75	,43	3-452	3,457	,016	2nd year and 3rd year 2nd year and 4th year
	2nd year	106	3,66	,40				
	3rd year	158	3,83	,39				
	4th year	79	3,79	,47				
Efficacy Perceptions Regarding Using ICT in Education	1st year	113	3,79	,62		5,308	,001	2nd year and 3rd year
	2nd year	106	3,64	,55				
	3rd year	158	3,93	,55				
	4th year	79	3,79	,60				

*P<0.05

According to the results of the ANOVA test conducted to grasp whether there was a significant difference according to the year of study in the scores of the pre-service teachers from both scales, it was found out that there is a significant difference between the scores of the 2nd grade students (x=3.66) and the 3rd grade (x=3.83) and 4th grade students (x=3.79) in favor of the 3rd and 4th grade students for C21Learner Usage Skills Scale.

The Learner Skills Usage Scale scores of 3rd and 4th year students are higher than the 2nd year students. Similarly, when the scores of candidate teachers from Efficacy Perceptions Regarding Using ICT in Education are examined, there is a significant difference between the 2nd year students (x=3.64) and the 3rd year students (x=3.93) in favor of the 3rd year students. In addition, correlation analysis was applied to examine the relationship between the scores they received from the C21Learner Skills Usage Scale and the Efficacy Perceptions Regarding Using ICT in Education scale. Correlation analysis results are exhibited in Table 5.

Table 5: Correlation results showing the relationship between C21Learner Skills Usage Scale and the Efficacy Perceptions Regarding Using ICT in Education Scale

	1	2		Ss.
C21Learner Skills Usage Scale	1	509**	3,81	,58
Efficacy Perceptions Regarding Using ICT in Education scale	509**	1	3,76	,42

When Table 5 is taken into consideration, it can be said that there is a moderately positive (r=509) significant relationship between candidate teachers' C21Learner Skills and their competency in using ICT in Education. As their usage of C21 skills increases, their proficiency in using ICT in education also increases. The results of the regression analysis conducted to test the extent to which

pre-service teachers' competencies in using ICT in Education predict their C21Learner skills are illustrated in Table 6.

Table 6: Prediction Level of the scales

	C21Learner Skills Usage Scale			
Variable	B	SH	B	T
Efficacy Perceptions Scale for Using ICT in Education	,366	,029	,509	12,588
	R=,509	R²=0,259		
	F=158,456			
	p<,05	*(,000)*		

In accordance with the findings of the regression analysis conducted to measure the extent to which pre-service teachers' Perceptions of Efficacy in Using ICT in Education predict their C21Learner Skills, it is possible to assert the idea that their competencies in using ICT in Education predict C21Learner Skills (R^2=0.259). 25 percent of C21learner skills can be explained by proficiency in using ICT in education.

DISCUSSION AND CONCLUSION

C21 skills, such as "Technological competencies, innovative thinking, cooperation, problem solving, critical thinking, creativity, information and communication technologies, effective communication", might be named as the main components of education (Wagner, 2008; Voogt & Roblin, 2012; Wilborn, 2013; Yalçın, 2018; Silber-Varod, V., Eshet-Alkalai, Y., & Geri, N., 2019). Due to the pandemic period, individuals are going on their learning processes with online education, and one of the main keys for individuals to be successful in this process is having these skills. In order to make individuals acquire these skills, teachers who guide them may also need to have the specified competencies. As Önal & Çakır (2015), Ansong Gyimah, (2017) and Harris, Mishra & Koehler (2009) stated, teachers should have technological skills and know that these skills will be used functionally and efficiently in the classroom environment if they want to create a meaningful learning environment. For this reason, ICT competencies related to the integration of technology should be added into curriculum in the education process of teacher candidates and 21st century. It is possible to claim that it is important for them to have the skills of education in order to achieve the purpose of education (Akgün, 2020). In this respect, with the present study, the aim was to find out the C21usage skills of teacher candidates and their perceptions of proficiency in using ICT in education. Another aim was to find out whether the gender and class variable created a statistically significant difference. In addition, the relationship between pre-service teachers' C21usage skills and their perception of efficacy in using ICT in education and the level of their perception of using ICT in education to predict C21Learning Skills were tried to be found out.

As a consequence of this study, it was concluded that pre-service teachers' C21usage skills are at medium-high level. Among the previous studies from the literature, Erten (2019), Yılmaz & Tanrıseven (2019), Yalçın (2018), Başar (2018), Kozikoğlu & Altunova (2018), Kan & Murat (2018) concluded that teacher candidates had a high level of C21 skills proficiency perceptions, and similar results were found out with this study. However, Orhan-Göksun and Kurt (2017) concluded that the use of C21 skills by candidate teachers was not at a high level, and they obtained a different result from this study.

The scores of the pre-service teachers from the scale "Efficacy Perceptions of Using ICT in Education" are at medium-high level. Akgün (2020), Murat & Erten (2018), Çelik & Karamustafaoğlu (2016) and Şad & Nalçacı (2015) highlighted that the ICT proficiency levels of the pre-service teachers were at the "adequate" level, and their results are consistent with the study. However, in the study of Saraç & Özarslan (2017), half of the teacher candidates were self-sufficient in the effective use of ICT in the field of education, while the remaining half of the them did not consider themselves sufficient, and they obtained a different result.

According to the results of the t-test conducted to display whether the gender variable made a difference in the scores of the teacher candidates from both scales, it was revealed that the gender variable did not make a significant difference for both scales. Gökbulut (2020), Erten (2019), Kozikoğlu & Altunova (2018) found that the C21 skills proficiency perceptions of teacher candidates did not create a significant difference in terms of the gender variable, and they reached similar results. However, Kan & Murat (2018), Başar (2018), Göksün (2016) found that the C21 skills proficiency perceptions of pre-service teachers changed according to the gender of the candidate teachers, and there was a significant difference in favor of female students. Therefore, their results are contradictory with thus study. On the other hand, Akgün (2020), Murat & Erten (2018), Göldağ & Kanat (2017) found that the gender variable did not make a significant difference in the ICT competencies of candidate teachers and obtained similar results with this study.

It has been revealed that there is a significant difference in favor of 3rd and 4th year students in the C21Usage Skills scale. However, Gökbulut (2020) & Başar (2018) obtained a different result from the study by finding that the C21 skills proficiency perceptions of pre-service teachers did not make a statistically significant difference according to the year of study at university. When the scores of the teacher candidates from the scale "Efficacy Perceptions of Using ICT in Education" are examined, it has been highlighted that there is a significant difference in favor of the 3rd year students. In the study of Murat & Erten (2018), it was concluded that the ICT usage levels of the pre-service teachers created a significant difference in terms of class level and that as the class level increased, their ICT skills also increased, which is consistent with this study. This may suggest that pre-service teachers actively use ICT as the time they spend in education faculties, and the time they take courses increase.

A positive and moderately significant relationship was found between candidate teachers' C21Learner Skills and their proficiency in using ICT in Education. As the C21Usage Skills of teacher candidates increase, their proficiency in using ICT in education also increases. Furthermore, it is possible to claim that proficiency in using ICT in Education predicts C21Learner skills in the study ($R2=0.259$). This situation can be explained by the proficiency in using ICT in Education, which composes 25 percent of C21learner skills.

The C21 skills Cooperation Society (P21) deals with information and media technologies within the scope of C21 skills in the theoretical framework they have prepared. Voogt, Erstad, Dede & Mishra (2013) emphasize information and communication technologies at the center of C21 skills and stated that ICT is a prerequisite for acquiring other C21skills. A study in a similar vein, Karakoyun & Lindberg (2020) found in their study that the majority of teacher candidates in Turkey associate C21 skills with technology. In the light of this information, it can be considered as an expected result that there is a positive and moderately significant relationship between the C21Learner Skills and the competencies of using ICT in Education. Almerich, Suárez-Rodríguez, Díaz-García, & Cebrián-Cifuentes (2020) in their study concluded that there is a positive and statistically significant relationship between higher-order thinking and cooperation among the ICT competencies they have addressed in the context of C21 competencies. In another study, Erten (2019) also put forward the idea that the majority of teacher candidates' views on gaining C21 skillscenter around activities aimed at gaining "knowledge, media and technology skills". Furthermore, Sang et al. (2018) found a positive relationship between teachers' use of information and communication technologies and other C21learning competencies. In that sense, the abovementioned studies from the literature and the results of the study confirm that there is a relationship between C21Learner Skills and ICT use in education.

As another voice from the numerous studies conducted in the literature, UNESCO (2011) emphasized that ICT proficiency is a basic feature that all teachers should have. In another study, Valtonen et al. (2017) stated that teachers play a key role in transferring C21 skills to students. In the light of this information, efforts should be made to provide teacher candidates with the necessary skills related to ICT within the scope of C21skills. The reason is that Kirschner, Wubbels, and Brekelmans

(2008) emphasized that one of the basic criteria of teacher training programs is to provide pre-service teachers with ICT skills.

On the other hand, Kumar and Vigil (2011) and Valtonen et al. (2017) found that teacher candidates have low level of knowledge, skills and experience on how to use ICT. For this reason, using ICT in education-teaching processes within the scope of C21 skills should be taught to candidate teachers in a practical way in Education Faculties. In this context, working environments that will allow pre-service teachers to use new technologies can be created, and within this scope, they might be asked to work on projects/activity/digital materials.

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