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Pre-service Teachers' Opinions about the Use of 21st Century Learner and 21st Century Teacher Skills

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Abstract: The purpose of the current study is to determine pre-service teachers' opinions about 21st century learner and teacher skills. The study group of the current research is comprised of 391 senior students from an education faculty. As the data collection tool, the 21st century Learner Skills Use Questionnaire and 21st Century Teacher Skills Use Questionnaire were employed. In the analysis of the collected data, frequencies, percentages, arithmetic means, independent samples t-Test, One-Way Anova, Correlation, Mann Whitney-U, Kruskal Wallis techniques were used. The findings of the study revealed that the pre-service teachers' opinions about 21st century learner and teacher skills vary significantly depending on the variables of gender, department attended, academic achievement, experience of private tutoring and practicum teaching (doing practicum teaching at elementary and secondary schools). As a result, it was concluded that the pre-service teachers are ready for using 21st century learner skills (cognitive skills, autonomous skills, collaboration and flexibility skills, innovativeness skills) and teacher skills (administrative skills, technopedagogical skills, affirmative skills, flexible teaching skills, generative skills). However, it was also found that the pre-service teachers were not able to make enough use of learner and teacher skills during their practicum teaching at schools. Moreover, a positive, medium and significant correlation was found between 21st century learner skills and 21st century teacher skills.

Keywords: *21st century learner skills, 21st century teacher skills, pre-service teachers, teacher training, teaching and learning.*

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Introduction

The skills needed by people in the 21st century in terms of professional life, citizenship and self-actualization are highly different from the ones needed in the 20th century. Adaptation of people having spent much of their life in the 20th century to the 21st century can be challenging as the skills of the 20th century are different from those of the 21st century and new information and communication technologies have emerged in the 21st century. For example, the work done by people, as opposed to the work done by machines, constantly changes as computers and telecommunications develop (Dede, 2009). Preparation of the students of the 21st century for adaptation to professional life, social values and life itself is a complicated task. Globalization, technology, migration, international competition, changing markets and international environmental and political changes add a new urgency to the acquisition of the skills and knowledge needed by students to be successful in the 21st century (Saavedra and Opfer, 2012a). Howard Gardner states that children should now be equipped with the knowledge and skills to do the works that cannot be done by machines. This also clearly indicates the importance of 21st century skills. Skills such as creativity, critical thinking, problem solving and cooperation will constitute some kind of "universal literacy" needed to survive in the 21st century (Akgunduz et al., 2015).

Many nations in the world have been conducting comprehensive reforms in their curricula, instruction and assessment to prepare children better for the living and working conditions and higher education in the 21st century (Schleicher, 2012). Many countries have begun to reform the mission statements of their education systems as a result of international benchmarks (e.g. PISA) (Häkkinen et al., 2017).

In the United States, a consortium of teachers, education experts and CEOs of the technological companies preoccupied with the occupations of future prepared a framework report entitled as "21st century skills" in 2011. This framework sets out what knowledge, skills and competencies students will need to be successful in their future business life and to become a model citizen in a democratic system. In the US, the educational community and business circles highly appreciated the report of 21st century skills framework and called for schools to equip their students with qualifications

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such as problem solving, creativity, innovation, critical thinking, information and communication technology literacy, so that they can be prepared for the business world of future (Aydeniz, 2017).

In our country, curriculums were renewed by the Ministry of National Education in 2017. Competencies and skills called as 21st century skills have been incorporated to these renewed curriculums. In this regard, the skills to be needed by students to be personally, socially, academically and professionally successful at both national and international level have been defined in the Turkish Competencies Framework (TYC). TYC defines eight key competencies. The competencies and skills to be imparted to students by the curriculums are as follows: (1) Communication in the mother tongue, (2) communication in foreign languages, (3) mathematical competency and basic science/technology competencies, (4) digital competency, (5) learning how to learn, (6) social and citizenship-related competencies, (7) taking initiative and entrepreneurship, (8) cultural awareness and expression (MEB, 2017a).

Moreover, the Ministry of National Education initiated the Project of Increasing Opportunities and Improving Technology "FATIH" in 2010 in order to provide equality of opportunity in education and instruction and to make more effective use of information technologies in order to enhance technological opportunities in learning-teaching process in such a way as to activate more senses (MEB, 2018). Eryılmaz and Uluyol (2015) stated that the FATIH project targeting the integration of information technologies into learning-teaching process is directly associated with some of 21st century skills such as information, media and technology skills. With all transformations and changes in education, learner characteristics and teacher characteristics have changed. Teachers need to teach 21st century skills to their students for them to survive in the 21st century. Teachers should first have these skills and should know the ways to effectively impart them to their students.

Voogt, Erstad, Dede and Mishra (2013) argue that not only students but also teachers must acquire 21st century skills and teachers should be qualified enough to support the development of 21st century skills. According to Valtonen et al. (2017), teachers are expected to be familiar with the various pedagogical approaches and appropriate ways to make use of information and communication technologies in promoting the development of their students' 21st century skills. According to Valli, Perkkilä and Valli (2014), teachers should have adequate understanding of the development and implementation of 21st century skills. Teacher training, which has an important role in the training of the teachers of future, plays an important role in the inculcation of knowledge and competencies required for the acquisition of these skills by teachers.

In our country, the institution primarily responsible for the training of pre-service teachers is education faculties. In these faculties, while induction training is given to pre-service teachers to prepare them for the profession on the one hand, academic discussions about education have been conducted on the other (YOK, 2018). Education faculties should be able to train their students in such a way as to teach in the technopedagogical classes of the 21st century. In this context, 21st century skills should be incorporated into teacher training programs. In the literature, these skills are addressed as follows:

Literature Review

21st Century Learner Skills

All of the international research and educational planners and theoreticians involved in the field of education have attempted to develop frameworks necessary for students to be successful in the information-based and technology-directed global society under the concept of "21st century skills" (Cretu, 2017). In the literature, there is no universal agreement on what 21st century skills are. In the literature, there are different classifications of these skills. For more effective education and instruction, it is of great importance to know what 21st century learner skills are. According to Trilling and Fadel (2009), in the studies conducted within the context of Partnership21 (P21, 2015), 21st learner skills are subsumed under three headings, being "learning and innovativeness skills", "information, media and technology skills", "life and career skills".

Wagner (2008) named 21st century skills to be possessed by 21st century learners as "survival skills" and gathered them under seven headings; "critical thinking and problem solving", "cooperation between networks and leadership through effect", "agility and adaptation", "initiative and entrepreneurship", "effective verbal and written communication", "having access to and analyzing information" and "curiosity and imaginative power". According to the standards of American Association of School Librarians (AASL), besides technology, great importance should be attached to face-to-face sharing of knowledge (Orhan-Goksun and Kurt, 2017). The AASL (2009) standards have been defined as "questioning, critical thinking and information acquisition", "reaching conclusions, making informed decisions, applying the existing knowledge into new situations and creating new information", "sharing information and demonstrating ethical and productive participation as the members of a democratic society" and "pursuing personal and aesthetic development". In a project by OECD, Pedro (2006) identified the characteristics of new millennium learners as "alternative cognitive skills", "changes in cultural practices and social values" and "expectations for teaching and learning".

21st Century Teacher Skills

Today, problem solving, communication, cooperation, teamwork, critical thinking, creative thinking, using information and communication technologies come to the fore as 21st skills to be acquired by students. In order to impart these skills to students, the teacher of the 21st century should be able to have skills and competencies such as continuous development, empathy, effective communication, problem solving, sample personality demonstration and guidance. Teachers who train learners of the 21st century should be able to apply 21st century learner skills in their in-class activities. Saavedra and Opfer (2012b) defined the skills to be possessed by 21st century teachers as making it relevant, teaching through disciplines, promoting thinking skills, encouraging the transmission of learning, teaching students how to learn, directly addressing misunderstandings, treating team work as an outcome, making use of technologies to reinforce learning and nurturing creativity.

Within the scope of general teacher competencies, the qualifications and competencies to be possessed by teachers are determined by the Ministry of National Education. The first official works on teacher competencies started in 1999. Answers to the questions such as "What should the qualifications of teaching be in the 21st century?", "What qualifications do we want from our teachers and students?" etc.... have been sought. In this way, the general competencies of the profession of teaching have been determined as 6 main areas of competencies; "personal and professional values-professional development", "knowing students", "learning and teaching process", "monitoring and evaluating learning and development", "school-family and society relationships" and "program and content knowledge", under which 31 sub-competencies and 233 performance indicators have been defined. It was published in 2006 in the Journal of Communiqués No. 2590 and entered into force. General teacher competencies of teaching profession were updated in 2017. General competencies of teaching profession are made up of 3 main areas of competencies related to each other and complementing each other, 11 sub-competencies and 65 indicators related to these competencies (MEB, 2017b). The International Society for Technology in Education (ISTE) standards and the National Educational Technology Standards (NETS) developed within the context of a project directed to training of the teachers of future have been adopted as a guide in the use of educational technologies in many countries as well as in our country. Though competencies in using educational technologies to be demonstrated by teachers have been updated in different years, they first emerged as 13 indicators with the name of NETS in 1993. They were last updated in 2008 to form five areas of competencies and to include four performance indicators under each area of competencies (Orhan, Kurt, Ozan, Som Vural and Turkan, 2014). These standards have been defined as "facilitating students' learning and creativity and inspiring", "designing and developing the experiences and evaluations of the digital age", "developing models for digital age working and learning", "promotion of digital citizenship and responsibility and creating models for them" and "attending to professional development and leadership" (ISTE Standards-T, 2008). The name of these standards was changed to "ISTE standards for teachers" in 2015 (ISTE, 2018).

As a response to the question "How to become a good teacher?", Melvin (2011) developed performance standards for teachers. These standards are "preparing the environment for the change", "organizing physical environment and materials", "reflective instructional model", "being a model as a leader", "doing practices in breaks", "working with parents", "building the sense of citizenship in students" and "constructing a permanent learning environment". Lemov (2010) collected 49 techniques that could be used for effective instruction under seven headings. These headings are; "generating high academic expectations", "making planning to ensure academic achievement", "construction and delivery of lessons", "making students interested in your lessons", "creating a strong classroom culture", "generating high behavioral expectations and maintaining these expectations" and "building personality and trust".

When the national literature is reviewed, the studies conducted by Coklar (2008); Daghan, Nuhoglu Kibar, Menzi Cetin, Telli and Akkoyunlu (2017); Orhan-Goksun (2016); Sural (2017); Sahin (2010) on 21st learner and teacher skills of pre-service teachers come to the fore. This amount of research seems to be inadequate. Thus, the current study is believed to make contribution to the literature. In this regard, answers to the following questions were sought:

1. Do the pre-service teachers' use of 21st century learner skills and 21st century teacher skills vary significantly depending on;

a. Gender,
b. Department (branch),
c. Academic achievement,
d. Experience of private tutoring,
e. Experience of using learner skills during their practicum teaching,
f. Experience of using teacher skills during their practicum teaching?

2. Is there a significant correlation between the pre-service teachers' 21st century learner skills and 21st century teacher skills?

Methodology

Research Model

The current study employed a model built on the relational survey and causal comparison designs. The relational survey models are research models aiming to determine the existence and/or degree of a correlation between two or more variables (Karasar, 2005). The causal comparison is a type of research aiming to determine the causes of an existing situation or event, variables affecting these causes or the results of a cause (Buyukozturk, Cakmak, Akgun, Karadeniz and Demirel, 2008).

Study Group

The universe of the current research is comprised of the Education Faculty students of Mugla Sitki Kocman University and the sampling consists of fourth-year students selected through convenience sampling, one of the purposive sampling methods (Yildirim and Simsek, 2011). A total of 391 pre-service teachers from the departments of social studies, Turkish, classroom, pre-school, science and technology, music, arts, English, guidance and psychological counseling, elementary school mathematics and German participated in the study on a volunteer basis.

Data Collection Tools

The data in the current study were collected with the 21st century learner skills use scale and the 21st century teacher skills use scale. Moreover, a personal information form developed by the researcher to collect demographics of the participants was used.

1) The 21st Century Learner Skills Use Scale: In the current study, the 21st century learner skills use scale developed by Orhan-Goksun (2016) was used. The scale is made up of four factors that are cognitive skills, autonomous skills, collaboration and flexibility skills and innovativeness skills and 31 items. The total variance explained by the factors is 34.75% and the internal consistency coefficient was found to be .89. The highest score to be taken from the 21st century learner skills use scale is 155 (31x5=155) and the lowest score to be taken is 31 (31x1=31). The scale is in the form of five-point Likert scale with the response options; "never (1), rarely (2), sometimes (3), usually (4), always (5)".

2) The 21st Century Teacher Skills Use Scale: In the current study, the 21st century teacher skills use scale developed by Orhan-Goksun (2016) was used. The scale is comprised of a total of 27 items subsumed under five factors that are administrative skills, technopedagogical skills, affirmative skills, flexible teaching skills and generative skills. The total variance explained by these five factors is 40.33% and the internal consistency coefficient calculated for the scale is .87. The 23rd item of the scale (I warn my students during the lesson) is reverse coded. The highest score to be taken from the 21st century teacher skills use scale is 135 (27x5=135) and the lowest score to be taken is 27 (27x1=27). The scale is a five-point Likert scale with the response options; "never (1), rarely (2), sometimes (3), usually (4), always (5)".

The scales were administered in the spring term of 2017-2018 academic year. Cronbach Alpha coefficients calculated for the 21st century learner skills use scale and the 21st century teacher skills use scale and their sub-dimensions are given in Table 1.

Table 1. Internal Consistency Reliability Coefficients for the Scales and their Sub-dimensions

Dimensions	Current Research	Orhan-Goksun (2016)
Cognitive skills	0,74	0,87
Autonomous skills	0,74	0,7
Collaboration and flexibility skills	0,74	0,67
Innovativeness skills	0,77	0,81
Learner skills (Total)	0,79	0,89
Administrative skills	0,65	0,85
Technopedagogical skills	0,68	0,62
Affirmative skills	0,72	0,41
Flexible teaching skills	0,8	0,75
Generative skills	0,67	0,71
Teacher skills (Total)	0,74	0,87

3. Personal Information Form: In this form developed by the researcher, there are questions aiming to elicit information about the participants such as their gender, department, academic achievement, experience of private tutoring, experience of using learner skills and teacher skills during practicum teaching.

Data Analysis: The quantitative data collected through the 21st century learner skills use scale and the 21st century teacher skills use scale was analyzed. In the analysis of the data, Frequencies, Percentages, Arithmetic Means, Correlation Coefficients, Independent Samples t-Test, One-Way Variance Analysis, Mann Whitney-U test and Kruskal Wallis test were used (Buyukozturk, 2007).

Findings / Results

In this section, the findings are presented under the sub-problems. The findings related to the first sub-problem: the descriptive findings related to the pre-service teachers' gender, department, experience of private tutoring, academic achievement, experience of using learner skills and teacher skills during practicum teaching are presented in Table 2.

Table 2. Frequencies and Percentages Related to the Pre-Service Teachers' General Demographics

		f	%
Gender	Female	275	70.3
	Male	116	29.7
	Total	391	100
Department (branch)	Turkish	48	12.3
	Pre-school	41	10.5
	Arts	12	3.1
	Elementary school mathematics	30	3.8
	Music	12	9.0
	German	15	11.5
	English	35	13.6
	Classroom	45	11.5
	Science and technology	53	13.6
	Social studies	41	10.5
	Guidance and psychological counseling	59	15.1
	Total	391	100
Experience of private tutoring	Yes	62	15.9
	No	327	83.6
	Total	391	100
Academic achievement	Lower than 2.00	89	22.8
	Between 2.01 and 3.00	213	54.5
	Between 3.01 and 3.50	76	19.4
	Between 3.51 and 4.00	13	3.3
	Total	391	100
Experience of using learner skills during practicum teaching	I am lacking	100	25.6
	Acceptable	201	51.4
	Well-qualified	90	23.0
	Total	391	100
Experience of using teacher skills during practicum teaching	I am lacking	104	26.6
	Acceptable	220	53.7
	Well-qualified	77	22.8
	Total	391	100

As can be seen in Table 2, of the participating pre-service teachers, 70.3% are females and 29.7% are males; 12.3% are from the department of Turkish teaching, 10.5% are from the department of pre-school teacher education, 3.1% are from the department of arts, 3.8% are from the department of elementary school mathematics, 9.0% are from the department of music, 11.5% are from the department of German teaching, 13.6% are from the department of English teaching, 11.5% are from the department of classroom teacher education, 13.6% are from the department of science and technology teaching, 10.5% are from the department of social studies, 15.1% are from the department of guidance and psychological counseling; 15.9% of them have the experience of private tutoring and 83.6% do not have the experience of private tutoring; 22.8% have the grade point average lower than 2.00, 54.5% have the grade point average between 2.01 and 3.00, 19.4% have the grade point average between 3.01 and 3.50 and 3.3% have the grade point average between 3.51 and 4.00; 25.6% of the pre-service teachers think that they are lacking in relation to the experience of using learner skills during practicum teaching, 51.4% think that they are acceptable and 23% think that

they are well-qualified; 26.6% of the pre-service teachers think that they are lacking in relation to the experience of using teacher skills, 53.7% think that they are acceptable and 22.8% think that they are well-qualified.

The findings obtained from the gender-based comparison of the pre-service teachers' opinions about 21st century learner and 21st century teacher skills are given in Table 3.

Table 3. Gender-based Comparison of the Pre-Service Teachers' Opinions about 21st Century Learner Skills and 21st Century Teacher Skills

Dimensions	Gender	n	$\overline{X}$	S	Sd	t	p
Cognitive skills	Male	116	4,049	,533	389	2,486	0,01
	Female	275	4,184	,471			
Autonomous skills	Male	116	3,696	,643	389	,453	0,65
	Female	275	3,727	,591			
Collaboration and flexibility skills	Male	116	3,395	,589	389	2,256	0,02
	Female	275	3,556	,667			
Innovativeness skills	Male	116	3,905	,836	389	,790	0,43
	Female	275	3,976	,805			
Administrative skills	Male	116	3,928	,546	389	2,782	0,00
	Female	275	4,091	,521			
Technopedagogical skills	Male	116	3,634	,471	389	2,200	0,02
	Female	275	4,091	,522			
Affirmative skills	Male	116	4,413	,595	389	3,638	0,00
	Female	275	4,624	,488			
Flexible teaching skills	Male	116	3,319	1,139	389	2,107	0,27
	Female	275	3,454	1,108			
Generative skills	Male	116	3,745	,873	389	3,190	0,00
	Female	275	4,076	,801			

p<0.05

As can be seen in Table 3, the female participants have better learner and teacher skills in the sub-dimensions of "*collaboration and flexibility skills"* (Male, $\overline{X}$= 3.39; Female, $\overline{X}$= 3.55), "*administrative skills"* (Male, $\overline{X}$= 3.92; Female, $\overline{X}$= 4.09), "*technopedagogical skills*" (Male, $\overline{X}$=3.63; Female, $\overline{X}$=4.09), "*generative skills"* (Male, $\overline{X}$=3.74; Female, $\overline{X}$=4.07). No significant gender-based difference was found in relation to "*autonomous skills*", "*innovativeness skills*" and "*flexible teaching skills*". However, Levene F test was used to investigate whether there is a gender-based significant difference for the sub-dimensions of "*cognitive skills"* and "*affirmative skills"*. As the group variances are not equal, Mann Whitney-U test was used to analyze. The obtained findings are presented in Table 4.

Table 4. Mann Whitney-U Test Results for the Pre-Service Teachers' 21st Century Learner Skills and 21st Century Teacher Skills According to the Gender Variable

Dimensions	Gender	N	Mean Rank	Rank Sum	M.W.U	p
Cognitive Skills	Female	275	202,80	55769,00	14081,00	0,06
	Male	116	179,89	20867,00		
Affirmative Skills	Female	275	208,74	54269,50	12445,500	0,00
	Male	116	165,81	22366,50		

p<0.05

As can be seen in Table 4, a significant gender-based difference is seen in the sub-dimension of "*affirmative skills*". In the sub-dimension of "*affirmative skills",* the female pre-service teachers have a skills mean score (SO=208.74) higher than that of the male pre-service teachers (SO=165.81). On the other hand, no gender-based significant difference was found in the sub-dimension of "*cognitive skills*".

The findings obtained from the comparison of the pre-service teachers' 21st century learner skills and 21st century teacher skills on the basis of the department variable are given in Table 5.

Table 5. Results of the Department-based Variance Analysis of the Pre-Service Teachers' 21st Century Learner Skills and 21st Century Teacher Skills

Dimensions	Source of Variance	Sum of Squares	Sd	Mean Square	F	p
Cognitive skills	Between-groups	4,343	10	,434	1,819	0,05
	Within-groups	90,726	380	,239		
	Total	95,068	390			
Autonomous skills	Between-groups	9,610	10	,961	2,729	0,00
	Within-groups	133,822	380	,352		
	Total	143,432	390			
Collaboration and flexibility skills	Between-groups	17,232	10	1,723	4,452	0,00
	Within-groups	147,072	380	,387		
	Total	164,305	390			
Innovativeness skills	Between-groups	9,918	10	,992	1,516	0,13
	Within-groups	248,548	380	,654		
	Total	258,467	390			
Administrative skills	Between-groups	4,347	10	,435	1,548	0,12
	Within-groups	106,705	380	,281		
	Total	111,053	390			
Technopedagogical skills	Between-groups	6,572	10	,657	2,625	0,00
	Within-groups	95,149	380	,250		
	Total	101,721	390			
Affirmative skills	Between-groups	5,122	10	,512	1,859	0,04
	Within-groups	104,690	380	,276		
	Total	109,812	390			
Flexible teaching skills	Between-groups	33,837	10	3,384	2,835	0,00
	Within-groups	453,543	380	1,194		
	Total	487,380	390			
Generative skills	Between-groups	17,693	10	1,769	2,638	0,00
	Within-groups	254,873	380	,671		
	Total	272,565	390			

$p<0.05$

As can be seen in Table 5, the pre-service teachers' scores for 21st century learner skills and 21st century teacher skills vary significantly depending on the department variable in the sub-dimensions of "*autonomous skills", "collaboration and flexibility skills", "technopedagogical skills"*, "*affirmative skills", "flexible teaching skills*" and "*generative skills*". In order to find the source of the difference between the groups of different departments, Scheffe test was administered. Yet, as a result of this test, no significant difference was found between the mean scores of the students from different departments. Moreover, no significant difference was found for the sub-dimensions of "*cognitive skills"*, "*innovativeness skills"* and "*administrative skills*". Levene F test was also conducted to determine whether the mean scores of the pre-service teachers from different departments vary significantly depending on the department variable. As the between-groups variances were not found to be equal, Kruskal Wallis analysis was conducted. The obtained findings are presented in Table 6.

Table 6. The Results of Kruskal Wallis Test Conducted to Test Whether the Pre-Service Teachers' 21st Learner Skills and 21st Century Teacher Skills Vary Significantly Depending on the Department Variable

Dimensions	Department	N	Mean Rank	sd	Chi-square	p	Significant difference
Affirmative skills	Turkish	48	209,26	10	20,789	0,02	Arts>Science-technology> Social studies> Turkish> English> Classroom> German> Pre-school> Guidance and psychological counseling >Elementary math>Music
	Pre-school	41	180,57				
	Arts	12	250,17				
	Elementary math	30	166,72				
	Music	12	140,88				
	German	15	187,80				
	English	35	200,46				
	Classroom	45	195,24				
	Science technology Social studies	53	231,67				
	Guidance and psychological counseling	41	211,70				
		59	168,08				

p<0.05

As can be seen in Table 6, the pre-service teachers' 21st century skills mean scores vary significantly depending on the department variable in the sub-dimension of "*affirmative skills*" [X^2 (10)=20.789, p<0.05]. When the mean ranks of the groups are considered, it is seen that the highest mean score belongs to the students from the department of arts (SO=250.17) in the sub-dimension of "*affirmative skills*". They are followed by the students from the department of science and technology (SO=231.67), the students from the department of social studies (SO=211.70), the students from the department of Turkish (SO= 209.26), the students from the department of English (SO=200.46), the students from the department of classroom teacher education (SO=195.24), the students from the department of German (SO=187.80), the students from the department of pre-school teacher education (SO=180.57), the students from the department of guidance and psychological counseling (SO=168.08), the students from the department of elementary school math teaching (SO=166.72) and the students from the department of music (SO=140.88.

The findings obtained from the academic achievement-based comparison of the pre-service teachers' 21st century learner and 21st century teacher skills are presented in Table 7.

Table 7. The Results of the Variance Analysis Conducted to Test Whether the Pre-Service Teachers' 21st Century Learner Skills and 21st Century Teacher Skills Scores Vary Significantly Depending on the Academic Achievement Variable

Dimensions	Source of Variance	Sum of Squares	Sd	Mean Square	F	p
Cognitive skills	Between-groups	2,707	3	0,902	3,781	0,01
	Within-groups	92,361	387	0,239		
	Total	95,068	390			
Autonomous skills	Between-groups	0,290	3	0,097	0,262	0,85
	Within-groups	143,142	387	0,370		
	Total	143,432	390			
Collaboration and flexibility skills	Between-groups	1,380	3	0,460	1,093	0,35
	Within-groups	162,925	387	0,421		
	Total	164,305	390			
Innovativeness skills	Between-groups	1,788	3	0,596	0,899	0,44
	Within-groups	256,679	387	0,663		
	Total	258,467	390			
Administrative skills	Between-groups	2,149	3	0,716	2,545	0,05
	Within-groups	108,904	387	0,281		
	Total	11,053	390			
Technopedagogical skills	Between-groups	0,722	3	0,241	0,922	0,43
	Within-groups	100,999	387	0,261		
	Total	101,812	390			
Affirmative skills	Between-groups	5,001	3	1,667	6,155	0,00
	Within-groups	104,811	387	0,271		
	Total	109,812	390			
Flexible teaching skills	Between-groups	0,801	3	0,267	0,212	0,88
	Within-groups	486,579	387	1,257		
	Total	487,380	390			
Generative skills	Between-groups	6,045	3	2,015	2,926	0,03
	Within-groups	266,521	387	0,689		
	Total	272,565	390			

p<0.05

As can be seen in Table 7, the pre-service teachers' 21st century learner skills and 21st century teacher skills scores vary significantly depending on the academic achievement variables in the sub-dimensions of *"cognitive skills*", "*affirmative skills"* and "*generative skills*". In order to find the source of the between-groups difference, Sheffe test was conducted. The results of Scheffe test revealed that the pre-service teachers with a grade point average lower than 2.00 ($\overline{X}$ =3.99) need more learner skills than the pre-service teachers with a grade point average between 3.01 and 3.50 in terms of the learner skills' sub-dimension of "*cognitive skills"*. Moreover, it was found that the pre-service teachers with a grade point average lower than 2.00 ($\overline{X}$ =3.77) need more teacher skills than the pre-service teachers with a grade point average between 3.51 and 4.00 ($\overline{X}$ =4.34) in terms of teacher skills' sub-dimension of "*generative skills"*.

No significant difference was found for the other sub-dimensions. In order to determine whether the pre-service teachers' *"affirmative skills"* vary significantly depending on the academic achievement variable, Levene F test was run. As the group's variances were not found to be equal, Kruskal Wallis analysis was conducted. The obtained findings are presented in Table 8.

Table 8. The Results of Kruskal Wallis Test Conducted to Determine Whether the Pre-Service Teachers' 21st Century Learner Skills and 21st Century Teacher Skills Scores Depending on the Academic Achievement Variable

Dimensions	Academic Achievement	N	Mean Rank	Sd	Chi-square	p	Significant difference
Affirmative skills	(A) lower than 2	89	167,72	3	11.447	0,01	C-A, C-B, C-D, D-A, D-B, B-A
	(B) between 2.1 and 3	213	196,92				
	(C) between 3.1. and 3.5	76	223,41				
	(D) between 3.51 and 4	13	214,23				

p<0.05

As can be seen in Table 8, the pre-service teachers' 21st century teacher skills scores vary significantly depending on the academic achievement variable in the sub-dimension of "*affirmative skills* [X^2 (3)=11.447, p<0.05]. When the between-groups means are considered, it is seen that the pre-service teachers with a grade point average between 3.01 and 3.50 have the highest "*affirmative skills*" mean score (SO=223.41). The pre-service teachers with a grade point average lower than 2.00 have a low "*affirmative skills*" mean score (SO=167.72).

The findings obtained from the comparison of the pre-service teachers' 21st century learner and 21st century teacher skills on the basis of experience of private tutoring are given in Table 9.

Table 9. The Results of t-Test Conducted to Determine Whether the Pre-Service Teachers' 21st Century Learner Skills and 21st Century Teacher Skills Scores Vary Significantly Depending on the Variable of Experience of Private Tutoring

Dimensions	**Experience of private tutoring**	**N**	**$\overline{X}$**	**S**	**Sd**	**t**	**p**
Cognitive skills	Yes	62	4,240	,549	389	1,671	0,09
	No	329	4,126	,481			
Autonomous skills	Yes	62	3,876	,571	389	2,249	0,02
	No	329	3,688	,609			
Collaboration and flexibility skills	Yes	62	3,672	,634	389	2,173	0,03
	No	329	3,477	,648			
Innovativeness skills	Yes	62	4,064	,861	389	1,153	0,25
	No	329	3,934	,804			
Administrative skills	Yes	62	4,041	,563	389	0,029	0,97
	No	329	4,043	,528			
Technopedagogical skills	Yes	62	3,687	,561	389	0,576	0,56
	No	329	3,728	,501			
Affirmative skills	Yes	62	4,575	,642	389	0,217	0,82
	No	329	4,559	,508			
Flexible teaching skills	Yes	62	3,362	1,241	389	0,394	0,69
	No	329	3,424	1,094			
Generative skills	Yes	62	4,096	,824	389	1,218	0,22
	No	329	3,955	,837			

p<0.05

As can be seen in Table 9, the pre-service teachers' 21st century learner skills scores vary significantly depending on the experience of private tutoring in the sub-dimensions of "*autonomous skills*" (having the experience, $\overline{X}$= 3.87; not having the experience, $\overline{X}$= 3.68) and "*collaboration and flexibility skills*" (having the experience, $\overline{X}$=3.67; not having the experience $\overline{X}$= 3.47) in favor of the pre-service teachers having the experience of private tutoring. No significant difference was found for the other learner and teacher skills sub-dimensions.

Findings obtained from the comparison of the pre-service teachers' 21st century learner and 21st century teacher skills on the basis of their using learner skills during teaching practicum are given in Table 10.

Table 10. The Results of the Variance Analysis Conducted to Determine Whether the Pre-Service Teachers' 21st Century Learner Skills and 21st Century Teacher Skills Vary Significantly Depending on their Use of Learner Skills during Practicum Teaching

Dimensions	Source of Variance	Sum of Squares	Sd	Mean Square	F	p
Cognitive skills	Between-groups	5,786	2	2,893	12,572	0,00
	Within-groups	89,283	388	,230		
	Total	95,068	390			
Autonomous skills	Between-groups	5,047	2	2,524	7,075	0,00
	Within-groups	138,385	388	,357		
	Total	143,432	390			
Collaboration and flexibility skills	Between-groups	3,606	2	1,803	4,354	0,01
	Within-groups	160,698	388	,414		
	Total	164,305	390			
Innovativeness skills	Between-groups	6,494	2	3,247	5,000	0,00
	Within-groups	251,973	388	,649		
	Total	258,467	390			
Administrative skills	Between-groups	7,028	2	3,514	13,107	0,00
	Within-groups	251,973	388	,268		
	Total	111,053	390			
Technopedagogical skills	Between-groups	2,944	2	1,472	5,781	0,00
	Within-groups	98,777	388	,255		
	Total	101,721	390			
Affirmative skills	Between-groups	2,624	2	1,312	4,749	0,00
	Within-groups	107,188	388	,276		
	Total	109,812	390			
Flexible learning skills	Between-groups	12,154	2	6,077	4,961	0,00
	Within-groups	475,226	388	1,225		
	Total	487,380	390			
Generative skills	Between-groups	9,764	2	4,882	7,208	0,00
	Within-groups	262,801	388	,677		
	Total	272,565	390			

$p<0.05$

As can be seen in Table 10, the pre-service teachers' 21st century learner skills and 21st century teacher skills scores vary significantly depending on the use of learner skills during practicum teaching in all the sub-dimensions. In order to find the source of the between-groups difference, Scheffe test was conducted. According to the results of Scheffe test, it can be said that the pre-service teachers see themselves better in terms of the use of learner skills when compared to teachers skills during practicum teaching in the sub-dimensions of "*cognitive skills*" (I am lacking, $\overline{X} = 3.96$; well-qualified, $\overline{X} = 4.30$), "*autonomous skills*" (I am lacking, $\overline{X} = 3.53$; well-qualified, $\overline{X} = 3.84$), "*collaboration and flexibility skills"* (I am lacking, $\overline{X} = 3,39$; well-qualified, $\overline{X} = 3.66$), "*innovativeness skills* " (I am lacking, $\overline{X} = 3.80$; well-qualified, $\overline{X} = 4.10$), "*administrative skills"* (I am lacking, $\overline{X} = 3,85$; acceptable, $\overline{X} = 4,04$; well-qualified, $\overline{X} = 4.24$), "*technopedagogical skills"* (I am lacking, $\overline{X} = 3.60$; well-qualified, $\overline{X} = 3,85$), "*affirmative skills"* (I am lacking, $\overline{X} = 4.44$; well-qualified, $\overline{X} = 4.67$), "*flexible teaching skills*" (I am lacking, $\overline{X} = 3.20$; well-qualified, $\overline{X} = 3.70$), and "*generative skills*" (I am lacking, $\overline{X} = 3.79$; well-qualified, $\overline{X} = 4.23$).

Findings obtained from the comparison of the pre-service teachers' 21st century learner and 21st century teacher skills on the basis of their using teacher skills during teaching practicum are given in Table 11.

Table 11. The Results of the Variance Analysis Conducted to Determine Whether the Pre-Service Teachers' 21st Century Learner Skills and 21st Century Teacher Skills Vary Significantly Depending on their Use of Teacher Skills during Practicum Teaching

Dimensions	Source of Variance	Sum of Squares	Sd	Mean Square	F	p
Cognitive skills	Between-groups	5,741	2	2,871	12,469	0,00
	Within-groups	89,327	388	,230		
	Total	95,068	390			
Autonomous skills	Between-groups	4,894	2	2,447	6,853	0,00
	Within-groups	138,539	388	,357		
	Total	143,432	390			
Collaboration and flexibility skills	Between-groups	5,136	2	2,568	6,260	0,00
	Within-groups	159,169	388	,410		
	Total	164,305	390			
Innovativeness skills	Between-groups	3,511	2	1,756	2,672	0,07
	Within-groups	254,955	388	,657		
	Total	258,467	390			
Administrative skills	Between-groups	7,112	2	3,556	13,274	0,00
	Within-groups	103,941	388	,268		
	Total	111,053	390			
Technopedagogical skills	Between-groups	4,191	2	2,095	8,336	0,00
	Within-groups	97,530	388	,251		
	Total	101,721	390			
Affirmative skills	Between-groups	2,700	2	1,350	4,890	0,00
	Within-groups	107,112	388	,276		
	Total	109,812	390			
Flexible learning skills	Between-groups	9,083	2	4,541	3,684	0,02
	Within-groups	478,297	388	1,233		
	Total	487,380	390			
Generative skills	Between-groups	12,565	2	6,282	9,375	0,00
	Within-groups	260,000	388	,670		
	Total	272,565	390			

p<0.05

As can be seen in Table 11, the pre-service teachers' 21st century learner skills and 21st century teacher skills scores vary significantly depending on the use of teacher skills during practicum teaching in some the sub-dimensions. In order to find the source of the between-groups difference, Scheffe test was conducted. According to the results of Scheffe test, it can be said that the pre-service teachers see themselves better in terms of the use of teachers skills when compared to learner skills during practicum teaching in the sub-dimensions of "*cognitive skills*" (I am lacking, $\overline{X} = 3.96$; well-qualified, $\overline{X} = 4.30$), "*autonomous skills*" (I am lacking, $\overline{X} = 3.54$; well-qualified, $\overline{X} = 3.80$), "*collaboration and flexibility skills"* (I am lacking, $\overline{X} = 3.32$; well-qualified, $\overline{X} = 3.60$), *"administrative skills"* (I am lacking, $\overline{X} = 3.84$; well-qualified, $\overline{X} = 4.23$), "*technopedagogical skills"* (I am lacking, $\overline{X} = 3.58$; well-qualified, $\overline{X} = 3.88$), "*affirmative skills"* (I am lacking, $\overline{X} = 4.43$; well-qualified, $\overline{X} = 4.67$), "*flexible teaching skills*" (I am lacking, $\overline{X} = 3.18$; well-qualified, $\overline{X} = 3.61$) and "*generative skills*" (I am lacking, $\overline{X} = 3.72$; well-qualified, $\overline{X} = 4.28$). No significant difference was found in relation to the use of teacher skills during practicum teaching in the sub-dimension of *"Innovativeness skills*" (I am lacking, $\overline{X} = 3.85$; well-qualified, $\overline{X} = 4.12$).

Findings related to the second sub-problem: The results of the correlation analysis performed to determine the degree of the relationship between the pre-service teachers' 21st century learner skills and 21st century teacher skills scores are given in Table 12.

Table 12. Correlations between the Pre-Service Teachers' 21st Century Learner Skills and 21st Century Teacher Skills Scores

Dimensions	1	2	3	4	5	6	7	8	9	10	11
1.Cognitive	1										
2.Autonomous	.54**	1									
3.Collaboration and flexibility	.54**	.53**	1								
4.Innovativeness	.53**	.48**	.48**	1							
5.Learner skills Total	.90**	.77**	.77**	.67**	1						
6.Administrative	.62**	.36**	.39**	.39**	.59**	1					
7.Teknopedagogical	.52**	.44**	.45**	.52**	.58**	.68**	1				
8.Affirmative	.58**	.26**	.21**	.27**	.47**	.61**	.42**	1			
9.Flexible teaching	.24**	.19**	.35**	.18**	.30**	.41**	.38**	.20**	1		
10.Generative	.44**	.23**	.35**	.33**	.44**	.61**	.50**	.42**	.35**	1	
11.Teacher skills	.65**	.41**	.47**	.46**	.65**	.93**	.83**	.65**	.56**	.70**	1

Correlation significant at ** p< 0.01, * p< 0.05

As can be seen in Table 12, a significant correlation was found between the pre-service teachers' 21st century learner skills and 21st century teacher skills total scores. This correlation is positive and medium (r=0.65).

Discussion and Conclusion

In the current study, the aim was to determine the relationships between the pre-service teachers' use of 21st century learner skills and 21st century teacher skills. The pre-service teachers' use of 21st century learner skills and 21st century teacher skills vary significantly depending on the variables of gender, department, experience of private tutoring, use of learner skills during practicum teaching and use of teacher skills during practicum teaching.

When the pre-service teachers' use of 21st century learner skills was investigated on the basis of the gender variable, it was found that the female pre-service teachers' "*collaboration and flexibility skills"* are better than that of the male pre-service teachers. This finding may indicate that female pre-service teachers are more prone to working in teams and pay greater attention to collaboration than male pre-service teachers. In a study conducted by Yesilyurt (2010), no gender-based significant difference was found between the participating pre-service teachers' qualifications in terms of suitability for cooperation-based learning method. The reasons for the inconsistency between the finding of the current study and that of Yesilyurt (2010) may be because Yesilyurt's sampling is dominated by the students of Technical Education Faculty most of whose student population is made up of male students. In the research of Daghan et al. (2017), pre-service teachers stated that the learners of the 21st century should have collaborative working skills. No significant difference was found depending on the gender variable in the sub-dimensions of "*cognitive skills*", "*autonomous skills"*, "*innovativeness skills"* and "*flexible teaching skills*". When the pre-service teachers' use of 21st teacher skills was investigated on the basis of the gender variable, it was found that the female pre-service teachers have higher use of "*administrative skills", "technopedagogical skills"*, "*generative skills", "affirmative skills*". This might be because the female pre-service teachers have more positive attitudes towards the profession of teaching, they are more idealistic and they train themselves better. In the existing research, female pre-service teachers' attitudes towards the profession of teaching have been found to be higher (Aksoy, 2010; Sahin and Sahin, 2017; Ustuner, Demirtas and Comert, 2009). In a study by Orhan-Goksun (2016), the female pre-service teachers were found to have higher use of 21st century teacher skills than the male pre-service teachers. The findings of this study concur with the findings of the current study. On the other hand, in a study conducted by Gurultu, Aslan and Alci (2018) to investigate the elementary school teachers' use of 21st century teacher skills on the basis of the gender variable, a significant difference was found only for "*flexible teaching skills"* in favor of the male teachers. This study does not support the findings of the current study.

When the pre-service teachers' 21st century learner skills were investigated on the basis of the department variable, it was found that their "*cognitive skills", "autonomous skills", "collaboration and flexibility skills", "innovativeness skills"* vary significantly depending on the department variable. When the pre-service teachers' 21st century teacher skills were investigated on the basis of the department variable, it was found that while their *"administrative skills", "technopedagogical skills"*, "*flexible teaching skills*" and "*generative skills*" do not vary significantly depending on the department variable, "*affirmative skills"* vary significantly.

In terms of "*affirmative skills"*, the pre-service teachers from the department of arts see themselves better. In the study by Orhan-Goksun (2016), it was also found that the pre-service teachers most using 21st teacher skills are those from the department of fine arts in Balikesir University. Coklar (2008) reported that depending on the department variable, the educational technology standards vary in relation to social, ethical, legal and humanitarian issues. The pre-service teachers from the departments of computer and instructional technologies and arts were found to be more adequate than the pre-service teachers from the other departments.

When the pre-service teachers' 21st century learner skills were investigated on the basis of the academic achievement variable, it was found that their *"cognitive skills*" vary significantly depending on the academic achievement variable. It is seen that the pre-service teachers with a grade point average lower than 2.00 need more learner skills than the pre-service teachers with a grade point average between 3.01 and 3.50. This finding shows that the pre-service teachers with lower academic achievement have inadequate awareness of the processing and coding of information through cognitive processes and of the outputs emerging as a result of the operations taking place in mental processes. Daghan et al., (2017) found that among 21st century skills most strongly emphasized by the pre-service teachers come cognition-based skills to the fore. Doganay and Demir (2011) found that in all the dimensions of cognitive awareness, the cognitive awareness levels of the pre-service teachers having higher academic achievement were found be significantly higher than those of the pre-service teachers with lower academic achievement. Kana (2015) found that the pre-service Turkish teachers with a grade point average between 2.51 and 4.00 were found to be better at organizing the learning process than the pre-service Turkish teachers with a grade point average between 1.00 and 2.50. The findings of these studies concur with the findings of the current study. No significant difference was found in the other sub-dimensions.

When the pre-service teachers' 21st century teacher skills were investigated on the basis of the academic achievement variable, it was found that their "*generative skills*" and "*affirmative skills"* vary significantly depending on the academic achievement variable. In terms of "*generative skills*", the pre-service teachers with a grade point average lower than 2.00 need more teacher skills than the pre-service teachers with a grade point average between 3.51 and 4.00. This might be because of the difficulties experienced by the pre-service teachers with a lower grade point average in designing materials and using them in activities. These problems can be solved by teaching them how to develop versatile materials and how to use them in teaching-learning environment. The pre-service teachers with a grade point average between 3.01 and 3.50 were found to have the highest "*affirmative skills"*. On the other hand, the pre-service teachers with a grade point average lower than 2.00 were found to have lower "*affirmative skills*". This finding can be explained by the assumption that the pre-service teachers with lower academic achievement may feel inadequate in terms of content knowledge and pedagogical knowledge. Torun and Karamustafaoglu (2017) conducted a study on pre-service teachers from an education faculty and their mean content knowledge level was found to be 47.63%. This shows that their content knowledge competence is quite low. According to OSYM (2018) Teaching Content Knowledge Test (OABT) 2017 report, the raw score means of the examinees from the subject area tests varied from 11.82 to 34.88. According to this report, new graduates can correctly answer only half of the questions related to their own subject area.

In a study by Sural (2017), it was found that the pre-service teachers having 21st century skills also think that 21st century skills are important. Therefore, the pre-service teachers with low academic achievement first need to believe the importance of 21st century skills to acquire these skills. No significant difference was found in the other sub-dimensions.

When the pre-service teachers' 21st century learner skills scores were investigated on the basis of the experience of private tutoring, it was found that the scores of the pre-service teachers with the experience of private tutoring taken from the sub-dimensions of "*autonomous skills"* and "*collaboration and flexibility skills"* are higher than those of the pre-service teachers not having the experience of private tutoring. Teachers giving private tutoring find the opportunity of working with students from different age groups having different mental capacities and learning styles. Thus, they can see their weaknesses and strengths in terms of teaching skills. As a result, they can look for ways of enhancing their weaknesses. In a study conducted by Valtonen et al. (2017), the pre-service teachers were found to be viewing themselves as good at cooperation, team work and learning strategies. Sural (2017) reported that the pre-service teachers got the highest scores from the importance of life and career skills. This is followed by the importance of learning and innovativeness. The findings of these studies support the findings of the current study. No significant difference was found in the other learner and teacher sub-dimensions.

When the pre-service teachers' 21st century learner skills and 21st century teacher skills were investigated on the basis of using learner skills during practicum teaching, it was found that they vary significantly depending on using learner skills during practicum teaching in all the sub-dimensions. In this regard, it can be argued that the pre-service teachers trained themselves better at using learner skills in the sub-dimensions of "*cognitive skills*", "*autonomous skills*", "*collaboration and flexibility skills",* "*innovativeness skills*", "*administrative skills"* ,"*technopedagogical skills",* "*affirmative skills",* "*flexible teaching skills*" and "*generative skills"* during practicum teaching when compared to teacher skills. The pre-service teachers use 21st century learner skills in the process of planning, preparing and application of tools, materials and activities in the learning-teaching process. Thus, it can be argued that the pre-service teachers' using 21st

century learner skills during practicum teaching developed their learner skills. A pre-service teacher who is a good learner can also be a good teacher. Orhan-Goksun (2016) found that the pre-service teachers' use of learner skills is above the medium level. In addition, Cretu (2017) found that through practicum teaching, the pre-service teachers developed some of their 21st century skills such as communication, critical thinking, collaboration and creative learning skills. The findings of these studies concur with the findings of the current study.

Gunuc, Odabası and Kuzu (2013) subsumed 21st century learner characteristics under four main themes that are personal skills, research and information acquisition skills, creativity and career skills and technology skills. In a study by Daghan et al. (2017), the pre-service teachers defined themselves as individuals who can have access to information, are open to life-long learning, can think critically and creatively, have problem-solving skills, can establish effective communication, can use technology and have collaborative learning skills. The findings of these studies support the findings of the current study.

When the pre-service teachers' 21st century learner skills and 21st century teacher skills scores were investigated on the basis of their using teacher skills during practicum teaching, it was found that they vary significantly in all the sub-dimensions of learner skills. As for teacher skills, in only the sub-dimension of "*innovativeness skills*", no significant difference was found. This might be because of the presence of new technological tools and digital programs in many of the schools. Significant differences were found for the other sub-dimensions of teacher skills. Thus, it can be argued that the pre-service teachers trained themselves better at using teacher skills during practicum teaching in the sub-dimensions of "*cognitive skills*", "*autonomous skills*", "*collaboration and flexibility skills", "administrative skills*", "*technopedagogical skills"*, "*affirmative skills", "flexible teaching skills*" and "*generative skills*". During practicum teaching, pre-service teachers prepare instructional activities and materials and deliver lessons through these activities and materials, resulting in their gaining teaching experience. The pre-service teachers can see their weaknesses and strengths in terms of teaching skills. The pre-service teachers' use of teacher skills promotes the development of their learner and teacher skills. A pre-service teacher with good teacher skills will probably continuously develop himself/herself as a learner. Orhan-Goksun (2016) determined that the pre-service teachers use 21st century teacher skills above the medium level. Gurultu et al. (2018) found that the elementary school teachers' level of use of 21st century teacher skills is high. In addition to this, in Tsourapa's study (2018), many of the teachers were found to have positive attitudes towards 21st century skills. The findings of these studies concur with the findings of the current study. Daghan et al. (2017) found that the pre-service teachers pay great attention to 21st century learner skills, have adequate information and skills needed to organize the learning environment, are continuously learning and developing themselves, can serve as a guide for students along their learning process and have strong subject area knowledge.

In the current study, a positive and medium correlation as found between the pre-service teachers' 21st century learner skills and 21st century teacher skills total scores (r=0.65). Orhan-Goksun (2016) found significant and positive correlations between the sub-dimensions of 21st century learner skills and 21st century teacher skills.

As a result, the current study shows that the pre-service teachers accomplished learning outcomes in general complying with the 21st century learner skills and the 21st century teacher skills. The female pre-service teachers' use of the 21st century learner skills in terms of collaboration and flexibility skills and use of the 21st century teacher skills in terms of administrative skills, technopedagogical skills, generative skills and affirmative skills is higher than that of the male pre-service teachers. The pre-service teachers from the department of arts see themselves better than the pre-service teachers from the other departments in terms of using the affirmative skills, a set of 21st century teacher skills. The cognitive skills, a set of 21st century learner skills, and the generative skills and affirmative skills, two sets of 21st century teacher skills, of the pre-service teachers having a grade point lower than 2.00 were found to be relatively lower. The 21st century learner skills mean score of the pre-service teachers having the experience of private tutoring was found to be higher than that of the pre-service not having the experience of private tutoring in relation to autonomous skills and flexibility skills. The 21st century learner skills and 21st century teacher skills mean scores of the pre-service teachers utilizing learner skills during their practicum teaching at schools were found to be higher in all the sub-dimensions. The use of the 21st century learner skills was found to be higher for the pre-service teachers making use of the teacher skills during their practicum teaching in relation to cognitive skills, autonomous skills, collaboration and flexibility skills and their use of the 21st century learner skills was found to be higher in relation to administrative skills, technopedagogical skills, affirmative skills, flexible teaching skills, generative skills. A positive and moderate correlation was found between the pre-service teachers' 21st century learner and 21st century teacher skills.

In light of the research findings, some suggestions can be made: Activities can be conducted to enhance the male pre-service teachers' attitudes and motivation towards the profession of teaching so that their teacher skills can be fostered. In order to improve pre-service teachers' affirmative skills at education faculties, supplementary learning activities can be organized. Education faculties can be equipped with new technological tools such as smart boards, documentary cameras for pre-service teachers to make more effective and efficient use of the 21st century learner skills. Faculty members working at education faculties carry out educational and instructional activities do develop pre-service teachers' 21st century learner and teacher skills. New research can be designed to elicit what these activities

are. Elective course can be incorporated into the curriculums of education faculties related to the use of learner and teacher skills.

Experimental studies can be conducted to enhance pre-service teachers' 21st learner and 21st century teacher skills. The 21st century learner skills and the 21st century teacher skills of pre-service teachers attending different education faculties located across Turkey can be compared. The current study was conducted on senior students. Studies can be conducted focusing on different departments and grade levels.

The pre-service teachers participating in the current study have been educated according to the 2006 teacher training program. In 2018-2019 academic year, a new teacher training program was put into effect in the undergraduate programs. The 21st learner skills and the 21st century teacher skills of the pre-service teachers educated according to the new program can be investigated.

The 21st century learner skills and 21st century teacher skills of the teachers working in state schools of the Ministry of National Education in Turkey can be investigated in relation to various variables. In-service teacher training programs can be organized about the topics needed by teachers.

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