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An investigation of the 21st century skills use of university students in Turkey

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Abstract

This study aims to investigate the 21st century skills use of university students. The study was designed in a relational survey model. The study group consisted of 244 undergraduate students studying in different departments of an educational faculty of a state university in Turkey and determined by a random sampling method. The data in the study were collected via "21st century learner scale" developed by Orhan Goksun & Kurt (2017) and analyzed with the help of parametric tests and discussed based on the variables such as gender, grade level, department, and academic achievement. Some of the findings are as follows: The students generally apply cognitive and innovation skills; but sometimes autonomous and collaboration/ flexibility skills. Female students have higher cognitive skills, which makes a significant difference from male students. On the other hand, there is no gender-based significant difference in terms of other skills. Considering department-based differences, there is only one significant difference in favor of the students at the classroom-teaching department in the collaboration and flexibility dimension. The analyses considering the class level shows the higher the grade level is, the higher level of 21st century skills the students have. Lastly, there is a linear relationship between skill scores and the academic achievement scores of the students. Based on the results of the study, it can be suggested that effective teaching/learning methods in gaining 21st century skills be determined/applied. In addition, necessary precautions should be made to enable students to gain autonomous and innovative skills as well as collaboration and flexibility skills, especially in curriculum development studies in the context of higher education.

Keywords: Autonomous skills; Cognitive skills; Collaboration and flexibility skills; Higher education; Innovation skills; 21st century skills

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1. Introduction

Nowadays changes in science, technology, economy, society happen at a blinding speed, which increases the volume of knowledge and decreases its validity duration. This fast changing knowledge and other developments cause some discussion about how to prepare individuals for the future. It is widely accepted preparing students for work, citizenship, and life in the 21st century is a complicated task (Asia Society, 2012). In other words, today, individuals involved in by education are considered equipped with the skills of the 21st century (Toprak, Derin & Guclu, 2020). The institutions responsible for this task are mainly educational institutions and their priority must be to provide a quality education where students can graduate equipped with the basic skills that will enable them to participate fully in society (OECD, 2015). Educators, education ministries and governments, foundations, employers, and researchers refer to these abilities with various terms including 21st century skills, higher-order thinking skills, basic learning outcomes, deeper learning outcomes, and complex thinking and communication skills (Asia Society, 2012; Puncreobutr, 2016). However, interest in these skills is not new. For example, for more than 40 years, the researchers at Harvard University's Project Zero have been studying how students learn and how to teach these skills (Asia Society, 2012). In the last decade of the 20th century, Barnett (1992) explained the aims of higher education as supporting lifelong learning, developing individuals' autonomy and integrity, helping them to create intellectual skills and perspectives, and improving critical thinking, which are directly related to so-called 21st skills. In short, roots of the skills as required qualifications for the 21st century individuals date back earlier times as Hayırsever & Kalaycı (2017) emphasized. However, there has certainly been increasing interest in these skills and also revealed numerous studies/reports that seek to identify and categorize them (Ananiadou & Claro, 2009; Beers, 2011; Bybee, 2009; Kay, 2010; Kogce, Ozpınar, Mandacı Sahin, & Aydogan Yenmez, 2014; NEA, 2011; Orhan Goksun & Kurt, 2017; P21, 2009; TUSIAD, 2012; Wagner, 2008).

Table 1: Categorization of 21 century skills*

Skills	Cognitive	Autonomous	Collaboration& Flexibility	Innovative
Binkley et al. (2010)	-Critical Thinking -Problem Solving -Information, Literacy, Knowledge -Learning To Learn	-Decision Making -Metacognition -Personal / Social Responsibility	-Communication -Collaboration -Team Work	-Creativity -Innovation
Kay (2010)	-Critical Thinking -Problem Solving -Use of Information -Media Literacy	-Entrepreneurship -Leadership -Responsibility	-Communication -Collaboration -Flexibility -Adaptability	-Creativity -Innovation -Technology -Literacy -Productivity
Partnership 21 (2009)	-Critical Thinking -Problem Solving -Information Literacy	-Initiative -Self-Direction -Productivity -Accountability -Leadership -Responsibility	-Communication -Collaboration -Flexibility -Adaptability -Social/Cross-Cultural Skills	-Creativity -Innovation -Information, Communications, Technology
Trilling & Fadel (2009)	-Critical Thinking -Problem Solving	-Professionalism	-Oral Com. -Written Com. -Team Work -Work Ethic -Collaboration	-Technology
Van Laar et.al. (2017)	-Info. Management -Communication -Critical Thinking -Problem Solving	-Self-Direction -Lifelong Learning	-Cultural Awareness -Ethical Awareness -Collaboration	-Flexibility -Creativity -Technical
Wagner (2008)	-Critical Thinking -Problem Solving -Accessing& Analyzing Information	-Initiative -Entrepreneurialism	-Collaboration -Leadership -Agility -Adaptability -Oral/Written Com.	-Curiosity -Imagination
Wrahatnolo (2018)	-Critical Thinking -Problem Solving -Information Literacy	-Planning -Initiative -Self-Management -Entrepreneurship -Accountability -Lifelong Learning -Leadership -Responsibility	-Flexibility -Adaptability -Social & Cultural Interactions -Collaborative Teamwork Communication	-Productivity -Creative Thinking -InnovativeThinking -Media Literacy -Info. Technology
Wynekoop &Walz (2000)	-Analytical Thinking -Abstract Thinking -Problem Solving		-Team Work -Leadership	-Creativity

*Source: The table has been structured by the researchers.

Various studies have determined 21st skills and called/categorized them differently. However, these skills and their categorizations are mainly in line with the categorization made by Orhan Goksun & Kurt (2017), which is used as the sub-titles in Table 1. Nearly all of the listed skills in different studies mentioned in the Table can be grouped using that categorization. For this reason, the categorization by Orhan Goksun & Kurt (2017) were used on the analyses and discussions of that study. As Table 1 depicts, they group the skills as cognitive skills, autonomous skills, collaboration and flexibility skills, and innovation skills. *Cognitive skills* are related to the processing and coding of information in mental processes and awareness of the processes that occur in mental processes. *Autonomous skills* describe the autonomous learning skills that emerge with the integration of self-management, self-control, individual or group working skills. *Collaboration and flexibility skills* point to the success of cooperative activities and to make learning environments flexible by expanding them. *Innovation skills* are restricted to adapt to new technologies.

Individuals need to obtain these skills to thrive in the world (Bialik & Fadel, 2015). Studies have shown that these skills are important for deep understanding and applicability for the real world, academic success, success at work, adjusting to change, keep learning (Harris, 2015; Kay, 2010; Simsek & Ilhan, 2019). Being aware of that fact, in many educational systems, comprehensive reforms have been conducted in their curricula, instruction, and assessment to prepare individuals better for the social and professional life (Schleicher, 2012). Furthermore, many universities, as the last step of formal education include so-called 21st skills and related skills in their mission/vision statements (Gazi, Ankara, Hacettepe universities, etc.) (Hayırsever & Kalaycı, 2017) and they are expected to develop curricula so that they can support their students in acquiring these skills. In this process, the first step should be an investigation of the 21st century skills use of university students to determine the level of their needs. The primary goal of a curriculum is to meet learners for their current needs, in that study 21st century skills. To reach that goal, needs analysis defining deficiencies between desired and current levels becomes a mandatory phase and plays a crucial role in the process of curriculum development. That study carries importance to present evidence based data for curriculum development studies. It is also essential for contributing to the literature by presenting a detailed view of university students' use of 21st century skills.

This study aims to investigate the 21st century skills use of university students. To this end, the level of students' 21st century skills use was investigated and compared based on their gender, departments, grade levels, and academic achievement.

2. Method

2.1. Model

The model of the study is a relational survey model aiming to determine the existence and/or degree of a correlation between the level of 21st century skills and some other variables, namely gender, department, grade levels, and academic achievement scores of university students (Karasar, 2014).

2.2. Participant (subject) characteristics and sampling procedures

The universe generally in quantitative studies, is an abstract concept that is easy to define but difficult to reach. On the other hand, the term "restricted universe (study group of the research)" which consists of the accessible and concrete samples (Karasar, 2014; Buyukozturk et al., 2012) is preferred widely. From the restricted universe (a state

university in the middle of Turkey), the sample consisted of the 244 undergraduate students who attended to different departments of education faculty at a state university, selected through a simple random sampling method.

Table 2. Demographic information and distribution of students

Gender	**F**	**%**
Female	167	68,4
Male	77	31,6
Grade	**F**	**%**
Second	106	43,4
Third	52	21,3
Fourth	86	35,2
Department	**F**	**%**
Turkish	102	41,8
Mathematics	56	23,0
Social sciences	51	20,9
Classroom teaching	35	14,3
Total	**244**	**100,0**

As Table 2 shows, the sample consisted of 167 female and 77 male students, which resulted in a demographic spread of 68% female and 32% male because of the high number of the female in the restricted universe. Moreover, the sample consisted of second, third and fourth grade students. The first grade students were excluded because they were at the beginning of their university experience. Lastly, the sample comprised of students from the departments of classroom teaching, mathematics, Turkish, and social studies participated in the study on a volunteer basis.

2.3. Data collection tool

The data in the study were collected via the "21st century learner skills use scale" developed and proven as valid and reliable by Orhan Goksun & Kurt (2017). The scale involves four dimensions that are cognitive, autonomous, collaboration, and flexibility and innovation skills and 31 items. The scale is in the form of a five-point Likert scale ranging "Never (1), Rarely (2), Sometimes (3), Generally (4), Always (5)". The total variance explained by the factors is 34.75% and the internal consistency coefficient was found to be 0,89 by Orhan Goksun & Kurt (2017).

In that study, the reliability coefficient of this scale was re-calculated and found as 0,891, and concluded that the scale is a reliable one for determining skills. Besides, since the target group and the sample group of the scale coincided with the sample of the current study, there was no need for revalidation and confirmatory factor analysis.

2.4. Data collection and analysis

The scales were administered in the spring term of the 2017-2018 academic year. It took nearly two weeks to obtain all the data because of the variance of the sampling. The collected data were subjected to comparative analysis based on gender, grade level, departments attended, and academic achievement scores.

Due to the normal distribution of the data (Test(z)= ,0991; kurtosis= - 0,197; skewness= -0,011), Independent Sample T-test from parametric tests and One-Way Analysis of Variance (ANOVA) for multiple comparisons were performed in addition to descriptive statistics such as frequency, percentage. LSD test was also applied to determine the source of the difference when necessary. Accepting the significance level as 0.05, the analyses of quantitative data were performed comparatively.

For interpretation and evaluation of the data, the calculated ranges (n-1/n) given in Table 3 were used (Tasdemir, 2003; Tekin, 2002).

Table 3. Calculated ranges (n-1/n)

Preferences	**Ranges**
Always	4,20-5,00
Generally	3,40-4,19
Sometimes	2.60-3,39
Rarely	1,80-2,59
Never	1,00-1,79

While determining the academic achievement status of the students; the scores were coded according to the following score ranges over the 4-point system specified in the data collection tool, and the analyses were made according to ranges as the followings;

failed (1,99 and below), Intermediate (2,00 - 2,49), Good (2,50 – 2,99), and Successful (3,00 and above).

3. Findings

3.1. The Status of the 21st Century Skills Use of University Students

The data obtained from the scale were examined, and the status of the 21st century skills use of university students are presented in Table 4.

Table 4. The status of 21st century skills use of university use in general and the dimensions

Number of Students	Cognitive	Autonomous	Collaboration & Flexibility	Innovation	**Mean**
244	3,95	3,26	3,15	3,57	**3,48**

Table 4 shows the scores of the cognitive and innovation skills dimensions are at the level of generally, and in another expression, these skills are close to the desired level. On the other hand, the scores regarding the autonomous and collaboration/flexibility dimensions are at the sometimes level, which shows these skills of the students need to be improved. Lastly, the general mean score shows the average of the 21st century skill use scores are at the level of generally.

3.2. Gender-based Comparison of the 21st Century Skills Use of University Students

A gender-based comparison of the status of students' using the 21st century skills was made via the independent sample t-test, and the findings obtained are presented in Table 5.

Table 5. Gender-based distribution of the students' 21st century skills use

Dimensions	Gender	N	$\overline{X}$	sd
Cognitive	Female	167	4,0321	,43900
	Male	77	3,7662	,53207
Autonomous	Female	167	3,2285	,64381
	Male	77	3,3333	,66227
Collaboration/Flexibility	Female	167	3,2006	,73211
	Male	77	3,0260	,74293
Innovation	Female	167	3,5299	,97050
	Male	77	3,6558	,85555
Mean	Female	167	3,4978	,49735
	Male	77	3,4453	,44329

According to Table 5, both male and female students have the highest scores in the cognitive skills dimension. Within the same dimension, female students' cognitive skill use score ($\overline{X}$ = 4.0321) is higher than men's and it is the highest in all dimensions. In addition, the average scores according to gender ($\overline{X}$ female = 3.4978; $\overline{X}$ male = 3.4453) are at the level of "generally". In other words, female and male students included in the

study indicated they "generally" use the skills. To find out whether this difference is significant or not, the T-test was conducted and the results were illustrated in Table 6.

Table 6. Differences of students' scores about 21st century skills use

Dimensions	Gender	N	$\overline{X}$	ss	sd	t	p
Cognitive	Female	167	4,0321	,43900	242	4,104	**,000**
	Male	77	3,7662	,53207			
Autonomous	Female	167	3,2285	,64381	242	-1,171	,243
	Male	77	3,3333	,66227			
Collaboration/	Female	167	3,2006	,73211	242	1,724	0,86
Flexibility	Male	77	3,0260	,74293			
Innovation	Female	167	3,5299	,97050	242	-,977	,330
	Male	77	3,6558	,85555			
Mean	Female	167	3,4978	,49735	242	,791	,430
	Male	77	3,4453	,44329			

Based on the comparison made based on the gender of the students, the differences in scores between female and male students in both the general means of the scale and the dimensions excluding cognitive skills are not significant. The only significant difference in the cognitive domain is in favor of female students ($t(242) = 4.104$, $p < .05$).

3.3. Grade level-based Comparison of the 21st Century Skills Use of University Students

A grade level-based comparison of the status of students' using the 21st century skills was made via the independent sample t-test, and the findings obtained are presented in Table 7.

Table 7. Grade level-based distribution of the students' 21st century skills use

Dimensions	Grades	N	$\overline{X}$	sd
Cognitive	2	106	3,9134	,47817
	3	52	4,0600	,45661
	4	86	3,9234	,50594
	Total	244	3,9482	,48530
Autonomous	2	106	3,1698	,65222
	3	52	3,3878	,65240
	4	86	3,2984	,63715
	Total	244	3,2616	,65016
Collaboration/ Flexibility	2	106	3,0519	,67195
	3	52	3,0705	,78822
	4	86	3,3062	,76691
	Total	244	3,1455	,73850
Innovation	2	106	3,5094	,89969
	3	52	3,4423	1,02734
	4	86	3,7209	,91267
	Total	244	3,5697	,93583
Mean	2	106	3,4111	,45123
	3	52	3,4901	,49350
	4	86	3,5622	,50003
	Total	244	3,4812	,48066

Table 7 shows there is a differentiation between the scores of the students based on their grade levels. The highest score of the dimensions is the cognitive domain scores, and it belongs to the students attending the 3rd grade ($\overline{X}$ = 4,0600). On the other hand, it is noteworthy that the skill use scores of students in the collaboration and flexibility dimension ($\overline{X}$ = 3,0705) at the same grade level is one of the lowest scores. In addition, it is seen that the general average scores of skill use increase as the grade level increases. To find out whether the difference between the scores is significant, One-Way Analysis of Variance (ANOVA) was conducted and the results are presented in Table 8.

Table 8. One-Way Analysis of Variance (ANOVA) results for grade level-based distribution of the status of students' using the 21st century skills

	Source of Variance	**SS**	**df**	**MS**	**F**	**p**
Cognitive	Between-groups	,831	2	,415	1,774	,172
	Within-groups	56,400	241	,234		
	Total	57,230	243			
	Between-groups	1,838	2	,919	2,196	,113

Autonomous	Within-groups	100,879	241	,419		
	Total	102,717	243			
Collaboration/ Flexibility	Between-groups	3,442	2	1,721	3,213	**,042**
	Within-groups	129,087	241	,536		
	Total	132,529	243			
Innovation	Between-groups	3,196	2	1,598	1,837	,162
	Within-groups	209,620	241	,870		
	Total	212,816	243			
Mean	Between-groups	1,089	2	,545	2,384	,094
	Within-groups	55,052	241	,228		
	Total	56,141	243			

According to Table 8, the students' 21st century skill use scores do not differ significantly based on their grade levels. However, only the scores of the collaboration and flexibility dimension create a significant difference in their grade levels (F (241) = 3,213, p <.05). The results of the multiple comparisons (LSD) made to understand the source of the difference are presented in Table 9.

Table 9. Results of multiple comparisons (LSD) of the scores to grade level results

Dependent Variable	(I) grade levels	(J) grade levels	Mean of Differences (I-J)
Collaboration and Flexibility	2	3	-,01863
		4	-,25431(*)
	3	2	,01863
		4	-,23569
	4	2	,25431(*)
		3	,23569

* p<0.05

As seen in Table 9 is examined, there is a significant difference between the 4th grade students and the 2nd grade students in favor of the 4th grade students. This situation indicates that as the students' grade level increases, their collaboration and flexibility skills scores also increase.

3.4. Department-based Comparison of the 21st Century Skills Use of University Students

Department-based comparison of the status of students' using the 21st century skills was analyzed, and the findings obtained are presented in Table 10.

Table 10. Department-based distribution of the students' 21st century skills use

Dimension	Department	N	$\overline{X}$	sd
Cognitive	Social Sciences	51	3,9273	,46401
	Turkish	102	4,0081	,46745
	Math	56	3,8771	,48055
	Classroom Teac.	35	3,9176	,56856
		244	3,9482	,48530
Autonomous	Social Sciences	51	3,2876	,68319
	Turkish	102	3,3203	,70191
	Math	56	3,0982	,54752
	Classroom Teac.	35	3,3143	,57276
		244	3,2616	,65016
Collaboration/ Flexibility	Social Sciences	51	3,1699	,80656
	Turkish	102	2,9935	,75377
	Math	56	3,1756	,61086
	Classroom Teac.	5	3,5048	,66726
		244	3,1455	,73850
Innovation	Social Sciences	51	3,6373	,91694
	Turkish	102	3,4559	,98026
	Math	56	3,5446	,87009
	Classroom Teac.	35	3,8429	,90563
		244	3,5697	,93583
Mean	Social Sciences	51	3,5055	,50876
	Turkish	102	3,4444	,48352
	Math	56	3,4239	,43461
	Classroom Teac.	35	3,6449	,48225
		244	3,4812	,48066

When the scores of the students according to the departments are examined, it is seen that the highest score belongs to the cognitive skills dimension ($\overline{X}$ = 4.0081) and the lowest score belongs to the collaboration/flexibility skills dimension ($\overline{X}$ = 2.9935). Both the highest and lowest scores belong to the students who attend to the Turkish language-teaching department. On the other hand, the average score of students studying in the department of classroom teaching ($\overline{X}$ = 3,6449) is higher than the scores of the students in other departments. The average score of the students studying in the mathematics department ($\overline{X}$ = 3,4239) is seen as the lowest average score. To understand whether the difference among the scores based on the departments is significant or not, One-Way Analyses of Variance (ANOVA) were made and the results are presented in Table 11.

Table 11. One-Way Analyses of Variance (ANOVA) results for department-based distribution of the status of students' using the 21st century skills

	Source of Varience	SS	df	MS	F	Sig.
Cognitive	Between-groups	,704	3	,235	,996	,395
	Within-groups	56,527	240	,236		
	Total	57,230	243			
Autonomous	Between-groups	1,977	3	,659	1,570	,197
	Within-groups	100,740	240	,420		
	Total	102,717	243			
Collaboration / Flexibility	Between-groups	6,956	3	2,319	4,432	**,005**
	Within-groups	125,573	240	,523		
	Total	132,529	243			
Innovation	Between-groups	4,201	3	1,400	1,611	,187
	Within-groups	208,615	240	,869		
	Total	212,816	243			
Mean	Between-groups	1,290	3	,430	1,881	,133
	Within-groups	54,851	240	,229		
	Total	56,141	243			

Table 11 reveals that the students' scores do not differ significantly based on the departments except for the scores related to the Collaboration and Flexibility dimension. To find out the source of that difference related to Collaboration and Flexibility dimension ($F(240) = 4{,}432$, $p < .05$), the multiple comparison (LSD) analyses are made and presented in Table 12.

Table 12. Results of Multiple Comparisons (LSD) of the scores to departments

Dependent Variable	(I) Grade Levels	(J) Grade Levels	Mean of differences
Collaboration and Flexibility	Social Sciences	Turkish	,17647
		Mathematics	-,00566
		Classroom Education	-,33483(*)
	Turkish	Social Sciences	-,17647
		Mathematics	-,18213
		Classroom Education	-,51130(*)
	Mathematics	Social Sciences	,00566
		Turkish	,18213
		Classroom Education	-,32917(*)
	Classroom Education	Social Sciences	,33483(*)
		Turkish	,51130(*)
		Mathematics	,32917(*)

* $p<0.05$

According to Table 12, there is a significant difference in favor of the students in the classroom-teaching department. In other words, the students in the classroom-teaching department use higher skill levels in terms of collaboration and flexibility than the students in other departments included in the study.

3. 5. Academic Achievement Scores-Based Comparison of the 21st Century Skills Use of University Students

Academic achievement scores-based comparison of the status of students' using the 21st century skills were analyzed, and the findings obtained are presented in Table 13.

Table 13. Academic achievement scores-based on the distribution of students' 21st century skills use

Dimensions	Scores	N	$\overline{X}$	sd
Cognitive	Intermediate	53	3,8635	,50992
	Good	106	3,9190	,49279
	Successful	85	4,0374	,45072
Total		244	3,9482	,48530
Autonomous	Intermediate	53	3,2201	,68076
	Good	106	3,3192	,67812
	Successful	85	3,2157	,59474
Total		244	3,2616	,65016
Collaboration/ Flexibility	Intermediate	53	2,8396	,64547
	Good	106	3,2280	,77094
	Successful	85	3,2333	,70813
Total		244	3,1455	,73850
Innovation	Intermediate	53	3,3585	,95765
	Good	106	3,5896	,95817
	Successful	85	3,6765	,88205
Total		244	3,5697	,93583
Mean	Intermediate	53	3,3204	,50078
	Good	106	3,5139	,46183
	Successful	85	3,5407	,47459
Total		244	3,4812	,48066

Table 13 depicts that the highest score among the dimensions of the scale belongs to cognitive skills dimension and the students in the Successful category according to their academic achievement scores ($\overline{X}$ = 4,0374). On the other hand, the lowest score belongs to students in the autonomous dimension and the Intermediate category according to their academic achievement scores ($\overline{X}$ = 3,8635). One-Way Analysis of Variance (ANOVA) results made to understand whether the difference between the scores of the students based on the academic achievement scores is meaningful are presented in Table 14.

Table 14. One-Way Analysis of Variance (ANOVA) results for academic achievement scores-based distribution of the status of students' using the 21st century skills

	Source of Variance	SS	df	MS	F	Sig.
Cognitive	Between-groups	1,147	2	,573	2,464	,087
	Within-groups	56,084	241	,233		
	Total	57,230	243			
Autonomous	Between-groups	,622	2	,311	,734	,481
	Within-groups	102,095	241	,424		
	Total	102,717	243			
Collaboration/ Flexibility	Between-groups	6,336	2	3,168	6,050	,003
	Within-groups	126,194	241	,524		
	Total	132,529	243			
Innovation	Between-groups	3,375	2	1,688	1,942	,146
	Within-groups	209,440	241	,869		
	Total	212,816	243			
Mean	Between-groups	1,785	2	,892	3,956	,020
	Within-groups	54,356	241	,226		
	Total	56,141	243			

Table 14 reveals that the students' scores differ significantly for the mean and the Collaboration/ Flexibility dimension based on their academic achievement scores. To reveal the source of that calculated significant difference ($F(241) = 3{,}956$, $p < .05$) the multiple comparison (LSD) analyses are made and presented in Table 15.

Table 15. Results of multiple comparison (LSD) of the academic achievement scores.

Dependent Variable	(I) academic achievement scores.	(J) academic achievement scores	Mean of Differences (I-J)
Collaboration/ Flexibility	Intermediate	Good	-,38836(*)
		Successful	-,39371(*)
	Good	Intermediate	,38836(*)
		Successful	-,00535
	Successful	Intermediate	,39371(*)
		Good	,00535
Mean	Intermediate	Good	-,19351(*)
		Successful	-,22028(*)
	Good	Intermediate	,19351(*)
		Successful	-,02677
	Successful	Intermediate	,22028(*)
		Good	,02677

* $p<0.05$

According to Table 15, there is a significant difference in favor of the students in the Successful and Good groups. In other words, as the success level increases, students' skills use also increase.

4. Results and Discussion

In the current study, the use of the 21st century skills by university students was investigated and discussed comparatively based on their gender, grade level, department, academic achievement. The obtained results in the light of findings are discussed below.

The students generally apply cognitive and innovation skills, but sometimes autonomous and collaboration/ flexibility skills. In similar studies (Daghan et al., 2017; Gunuc, Odabası and Kuzu, 2013; Tican & Deniz, 2019; Valtonen et al., 2017), university students indicated that they have cognitive skills such as research and information acquisition skills, ability to access to information and emphasized their importance. Although cognitive skills are seldom taught explicitly, several studies conclude that schooling can promote cognitive skills (Finn et al., 2014). For that reason, it is expected for the students to have high level of cognitive skills when the students' educational backgrounds are taken into consideration. In terms of innovation skills, the study focuses on the university students' adaption to new technologies. The university students involved in the current study can be included in the so-called "z generation" born after the year 2000 (Sad & Donmus, 2017). For that reason, it is easy to adapt to new technologies and use them for the students. On the other hand, the students indicated they sometimes apply autonomous and collaboration / flexibility skills, which can be regarded as the below of the expected levels. There are some studies with contradictory findings to the current study. For example, Valtonen et al. (2017) found out university students regarded themselves as good at collaboration, teamwork and learning strategies. In another study by Daghan et al. (2017), it was emphasized university students have problem-solving and collaborative learning skills, and they have skills to establish effective communication. Tican & Deniz (2019) had also reached out that the

students generally use collaboration / flexibility skills. Although these studies have similar sampling group, the findings of these studies do not support the findings of the current study, which increases the importance of determining students' skill use. Because being autonomous and having cooperative / flexibility skills are two important skills to be successful at social, academic and professional life in 21st century and the future as Berger (2016) emphasized similarly, university students need to be supported to gains such skills.

Another result of this study is that female students have higher cognitive skills, which makes a significant difference from male students. On the other hand, no gender-based significant difference was found in some other studies conducted on similar sampling (Tican & Deniz, 2019; Yesilyurt, 2010). Considering department-based differences, there is only a significant difference in favor of the students at the classroom-teaching department in the collaboration and flexibility dimension. In our study, the difference in favor of classroom teaching department can be related to the student profile of this department. The difference in favor of classroom teaching department differs from other studies results. In Tican & Deniz's (2019) study including eleven different departments of educational faculty, they reached out no significant difference among the students' use of the skills in all dimensions. The analyses considering the class level indicate the higher the grade level is the higher level of 21st century skills the students use. The increasing skill use level is seen as a positive result of the effort of the university that constitutes the sample of the research to fulfil its function as in the studies conducted by some other researchers (Tican & Deniz, 2019; Zeybek, 2019). Lastly, there is a linear relationship between skill scores and the academic achievement scores of the students. As the students' academic achievement scores increase, their skill levels also increase. That can be discussed in two dimensions: First, the students who focus on their academic achievement and make effort for that use the skills more frequently. As the second way, when the students use the 21st century skills, they reach high level of academic success. For instance, Guclu (2019) emphasizes highly motivated students who are willing to be the part of society and entrepreneurship push up both cognitive skills at school and increase students' achievement in lifelong learning.

5. Conclusions and Suggestions

Along with other developments in the field of educational sciences, the necessity for university graduates to have the 21st century skills force to question and increase the quality of education at all levels of education systems, especially at the higher education level. There are plenty of studies on these skills in educational sciences and other related literature (Kay, 2010; Kogce, Ozpınar, Mandacı-Sahin, & Aydogan-Yenmez, 2014; NEA, 2011; TUSİAD, 2012; Wagner, 2008). However, determining the use of these skills by students at university level needs to be analyzed deeply because universities are accepted as the last step of formal education. Unfortunately, they may be the last chance to acquire 21st century skills for some students. To determine the skill use levels of students is the first step to take action to support students to acquire or/and improve the skills by developing proper curriculum/making changes on the existing curricula. In a wide study called as Strategic Curriculum Change in Universities by Blackmore and Kandiko (2012), curriculum studies at 26 universities in the UK, US, Australia, the Netherlands, South Africa, and Hong Kong were analyzed. That study reached out that some universities made curricular changes to include 21st century skills into curricula at higher education and three main ways to make curricular changes were determined. Firstly, they could be integrated into existing curriculum or embedded in new modules.

Secondly, they could become required elements made available through existing courses or new position. Lastly, they could be structures such as in core modules for all students or through distributed elective elements. It is clear from the current study findings, students are needed to support to acquire such skills, and applying one of the three ways determined by Blackmore and Kandiko (2012) can be a good way to support them.

In that study, university students were investigated in terms of cognitive, autonomous, collaboration and flexibility, innovation skills use. These results gave valuable insights for curriculum development and evaluation studies and for the education administrators and decision makers at universities. In this context, depending on the fact that the cognitive skills of the students are higher than the other skills, it is necessary to consider other skills in the new curriculum development studies, to form a new perspective and to investigate.

Depending on the results of the study, the following suggestions can be made; (i) to determine/apply teaching/learning methods that can be effective in gaining 21st century skills, (ii) to make necessary precautions in order to enable students to obtain autonomous and innovative skills as well as collaboration and flexibility skills, especially in curriculum development studies in the context of higher education. Thus, an important step can be taken in gaining the skills by the students and in fulfilling the duties of adapting to other developments taking place in the context of higher education.

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