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Research

Music Students' Use of Mobile Applications for Learning Purposes

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Original Research

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Abstract:

This paper analyzes the use of mobile applications for learning purposes by music education department students. The survey design was used as the research method. The Mobile Application Usage in Music Learning scale developed by the researcher was used as a data collection tool. After the validity and reliability studies were carried out, the scale was applied to 505 music education students from 5 universities. As a result of the research: It was found that the mobile application usage levels of the music education students were moderate, mobile application usage levels changed according to gender but did not change according to grade level, musical instrument type, and operating system used. At the end of the research, suggestions were made about the participant groups, the use of the scale, and mobile applications.

Keywords: Music education, scale development, mobile learning, mobile application.

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INTRODUCTION

Research on the use of mobile devices in education is increasing day by day. It can be said that mobile applications have a significant impact on the adoption and increase in the usage area of mobile devices. Mobile applications are mobile device-based software developed to assist users in performing certain tasks (Song & Kim, 2015). Music is one of the fields where experimental studies are conducted showing that mobile applications are an effective tool in the development of students' different musical abilities (Burton & Pearsall, 2016; Ng, Lui, & Kwok, 2015; Palazón & Giráldez, 2018). The focus of this study is to present the level at which future music educators use mobile applications, which have turned into a powerful learning tool.

With the addition of mobile devices to learning environments, it can be stated that physical limitations are eliminated and faster and more accessible learning environments are created. With mobile devices, it is possible to be included in the learning environment at any time and from any place. Pachler et al. (2010) stated that mobile devices will become the main tool in accessing information and self-expression, and therefore it would be beneficial to use them in educational environments. Herrington & Herrington (2007) emphasized that mobile technologies have the potential to change habits related to teaching-learning environments and provide the appropriate environment for authentic learning that requires high-level skills required by the 21st century. In the Unesco (2015) education report, it was reported that mobile technologies are the key to providing equal and quality service for everyone. Ventura (2017) stated that mobile technologies used by the teacher in a planned way are learning aids that allow the assimilated knowledge to be organized and integrated stably. Due to the stated benefits, since the beginning of the 2000s, interest in the use of mobile tools and technologies in education has increased in many countries and mobile learning has begun to be shown as the learning technology of the future (Çelik, 2013).

According to the 2018 ECAR mobile technology usage survey: laptops (94%), tablets (83%), and smartphones (53%) have a significant impact on higher education student achievement (Galanek, Gierdowski, & Brooks, 2018).

McQuiggan Kosturko et al. (2015) stated that mobile devices to be handled in the mobile learning environment should be portable, can be used on the go, content can be edited, and provide internet connection. Traxler (2010) states that it is not enough for the devices used in the concept of mobile learning to be just a mobile device or to be technologically advanced. He states that when determining the devices to be used, the systems, networks, and infrastructures that support them are as important as the devices themselves.

Many devices such as laptops, media players, gaming devices, cameras, audio recorders, tablets, smartphones are called mobile devices. Among all these devices, smartphones and tablet computers come to the fore, which have many features together.

Smartphones and tablets are distinguished from their competitors, such as hardware-powered laptops, with a significant difference. These devices can also be used on the go. For these reasons, it can be said that the use of smartphones and tablets in educational environments is more advantageous than other mobile devices.

Today's mobile devices have turned into devices that allow multi-purpose use with many advanced features. Features such as the expansion of their memories, the acceleration of internet connections, the increase in photo and video quality, the expansion of location features, the increase in both the number and quality of mobile applications can be shown as factors contributing to this transformation. With all these features, mobile learning tools can be easily incorporated into newer teaching approaches such as flipped classroom (Wong, 2016), blended learning (Borba et al., 2016), collaborative learning (Ilic, 2014), project-based learning (Chou et al., 2012), authentic learning (Burden & Kearney, 2016). Mobile learning has been used successfully in many fields such as language (Bayyurt et al., 2014), mathematics (Khoo, 2016), chemistry (Melo & Çomo, 2016), music (Debevc et al., 2020), history (Pegrum, 2019), physical education (Crawford & Fitzpatrick, 2015), and geography (Crompton, 2016). In addition, it is also useful in informal education areas by providing performance support (Cook & Santos, 2016; Dyson, 2014; Gu, 2016; Fahlman, 2014; Pimmer & Pachler, 2014). Mobile learning contributes positively to the motivation, creativity, comprehension, and comprehension levels of the learners (Kelekçi Olgun, 2018; Parsons, 2017; Steel, 2017).

In the literature, there are many studies in which mobile applications are used in music education. Birch (2017) examined the usability of the mobile application SoundCloud in music education. The study was conducted with 150 high school students. An institutional account has been opened and individual and collective recordings of music lessons have been uploaded to this account. Students were able to access these records whenever they wanted with their mobile devices. As a result of the research, it was determined that students' motivation, out-of-school learning activities, and self-confidence increased. Chen (2015) examined the effect of mobile application use on the development of aural skills. The research was conducted with 194 people using the Auralbook application. As a result of the study, it was concluded that the use of mobile applications contributed to motivation and musical skills. Chong (2019) examined the effect of the Harmonia-on-the-Go mobile application on students' music theory learning. The study was conducted with 37 high school students. As a result of the research, it was determined that the use of mobile applications contributed positively to the success and motivation of the students.

These studies show that mobile application support makes significant contributions to music learning. Participants in these studies used a mobile application for a specific purpose with the guidance of the researcher. So, do they have mobile application usage habits for learning purposes in their normal lives? Research to date has not yet determined the mobile application usage levels of music education students.

Today's music education students will take important roles in raising future musicians and music lovers. In higher education, it is aimed to bring students at the highest level that can meet the needs of society (MEB, 2018). In line with this purpose, it is aimed to train music teachers who are qualified and open to development in music education departments. Mobile learning (Özdamar Keskin, 2011), which is increasingly used and has become an interdisciplinary field, has the potential to be a powerful educational technology (Ekici, 2018). This study aims to examine the use of this potential by music education students.

Depending on the purpose of the research, the sub-problems to be answered are as follows:

1. What is the level of using mobile applications for learning purposes among the students of the music education department?
2. Do students' mobile application usage situations differ according to their gender, grade, musical instrument types, and the operating system they use?

METHOD

Research Model

A survey was used in this research. Büyüköztürk et al., (2016) define the survey model as follows: "research conducted on larger samples, generally compared to other studies, in which the views of participants on a subject or event or their interests, skills, abilities, attitudes, etc. are determined" (p. 177).

Participants

The study group consisted of undergraduate music education students of Gazi University, Marmara University, Uludağ University, Dokuz Eylül University, Necmettin Erbakan University in 2019-2020 academic year. The five oldest music education departments in Turkey, which were determined by the purposive sampling method, were included in the research. It was aimed to reach all enrolled students (YÖK, 2020). The distribution by universities is shown in Table 1.

Table 1

Distribution by Universities

University	N	%
Gazi	145	28,7
Marmara	105	20,8
Uludağ	89	17,6
Dokuz Eylül	90	17,8
Necmettin Erbakan	76	15,0
Total	505	100,0

Five hundred and five students participated in the study. The most participation was in Gazi University and the minimum participation was in Necmettin Erbakan University. Information on the number of students that can be reached is given in Table 2.

Table 2

Study Group

University	Enrolled	Reached	%
Gazi	236	145	61,4
Marmara	326	105	32,2
Uludağ	214	89	41,6
Dokuz Eylül	163	90	55,2
Necmettin Erbakan	189	76	40,2
Total	1128	505	44,8

As seen in the table, 1128 registered students were tried to be reached. Five hundred and five students who responded positively and participated in the research formed the study group. Approximately half of the targeted group has been reached.

Table 3

Demographic Information

		N	%
Gender	Female	271	53,7
	Male	234	46,3
Grade	1	124	24,6
	2	141	27,9
	3	134	26,5
	4	106	21,0
Musical Instrument Type	Turkish Music	127	25,1
	Western Music	378	74,9

In Table 3, information about 505 music students who responded positively and participated in the study is given. It can be said that a balanced distribution is realized, except for the musical instrument type.

This study, it was tried to examine the usage levels of mobile applications for learning purposes. In addition, the results were compared according to different variables. The explanation about the determined variables is presented below.

1. Musical Instrument Type: The music teaching undergraduate program in Turkey includes both Turkish and Western music lessons. So, does musical identity affect mobile application usage? For this, the mobile application usage levels of the students who play Turkish music and Western music instruments were compared.
2. Gender: Especially in technology-based research, the gender variable is questioned. It has been stated in many studies that males are more prone to technology. So, how is this situation in mobile application usage? For this reason, a comparison was made in the gender variable.
3. Operating System: Android and iOS are two operating systems that are widely used today. Both operating systems have their application markets. Do operating systems and the variety of applications they provide affect mobile application usage levels? In this context, usage levels were compared in the study according to the operating system variable.
4. Grade: Is the use of mobile applications for learning purposes acquired at the university or is it an individual situation? As the grade levels of the students increase, it is expected that their musical knowledge will increase. So, does this affect mobile application usage? For this reason, a comparison was made between grade levels.

Data Collection Tools

The Mobile Application Usage Scale in Music Learning was developed as a data collection tool in the research.

A literature review was conducted to determine the structural features and boundaries of the scale. First of all, it was tried to determine the types of mobile applications that can be used in music education. For this, literature (Demirtaş, 2019; Fulcher, 2017; Kell, Wanderley & Kit 2013; Khoury, 2017; Kocakaplan, 2018; Lehimler, 2019; Parasız, 2018; Webster & Williams, 2018) and mobile application markets, and music education undergraduate program were examined. There were 24 items in the draft form prepared.

Expert opinion was taken to ensure the content validity of the scale. Five of the seven experts work in music education, one in assessment and evaluation, and one in the Turkish language. After evaluations by experts, the number of items on the scale was reduced to 18.

The data collection tool consists of two parts. In the first part, there were eight factual questions to describe the demographic characteristics of the participants. In the second part, there were 18 items written in the form of behavioral statements. These items were created to determine the frequency of mobile application usage of the participants. The scale was

prepared in a five-point Likert (1932) type rating. The grading used in the scale is as follows: Never = 1, Rarely = 2, Sometimes = 3, Often = 4, Always = 5.

The scale was applied in three different universities to determine the validity and reliability of the measurement tool. Information about the group in which the scale development study was conducted is given in Table 4.

Table 4

Scale Development Study Group

		N	%
University	Atatürk	73	36,1
	İnönü	57	28,2
	Muğla	72	35,6
Gender	Female	132	65,3
	Male	70	34,7
Grade	1	59	29,2
	2	66	32,7
	3	40	19,8
	4	37	18,3
Musical Instrument Type	Turkish Music	64	31,7
	Western Music	138	68,3
Total		202	100

As seen in Table 4, 202 music education students participated in the scale development study. It is recommended to reach ten times the number of items in scale development studies (Field, 2018, p. 1013; Kline, 1994, p. 74). For this reason, it can be said that the number of 202 participants reached for the 18-item scale is sufficient.

To determine whether the scale is suitable for factor analysis, the sample adequacy test Kaiser-Meyer Olkin (KMO) (Can, 2016, p. 319) and Bartlett's Test of Sphericity, which determines whether the distribution is normal or not (Tavşancıl, 2014, p. 51), were used.

According to the results of the analysis, the KMO value was found to be 0.88. Kaiser (1974, p. 35) states that this value should be higher than 0.50 (0.90 excellent, 0.80 good, 0.70 moderate). The data were normally distributed according to the Bartlett test of sphericity (x^2=1585,955, p=0.00). According to these findings, it can be said that the prepared scale is suitable for factor analysis.

Exploratory Factor Analysis (EFA) was performed to determine the construct validity of the scale. As a rotation technique, the Promax rotation technique, which is stated to offer the best solution for factor analysis (Hendrickson & White, 1964), was used.

When the item factor loads were examined, the 12th item (0.365-0.325), which gave loads on both factors, was removed from the scale.

Table 5

Total Variance Explained

	Initial Eigenvalues			Rotation Sums of Squared Loadings
Component	**Total**	**% of Variance**	**Cumulative %**	**Total**
1	6,179	36,349	36,349	4,491
2	2,368	13,927	50,276	3,942
3	1,165	6,852	57,129	4,057
4	1,036	6,097	63,226	3,446
5	,817	4,804	68,030	

When Table 5 is examined, it is seen that the items belonging to the scale are grouped under four factors with an eigenvalue greater than 1. These four factors explain most of the variance (63,226%) of the scale.

Factor results after Promax rotation are as follows: first factor six items (11, 14, 15, 16, 17, 18), second factor four items (1, 2, 3, 4), third factor four items (7, 8, 9, 10), and the fourth factor is three items (5, 6, 13). The load values of the items are as follows: the first factor is between 0.571-0.861, the second factor is between 0.627-0.869, the third factor is between 0.421-0.769, and the fourth factor is 0.634-0.818. Factor naming was done as follows: 1- Support apps, 2- Western music apps, 3- Creativity apps, 4- Turkish music apps.

The dimensions of the scale were revealed by factor analysis. Factor naming was tried to be done according to the characteristics of the items it contains. Explanations about the determined groups are given below.

1. Support Apps: Music listening and video watching applications, social sharing applications where musical developments can be followed, applications used to access music materials, voice recorder applications, metronome, tuner (Youtube, Spotify, Shazam, IMSLP, Facebook, Audio Recorder, Soundbrenner, Boss Tuner).
2. Western Music Apps: Applications based on Western music sound systems such as hearing, theory, virtual instruments (Better Ears, Mapping Tonal Harmony Pro, Piano, Guitar).
3. Creativity Apps: Sound recording and editing applications, notation applications (Garageband, iMPC, Korg Gadget, Mixfader).

4. Turkish Music Apps: Applications based on Turkish music sound systems such as hearing, theory, virtual instruments (Ahenk, Qanun, Nota Arsivi, Zurna).

Cronbach Alpha internal consistency coefficients were calculated to examine the internal consistency of the data collection tool revealed by EFA and to reveal the proof of reliability.

Table 6

Reliability Statistics

Factor	N of Items	Cronbach's Alpha
Support apps	6	,857
Western music apps	4	,838
Creativity apps	4	,756
Turkish music apps	3	,689

Cronbach Alpha values of the factors are given in Table 6. Özdamar (1999) states that "a value above 0.60 is quite reliable in the evaluation of the alpha coefficient" (as cited in Tavşancıl, 2014, p. 29), while Nunnally ve Bernstein (1994) state that "a value above 0.70 is sufficient" (p. 265). When the results of the analysis are examined, it is seen that the Turkish music apps (0.689) factor is very close to the value of 0.70, while all other factors are above the value of 0.70. Field (2018) states that the number of items affects the alpha coefficient (p. 1046). The fact that the number of items in the Turkish music apps factor is less than the others can be considered the reason for the coefficient difference. In the analysis of the overall scale, the Cronbach Alpha coefficient was found to be 0.888. According to the data obtained, it can be said that the scale is at a reliable level.

As a result of the analyzes made, it can be said that the Mobile Application Usage Scale in Music Learning is a valid and safe measurement tool consisting of 17 items.

Data Analysis

The prepared scale was applied online to 505 music education students after obtaining the necessary permissions. The collected data were entered into the SPSS 21 program. Since three erroneous data were detected in the control, analyzes were carried out with 502 data.

It was examined whether the data were normally distributed or not to determine which types of statistical tests would be performed. For this, it was checked whether the skewness and kurtosis coefficients were in the expected (±1) value range for the normal distribution (George & Mallery, 2019, p. 115), and Shapiro-Wilk, Kolmogorov-Smirnov normality tests were applied.

Table 7

Determined Statistical Tests

	Gender	Grade	Musical Instrument Type	Operating System
Western music apps	Mann-Whitney U	Kruskal-Wallis	Mann-Whitney U	Mann-Whitney U
Turkish music apps	Mann-Whitney U	Kruskal-Wallis	Mann-Whitney U	Mann-Whitney U
Creativity apps	Mann-Whitney U	Kruskal-Wallis	Mann-Whitney U	Mann-Whitney U
Support apps	Mann-Whitney U	Kruskal-Wallis	Mann-Whitney U	Mann-Whitney U
General	Mann-Whitney U	ANOVA	t	t

Statistical tests determined according to each variable are given in Table 7. In the application of parametric tests, there is a prerequisite that the data show normal distribution (Morgan et al., 2011). For this reason, testing the difference between the scores of the two groups was examined with the Mann-Whitney U test for data that did not show normal distribution (George & Mallery, 2019, p. 373) and with the Independent Samples t-Test for those with a normal distribution (Can, 2016, p. 115). Testing the difference between the scores of more than two groups was examined with the Kruskal-Wallis test for data that do not show normal distribution (Bryman & Cramer, 2005, p. 169), and with One-Way ANOVA for those with a normal distribution (George & Mallery, 2019, p.371).

Although the Mann-Whitney U test reveals the difference between the means, it does not calculate the magnitude of this difference. For this reason, the effect size was also calculated. The effect size (r) is calculated by dividing the z value resulting from the test by the square root of the sample number (Field, 2018, p. 403). The calculated effect size was interpreted according to the criteria of 0.10 low, 0.30 medium, 0.50 high (Field, 2018, p. 179).

Ethical Permissions

This study was approved by the Gazi University.

Ethical review board name: Gazi University Ethics Committee

Date of ethics review decision: 26.08.2019

Ethics assessment document issue number: 91610558-302.08.01

RESULTS

The first sub-problem of the research is as follows: What is the level of using mobile applications for learning purposes among the students of the music education department?

Table 8

Scale Scores

Factor	N	Minimum	Maximum	$\bar{x}$	SD
Western music apps	502	1,00	5,00	3,32	,91
Turkish music apps	502	1,00	5,00	2,43	,83
Creativity apps	502	1,00	5,00	3,21	,95
Support apps	502	2,33	5,00	4,27	,56
General	502	1,65	5,00	3,31	,60

Table 7 presents the results obtained from the scale of mobile application use in music learning. The overall score average was calculated as 3,31. Accordingly, it can be said that the mobile application usage frequency of music education students is at a moderate level.

The average score of the Western music apps factor was measured as moderate (3,32). According to the factor results, students generally use mobile applications while doing solfeggio exercises (3,65); and occasionally use mobile applications during theory (3,20), hearing (3,30), and singing studies (3,15).

The average score of the Turkish music apps factor was measured as moderate (2,43). According to the factor results, students occasionally use mobile applications while doing Turkish music song exercises (2,62); and rarely use mobile applications during aural (2,25) and maqams (2,41) studies.

The mean score of the creativity apps factor was measured as moderate (3,21). According to the factor results, students generally use mobile applications while playing the instrument (3,45) and when they need accompaniment (3,41); They occasionally use mobile applications while writing notes (2,90), composing, and arranging (3,08).

The mean score of the support apps factor was measured to be high (4,27). According to the factor results, students generally use mobile applications when they need metronome (4,11); They always use mobile applications to listen to music (4,34), use a tuner (4,26) , record (4,33), access music materials (4,22), follow musical developments (4,33).

The second sub-problem of the research is as follows: Do students' mobile application usage situations differ according to their gender, grade, musical instrument types, and the operating system they use? The results of the Mann-Whitney U test for the gender variable are given in Table 9.

Table 9

Mann-Whitney U Test for the Gender

	Group	N	Mean Rank	Sum of Ranks	$\bar{x}$	p
Western music apps	Female	268	274,26	73503,00	3,45	**,00**
	Male	234	225,43	52750,00	3,16	
Turkish music apps	Female	268	252,32	67622,50	2,42	**,89**
	Male	234	250,56	58630,50	2,43	
Creativity apps	Female	268	261,61	70112,00	3,26	**,09**
	Male	234	239,92	56141,00	3,15	
Support apps	Female	268	264,19	70804,00	4,30	**,03**
	Male	234	236,96	55449,00	4,22	
General	Female	268	267,38	71658,50	3,36	**,00**
	Male	234	233,31	54594,50	3,24	

As seen in Table 9, there is no significant difference in Turkish music apps and creativity apps factors according to gender ($p>0.05$). A significant difference was found between the means for Western music apps and support apps ($p<0.05$). A statistically significant difference was observed between the scores of female students (3.36) and the scores of male students (3.24) when looking at the scale in general. The effect size calculated as a result of the test ($r=0.11$) shows that this difference is low. According to the results of the analysis, it can be said that female students use mobile applications more frequently for educational purposes than male students. The Kruskal-Wallis test analysis results for grade level are given in Table 10.

Table 10

Kruskal-Wallis Test Analysis of Grade Variable for Factors

Factor	Grade	N	Mean Rank	df	X^2	p
Western music apps	1	121	270,80	3	3,43	**,33**
	2	141	252,44			
	3	134	243,16			
	4	106	238,76			
Turkish music apps	1	121	255,40	3	7,08	**,06**
	2	141	230,81			
	3	134	275,72			
	4	106	243,95			
Creativity apps	1	121	277,83	3	6,40	**,09**
	2	141	245,38			
	3	134	250,34			
	4	106	231,04			
Support apps	1	121	261,82	3	5,97	**,11**
	2	141	266,88			
	3	134	247,11			
	4	106	224,82			

As can be seen in Table 10, the frequency of students' use of mobile applications does not differ significantly based on factors according to their grade levels (p>0.05). The results of the one-way ANOVA analysis of the overall scale are given in Table 11.

Table 11

One-Way ANOVA Test Analysis of Grade Variable by Overall Score

	Sum of Squares	df	Mean Square	F	p
Between Groups	2,146	3	,715		
Within Groups	179,947	498	,361	1,98	**.116**
Total	182,093	501			

It is seen in Table 11 that students' mobile application usage status does not show a significant difference according to their grade levels in general [$F_{(3-498)}$=1,98, p>0.05]. Accordingly, it can be said that the grade level does not have a significant effect on the use of mobile applications in music learning.

Table 12

Mann-Whitney U Test Results of the Variable of Musical Instrument Type by Factors

	Group	N	Mean Rank	Sum of Ranks	$\bar{x}$	p
Western music apps	Turkish Music	127	237,11	30113,50	3,22	**,19**
	Western Music	375	256,37	96139,50	3,35	
Turkish music apps	Turkish Music	127	283,09	35953,00	2,61	**,00**
	Western Music	375	240,80	90300,00	2,36	
Creativity apps	Turkish Music	127	244,93	31106,50	3,16	**,55**
	Western Music	375	253,72	95146,50	3,22	
Support apps	Turkish Music	127	249,42	31676,00	4,24	**,85**
	Western Music	375	252,21	94577,00	4,27	

Table 12 shows that students' mobile application usage status differs significantly in the Turkish music apps factor (p<0.05). No significant difference was found in other factors (p>0.05). It can be said that students who play Turkish music instruments use Turkish music apps more often than students who play western music instruments. Independent samples t-test results of the scale are given in Table 13.

Table 13

Independent Samples T-Test Results of the Variable of Musical Instrument Type by Overall Score

Group	N	$\bar{x}$	Sd	df	t	p
Turkish Music	127	3,31	,67	500	,104	**,918**
Western Music	375	3,30	,57			

It is seen in Table 13 that students' mobile application usage status does not show a significant difference according to their musical instrument type in general. It can be said that the musical instrument type does not have a significant effect on the use of mobile applications in music learning.

Table 14

Mann-Whitney U Test Results of the Variable of Operating System by Factors

	Group	N	Mean Rank	Sum of Ranks	$\bar{x}$	p
Western music apps	Android	314	249,32	78288,00	3,30	**,66**
	iOS	188	255,13	47965,00	3,34	
Turkish music apps	Android	314	244,29	76707,50	2,39	**,14**
	iOS	188	263,54	49545,50	2,47	
Creativity apps	Android	314	252,65	79331,50	3,23	**,81**
	iOS	188	249,58	46921,50	3,17	
Support apps	Android	314	243,10	76333,00	4,23	**,09**
	iOS	188	265,53	49920,00	4,32	

Table 14 shows that students' mobile application usage does not differ based on factors according to the operating system they use (p>0.05). Independent samples t-test results of the scale are given in Table 15.

Table 15

Independent Samples T-Test Results of the Variable of Operating System by Overall Score

Group	N	$\bar{x}$	Sd	df	t	p
Android	314	3,29	,61	500	-,666	**,506**
iOS	188	3,33	,58			

Table 15 shows that there is no significant difference between the mean score of students using Android and iOS users (p>0.05). In this case, it can be said that the operating system used does not have a significant effect on the frequency of mobile application usage.

CONCLUSION AND DISCUSSION

For the first sub-problem of the research, the mobile application usage levels of the music education department students were examined. According to the data collected from 502 participants with the Mobile Application Usage Scale in Music Learning; Music education students' use of mobile applications related to their learning is at a moderate level ($\bar{x}$=3,31). Similarly, Bannerman & O'Leary (2020) found that music education students', Bauer ve Dammers (2016) found that music teachers' frequency of using the software was moderate. The highest level of usage was in the support apps factor ($\bar{x}$=4,27). According to the items in this factor, music students; use mobile applications intensively when they need to listen to music, need a metronome and tuner, take audio or visual recordings, access music materials, and follow musical developments. The lowest level of usage was observed in the Turkish music apps factor ($\bar{x}$=2,43). Music education students stated that while they occasionally use mobile applications while studying Turkish music songs, they rarely use mobile apps for Turkish music aural studies. A moderate level of participation was also observed in Western music apps and creativity apps factors. While students are studying solfeggio and instruments, and when they need accompaniment, they generally use mobile applications; They stated that they occasionally use mobile applications for notation writing, western music theory, hearing, singing, and composition-arranging.

Lehimler (2019) concluded that awareness of applications such as listening to music, writing notes, tuners, and metronome is high. On the other hand, he concluded that awareness of the applications developed for instrument training, singing, music theory, and hearing training is at a low level. He concluded that the music teacher candidates have less idea about the software developed especially for musical performance. Gorgoretti, (2019) stated that music education students use notation and music creation software as well as social networks and music listening applications intensively. Haning (2015) found that music education students frequently use notation and music creation software. Ayhan ve Ertekin (2017) stated that music students are very interested in technological materials prepared for solfeggio studies. Gilbert (2015) determined that music teachers find technology support useful for instrument studies and they frequently use software developed for accompaniment and recording. Gaines (2018) found that music students in higher education frequently benefit from technology for learning, discovery, and performance purposes, and they especially use accompaniment, music production, and recording software. Fulcher (2017) stated that music students frequently use social networking applications and music listening applications for musical sharing and learning purposes. Upitis et al., (2016) determined that music teachers found the use of mobile devices for educational purposes more usable than computers, and the most frequently used listening, recording, and metronome software intensively.

When the results given above are compared with the data obtained in this study, the results of listening to music, virtual instrument, accompaniment, recording, metronome,

and tuner use are similar. On the other hand, especially notation software differs. In many studies, it has been stated that notation software is the most used software. In these studies, music software has been examined in general without making any distinction between mobile devices and computers. It can be said that the use of notation software on computers has some advantages over mobile devices. Computers provide more comfortable use for notation software than mobile devices in terms of screen size and keyboard usage. It can be said that the reason for the difference is due to this situation. When the application markets are examined, it can be seen that the number of mobile applications related to notation is less than other application types (Kell & Wanderley, 2014).

When we look at the music teaching curriculum in Turkey, it is seen that Turkish music lessons are at the same rate as Western music lessons. While the students in this department make use of mobile applications while doing studies such as western music hearing and theory, they use fewer mobile applications in studies related to Turkish music. The main reason for the lower frequency of use of Turkish music applications compared to other application groups may be that the variety of applications produced specifically for this field is quite low.

For the second sub-problem, mobile apps usage frequencies were compared according to gender, grade, musical instrument type, and operating system. As a result of the analysis, a significant difference was found in favor of women. According to the analysis made based on factors, there is no difference in the factors of Turkish music apps and creativity apps, a significant difference was found in favor of female in the factors of western music and support apps.

When we look at the literature, it can be said that although there are studies in which gender does not affect technology use (Raman et al., 2014; Salentiny, 2012), there are many studies in which men's technology use, attitude, and acceptance levels are higher (Ardies et al., 2015; Liaw & Huang, 2011; Milis et al., 2008; Okazaki & Santos, 2012). Similarly, men's self-efficacy in the use of music technologies related to their education (Doherty, 2018) and their experience in music technologies (Bannerman & O'Leary, 2020) were found to be higher than women's. Despite this situation, research results on mobile technologies differ. In many studies, it was emphasized that the use of mobile applications did not change according to gender (Hilao & Wichadee, 2017; Huseynov, 2020; Kamiyama et al., 2016; Lehimler, 2019; Wai et al., 2018) and in some studies, results in favor of women were obtained (Hwang et al., 2016; Kim et al., 2015). In this study, the frequency of using mobile applications for educational purposes among women was higher than that of men. From this point of view, it can be said that with the increasing use of mobile devices and applications, the difference in gender variables decreases.

In the examination made according to the grade level variable, no difference was found between the grade level of the music education students and the frequency of mobile apps usage. Similarly, Prieto et al. (2016) concluded that the class variable did not affect

mobile application usage. Considering the age factor, van der Kaay & Young (2012) concluded that younger people are more interested in technology use. When the mobile apps download and usage rates are examined, it is seen that while the age level increases, the usage rate decreases (Shah, 2020). The close age of the undergraduate students who make up the study group of this research can be seen as the reason for the lack of difference in mobile apps usage levels. According to this result, it can be said that the education given at the university does not affect the students' use of mobile applications for learning purposes. Students have gained this habit individually.

In the analysis made according to the musical instrument type variable, it was found that the mobile application usage of the music education students differed only in the Turkish music apps factor. It was determined that students who play Turkish music instruments use mobile apps more intensively in cases related to Turkish music. It has been concluded that the musical instrument type does not affect the use of mobile apps according to western music apps, creativity apps and support apps, and the scale in general.

No significant difference was found in the examination made according to the operating system. It can be said that the use of Android or iOS operating system has no effect on the use of mobile apps in music learning. Chmielarz (2020) stated that iOS users use their smartphones more functionally than Android users. Differently, Pryss et al. (2020) concluded that the use of mobile apps did not change according to the operating system used. At this point, it can be said that the prominent factor is the variety of mobile apps. The application markets of both operating systems contain similar mobile apps that will meet the application use cases created within the scope of this research. The presence of mobile apps that meet similar features on both platforms can be seen as the reason why mobile apps usage is similar.

The results of this study showed that students who play Turkish music-Western music instruments, those who are new to music education and about to graduate, and students who use different operating systems benefit from mobile applications at a similar level. In addition, it was observed that technology usage habits changed according to gender. The importance of mobile technologies in human life is increasing day by day. Mobile technologies that attract the same attention of different groups can be seen as a unifying factor. This unifying power can be used positively in music education as in many other fields.

LIMITATIONS AND RECOMONDATIONS

The study group of the research was formed only from students of the music education department. The result of this study does not include students who continue their education in other fields of music. The use of mobile apps in music learning can be examined

in different studies with other music students, teachers, amateur and professional musicians.

The data collection process of the research took place in the 2019-2020 academic year. The pandemic process that emerged after this process may have caused differences in the use of mobile applications. It is recommended to conduct studies examining the pandemic process and after.

The scale used in the study was developed only with music education students. It is recommended to test the validity of the scale on different groups. In addition, only exploratory factor analysis was applied during the scale development process. It is also recommended to perform confirmatory factor analysis in different studies.

One of the findings of the research is that the use of mobile applications related to Turkish music has the lowest rate. For this reason, it is recommended to develop mobile applications related to Turkish music.

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Data Collection Tool

Geleceğin müzik öğretmeni,

Mobil uygulamalar, akıllı telefon, tablet bilgisayar gibi mobil cihazlar için hazırlanmış yazılımlardır. Bu çalışma, müzik öğrenimi gören bireylerin, mobil uygulamaları kullanma düzeylerini belirleyebilmek için hazırlanmıştır. Vereceğiniz cevaplar bilimsel bir araştırma verisi olarak kullanılacağından, tüm soruları içtenlikle cevaplamanız, araştırmanın sağlıklı olarak tamamlanması için önemlidir. Her sorunun size en uygun tek bir cevabına (x) işareti koyunuz. Cevaplar araştırmanın amaçları dışında kullanılmayacaktır. Lütfen boş bırakmayınız.

Katkılarınız için teşekkür ederim.

Erkan DEMİRTAŞ

Cinsiyetiniz	☐ Kadın ☐ Erkek
Sınıfınız	☐ 1 ☐ 2 ☐ 3 ☐ 4
Bireysel çalgı alan türünüz	☐ Türk Müziği ☐ Batı Müziği
Akıllı telefonunuzun işletim sistemi	☐ Android ☐ IOS ☐ Windows ☐ Akıllı telefonum yok
Tablet bilgisayarınızın işletim sistemi	☐ Android ☐ IOS ☐ Windows ☐ Tablet bilgisayarım yok
Sürekli internet bağlantısına sahip misiniz?	☐ Evet ☐ Hayır
Mobil müzik uygulamaları ile ilgili eğitim almak ister misiniz?	☐ Evet ☐ Hayır
Mobil uygulama geliştirme ile ilgili eğitim almak ister misiniz?	☐ Evet ☐ Hayır

	Aşağıdaki durumlara ait **mobil uygulama** kullanma sıklığınızı belirtiniz	**Her Zaman**	**Çoğunlukla**	**Ara Sıra**	**Nadiren**	**Hiçbir Zaman**
1	Solfej çalışırken (ses alma, kontrol etme vb.)					
2	Batı müziği teorisi çalışırken					
3	Duyma (aralık, dizi, akor vb.) çalışmaları yaparken					
4	Şan çalışmaları yaparken					
5	Türk müziğine yönelik işitme çalışmaları yaparken					
6	Türk müziği eserlerini çalışırken					
7	Enstrüman çalışırken					
8	Nota yazmam gerektiğinde					
9	Eşlik ihtiyacım olduğunda					
10	Beste, aranje, düzenleme gibi çalışmalar yaparken					
11	Bir eseri dinlemem gerektiğinde					
12	Türk müziği dizi ve makamlarına çalışırken					
13	Metronom kullanmaya ihtiyaç duyduğumda					
14	Akort cihazı kullanmaya ihtiyaç duyduğumda					
15	Sesli/görsel/yazılı kayıt almam gerektiğinde					
16	Müzik materyallerine (nota vb.) ulaşmak için					
17	Müzikal gelişmeleri takip etmek için					

TEŞEKKÜRLER