TECHNOLOGY OWNERSHIP AND ACADEMIC ACHIEVEMENT STATUS OF LEARNERS AT ANADOLU UNIVERSITY OPEN EDUCATION SYSTEM BETWEEN 2011 AND 2014

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Abstract: The aim of this study is to analyze the technology ownership of learners who were enrolled in Anadolu University Open Education System between 2011 and 2014, to assess its current state, to investigate the changes in this four-year-period, and to explore whether there is a link between learners' technology ownership and academic achievement. The data set was obtained by combining the questionnaire data, which included technology ownership and internet access opportunities for learners who were enrolled between 2011 and 2014, with their academic achievement information was analyzed. The changes and trends in technological device ownership during these four years, and the relationship between technological device ownership and academic achievement were interpreted. In addition, learners' computer usage levels, internet access possibilities, usage purposes and reception of television broadcast were investigated. 722,399 questionnaire data were analyzed to determine technology ownership and 438,363 questionnaires were analyzed to determine whether there is a difference between technology ownership and academic achievement. As a result of these analyses, it was determined that there was an increase in mobile phone and tablet computer ownership, while there was a decline in MP3/MP4 players, VCD/DVD players, phone and television ownership. As a result of independent two sample t-tests that were conducted at a 95% significance level, it has been found that there was a difference in academic achievement between the learners who have and do not have computers, handheld computers, and tablet computers.
Keywords: Open Education, Open and distance learning, Learners' technology ownership, Academic achievement.

INTRODUCTION

The usage of information and communication technologies has been rapidly increased in the 21st century and technology permeates all aspects of our lives. Also the usage of technology and advancements in internet technologies have affected and transformed learning environments. Online learning environments, that are designed to be independent of location, time and space of learners, are commonly preferred and have become more advanced, varied, personalized and mobilized as time has gone on. Parallel to advancements in technology, online materials have begun to be used alongside printed materials in open and distance learning environments. Learners' ownership of appropriate technologies is important from the perspective of their inclusion in the system and getting benefit from the services provided in an efficient way. Effective use of technological devices such as computers, smartphones, and tablet computers in open and distance learning, which find widespread usage in daily life as well, allows learners to access different learning environments and content.

Technological device ownership is important for learners to have fast and effective access to learning and information resources. In the 2000s, learners' access to technological devices and environments have dramatically increased. According to the results of the study conducted by the Turkish Statistical Institute (TurkStat) on Information Technology Ownership in Households between 2004-2015, the percentage of households that have access to the internet is 69.5%, while the percentage of households that have at least one mobile

phone is 96.8%. When internet usage purposes were examined, it was seen that usage of social media ranks first, and use of portable devices has increased. On the other hand, an Information and Communication Technology (ICT) Usage Questionnaire in Households and Individuals (2015) conducted by TurkStat shows that 41.3% of participants use the internet to search for information about education, apprenticeship, or private tutoring and courses. It can be argued that increase in access to the internet and use of portable devices, as well as the provision of online content, will help learners have easier access to educational content and facilitate mobile learning in becoming more widespread. Figure 1 shows households' technology ownership percentages in TurkStat's 2015 questionnaire.
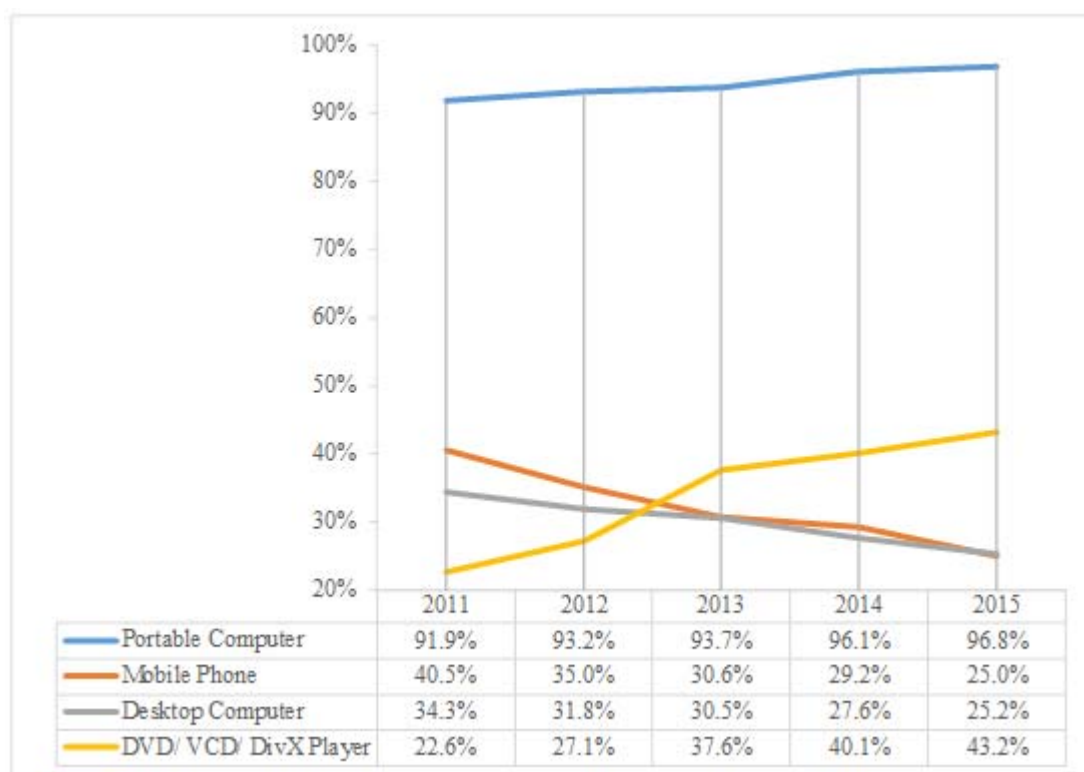

	2011	2012	2013	2014	2015
Portable Computer	91.9%	93.2%	93.7%	96.1%	96.8%
Mobile Phone	40.5%	35.0%	30.6%	29.2%	25.0%
Desktop Computer	34.3%	31.8%	30.5%	27.6%	25.2%
DVD/ VCD/ DivX Player	22.6%	27.1%	37.6%	40.1%	43.2%

Figure 1. Information technology ownership in households (2011-2015)
Note: Data obtained from http://www.tuik.gov.tr/PreTablo.do?alt_id=1028.

It can be claimed that advancements in information technologies, increase in personal internet usage and speed, proliferation of access from anywhere, and widespread use of cloud computing have all increased use of portable computers, mobile phones, and all other similar portable devices. It can also be said that this situation is important for the educational institutions that provide learning services independent of time and space, and that it should be analyzed by these institutions. Technology is an instrument that supports and makes learning easier. From the perspective of online learning environments, learners' technology ownership and use of technology for learning purposes can affect their achievement. In open and distance learning systems, in order for learners to use resources in an effective way, they need to have suitable technologies and should be able to use them. It can be assumed that since technology ownership increases possibilities for access to information, it also increases academic achievement. However, many research studies in the literature show that the opposite of this can also be possible. Within this context, it would be wise for institutions to investigate their own learners' technology ownership and usage.

The objective of this study is to analyze the technology ownership of learners who were enrolled in Anadolu University Open Education System between 2011-2014, to make an assessment of the current situation, to analyze the changes in this four-year period, and to investigate whether there is a difference between technology ownership and academic achievement. The study also analyzes learners' computer usage levels, internet access possibilities, internet usage purposes, and reception of television broadcast. In order to do this analysis, 722,399 questionnaire collected from the learners are analyzed to determine the technology ownership, and 438,363 questionnaires are analyzed to show if there is a difference between technology ownership and academic achievement.

LITERATURE REVIEW

The literature on learners' technology ownership is very rich. However, results of these studies differ with respect to learners' age differentials, the level of education, income level, and the countries they live in. When the relationship between learners' technology ownership and academic achievement is analyzed there is no consensus in the literature. With the same variables and different samples, researchers found positive, neutral and negative relationships, which also point to the fact that it will be appropriate for institutions to carry out studies about their own learners.

In the study titled "Students, Computers and Learning: Making The Connection, PISA" which was commissioned by the Organization for Economic Co-operation and Development (OECD) in 2015 and which included more than 70 countries, it was mentioned that learning environments should be designed in such a way as to allow for digital skills, and that technology can make significant contributions in good learning environments. The study showed that in 2012, 96% of 15-year-old students in OECD countries had a computer at home, but only 72% of them used desktop, laptop or tablet computers at school. The study mentioned that while the learners who spent little time on computers at school had the best learning outputs, the learners who used computers frequently at the schools ranked among the last ones with respect to learning outputs. The same study gave the percentage of Turkish learners who had at least one computer in 2012 as 70.7%, the ones who had two or more computers as 4.1% and learners who had computer availability at school as 48.7%. According to the same study, daily out-of-school internet usage duration was 52 minutes on weekdays and 15 minutes at school on weekdays and these figures were below the OECD averages. The percentage of students who made a search on the internet for schoolwork at least once a week was 28% at school and 50.2% out of school. The study mentioned that on average learners in OECD countries were online more than two hours and the internet was being used mostly for entertainment purposes. The usage percentage of mobile computers has increased in schools. In countries where internet usage is low for schoolwork, a faster progress has been observed in the reading levels of learners. Likewise, a negative relationship has been found between computer usage level and performance at the schools that were above the OECD averages. This study particularly emphasized that appropriate usage of technology in well-designed learning environments could enhance academic achievement, otherwise technology usage either would not make any contribution to academic achievement or it would affect it in a negative way.

In an Educause Center for Analysis and Research (ECAR) study in 2014 that included 213 universities, 15 countries and more than 75,000 learners, learners' technology experiences, the devices they owned, the way they use them and their technology perceptions were analyzed. The study determined that ownership of mobile devices, such as smartphones and tablets, increased dramatically while there was not a significant upward trend in laptop and e-

reader ownership. The same study also investigated the use of e-readers, tablets, smartphones and laptops for academic purposes, and observed that there was an increase in the usage of these devices between 2012-2014, while the biggest increase was observed in the usage of tablet computers and smartphones. The usage ranking of the devices for academic purposes in descending order was as follows: laptop, smartphone, tablet and e-reader. When one looked at the degree of importance of the devices with regards to academic achievement, the ranking stayed the same. Between 2013 and 2014, the importance of all devices except laptops with regards to academic achievement decreased. Looking at the results of this study, it can be said that the usage of tablet computers and laptops, in particular, will be more widespread in the coming years.

There are some studies which found a positive relationship between technological device ownership and academic achievement. In Ahlan, Atanda and Shehu's (2014) study that was conducted in Ilorin University, the researchers investigated performance-increasing effects of computer aided tests on the academic performance of learners, their acceptance and how they can be developed further. They also analyzed the relationship between computer ownership and academic performance. The study concluded that there is a positive relationship between technology ownership and academic performance. In a study conducted by Judge (2005) on 1,601 nursery students and first graders, a positive relationship was found between computer usage and access and academic achievement. Jackson et al. (2006) analyzed the relationship between internet usage at home and the academic achievements of 140 lower income learners and found a positive relationship. The age variable did not lead to a change in this situation. In other studies, a positive relationship was found between ownership of home computers and school performance (Attewell and Battle, 1999; Beltran, Das and Fairlie, 2006).

In the studies which found a negative relationship between technological device ownership and academic achievement, it has been particularly emphasized that learners' concentration levels are lessened while studying because of the usage of social media, messaging or chatting, and therefore they are unable to use their time effectively. In the study conducted by Lepp, Barkley and Karpinski (2013) a negative relationship was found between cellphone use and academic performance. In their study on university students, Jacobsen and Forste (2011) found a negative relationship between electronic device usage and grade point averages. The researchers found that learners were spending too much time with electronic devices and this negatively affected their academic performance. Likewise, Paul, Baker and Cochran (2012) found a negative relationship between social network use and academic performance.

On the other hand, there are also some studies which found no relationship between technological device ownership and academic achievement. In their research conducted on 101 tenth grade students, Hunley et al. (2005) did not find a significant relationship between computer usage and academic achievement. Using Program for International Student Assessment (PISA, 2000) data, Bielefeldt (2005) analyzed the relationship between learners' technology usage and their academic achievements. Bielefeldt did not find a significant effect of having access to computers at school on mathematics and reading skills; however, he found that having access to computers at home had a negative effect on academic achievement. In their study, which was conducted with 1,123 learners between sixth and tenth grades, Fairlie and Robinson (2013) did not find any relationship between having home computers and academic achievement.

METHODOLOGY

In this study, the data that was obtained from questionnaires applied to individuals who were studying in Anadolu University Open Education System between September 2011 and February 2015 was analyzed. The questionnaires were applied both on those learners who recently joined the Open Education System and on the learners who were already in the system, in order to measure the service quality and to collect more information about the learners. The data characteristics were analyzed in the study and the tasks that were performed are shown as follows:

- Questionnaires were applied online to gather information regarding learners' technology ownership, their level of computer usage and internet usage.
- Through the web-based questionnaire in which the learner information system guides the learners, questionnaire data along with learners' identity information were stored in a database management system.
- Questionnaire data was made ready for analysis using the MS SQL server database management system. In the preparation process, multiple questionnaire entries and invalid questionnaire data were cleared.
- Questionnaire data of the learners who answered the questionnaire questions were associated with their grade point averages for the relevant period. By this way, the grade point average that the learner received in the period in which learner filled in the questionnaire form is reflected onto the data set.
- The data set was transferred to IBM SPSS Statistics software and analyzed.

Table 1 presents numbers of questionnaire participant with respect to years in the data set prepared for the study. Descriptive statistics of the data obtained from the questionnaire studies applied in 2011-2012 and 2014-2015 academic years were derived.

Table 1: *The Number of Students Filled the Questionnaire by Years and Studentship Type.*

Studentship Type	Year				Total
	2011	2012	2013	2014	
New Registration Registration	61,259	201,910	92,554	72,661	428,384
Renewal	30,791	136,068	74,286	52,870	294,015
Total	92,050	337,978	166,840	125,531	722,399

In order to determine if there is a difference between learners' technology ownership and academic achievement, which is the subject of this study, the following three hypotheses were constructed and statistical data analysis is carried out by IBM SPSS.

- H_1: There is no difference between the academic achievement of learners who have computers and learners who do not have computers.
- H_2: There is no difference between the academic achievement of learners who have handheld computers and learners who do not have handheld computers.
- H_3: There is no difference between the academic achievement of learners who have tablet computers and learners who do not have tablet computers.

FINDINGS

A total of 722,399 questionnaire data collected from the learners who were enrolled in Anadolu University Open Education System in the period of 2011-2014 are analyzed, of

which 428,384 were new registrations and 294,015 were registration renewals. Learners' technology ownership is analyzed with respect to years. In order to determine whether there is a difference between the academic achievement of learners who have and do not have the technology in question, as well as to test the hypotheses of the research, independent two sample t-test is applied. Table 2 shows the learners' computer usage levels by years.

Table 2: *The Number of Learners at Different Computer Usage Levels by Years*

Computer Usage	Numbers			
Level	2011	2012	2013	2014
No Computer Skills At All	560	444	227	240
Beginner Level	7,024	5,276	2,988	3,032
Intermediate Level	67,190	58,640	29,156	28,319
Advanced Level	55,827	47,581	23,146	21,999
Total	130,601	111,941	55,517	53,590

When Table 2 is analyzed, it can be seen that the number of learners at different levels decreased from 2011 to 2014. This might be related to the fact that the total number of questionnaire filled by respondents declined at the same period. Therefore, it will be more appropriate to look at percentages to make better interpretations of computer usage levels. Computer usage percentages of learners by years are presented in Figure 2.

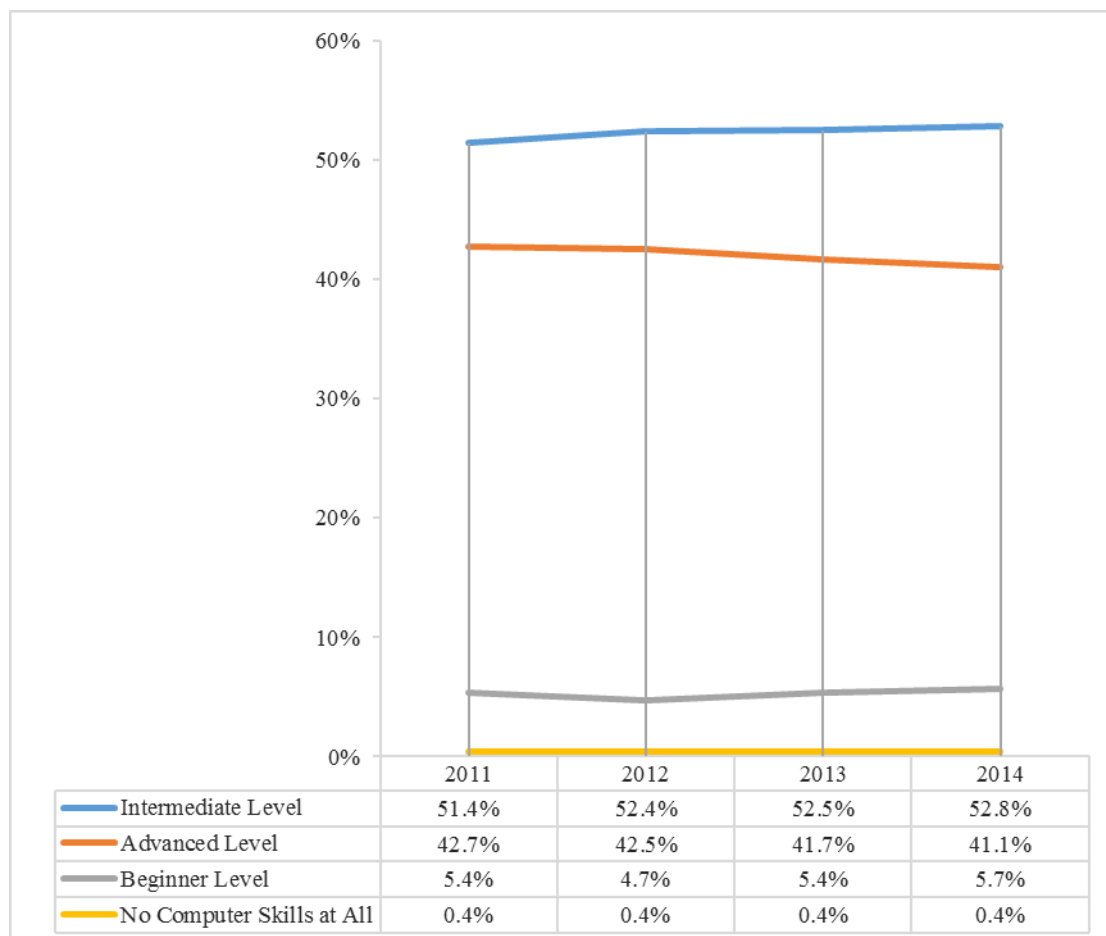|	2011	2012	2013	2014
Intermediate Level	51.4%	52.4%	52.5%	52.8%
Advanced Level	42.7%	42.5%	41.7%	41.1%
Beginner Level	5.4%	4.7%	5.4%	5.7%
No Computer Skills at All	0.4%	0.4%	0.4%	0.4%

Figure 2. Computer usage percentages of learners by years

When Figure 2 is analyzed, it is seen that in the period 2011-2014, the percentage of learners who mentioned that they did not use computers at all stayed the same at 0.4%, the percentage of those at beginner level increased from 5.4% to 5.7%, the percentage of intermediate level learners increased from 51.4% to 52.8%, and the percentage of advanced level users decreased from 42.7% to 41.1%. It can be said that, in general, learners think themselves as intermediate and advanced level computer users. Any significant changes in the data gathered related to the computer usage were not observed. The fact that there was only one question in the questionnaire form related with computer usage may have led to obtain this result. In the future including more detailed and varied questions to measure the computer skills of individuals may allow for gathering this data in a more consistent way. Table 3 presents internet access possibilities of learners in the Open Education System by years.

Table 3: *Internet Access Possibilities of Learners by Years*

Internet Access Possibilities	Years			
	2011	2012	2013	2014
I don't have any possibility for access	6,181	6,312	4,127	3,903
I have access only at home	77,996	72,965	37,394	32,212
I have access through internet cafés only	15,127	13,280	6,913	5,761
I have access only at work	26,814	25,461	13,228	10,928
I have access both at home and work	88,878	88,768	47,578	44,078
Total	214,996	206,786	109,240	96,882

When Table 3 is analyzed, it is seen that learners who have access to the internet only at home and learners who have access both at home and at work constitute a majority of the learner body. Figure 3 shows learners' internet access possibilities by years.
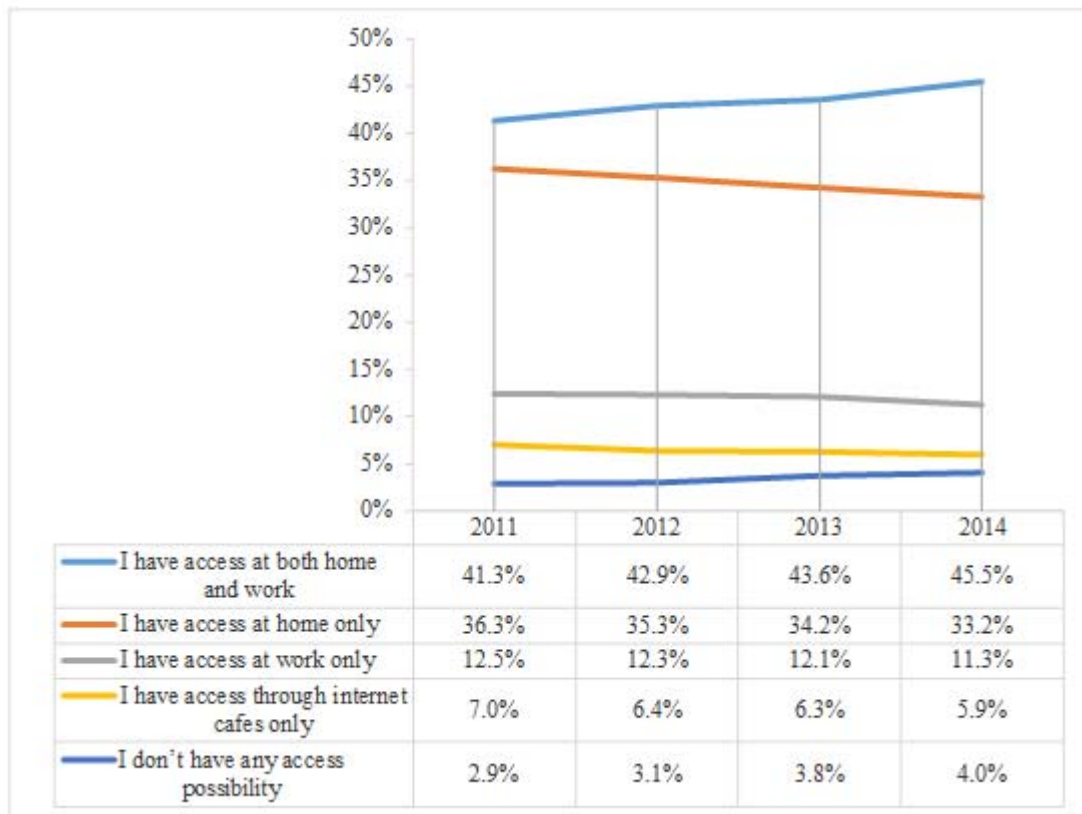
Figure 3. Learners' internet access possibility percentages by years

Analysis of Figure 3 reveals that in the period 2011-2014 the percentage of learners who did not have internet access increased from 2.9% to 4.0%; the percentage of learners who had internet access only at home decreased from 36.3% to 33.2%; the percentage of learners who had access through internet cafés only decreased from 7% to 5.9%; the percentage of learners who had internet access at work only decreased from 12.5% to 11.3%; and the percentage of learners who had access to the internet at both home and work increased from 41.3% to 45.5%. Learners have the highest internet access possibility percentage at both home and work. The fact that individual and mobile internet usage increased and internet access from anywhere became commonly available can explain the declines in access possibilities from home, workplaces, and internet cafés, which are location-dependent access points.

When learners' internet access ownership by years was examined, it is seen that between 2011 and 2014 internet access percentages were 97.1%, 96.9%, 96.2%, and 96%, respectively. According to these results, it is observed that approximately 96% of learners have internet access. This percentage is significantly higher than the internet access percentages reported in the study by TurkStat (2015). When one takes into account the online services, content, and resources provided by the Open Education System, learners having a high percentage of internet access is important from the perspective of accessing and benefitting from these services. Learners' distribution between 2011 and 2014 with respect to internet usage purposes is presented in Table 4.

Table 4 :*Internet Usage Purposes of Learners by Years*

Internet Usage Purpose	Years							
	2011		2012		2013		2014	
	Yes	No	Yes	No	Yes	No	Yes	No
Obtaining Information	113,993	16,608	97,912	14,029	47,731	7,786	45,221	8,369
Communication	87,375	43,226	74,607	37,334	36,414	19,103	34,094	19,496
Shopping	47,328	83,273	43,194	68,747	21,326	34,191	20,508	33,082
Entertainment/Chat	44,926	85,675	40,489	71,452	20,158	35,359	18,618	34,972
Reading Newspaper/Journal	66,737	63,864	58,604	53,337	27,569	27,948	24,524	29,066
Banking Transactions	56,296	74,305	49,700	62,241	24,069	31,448	23,018	30,572
Social Media	72,896	57,705	66,088	45,853	33,450	22,067	31,445	22,145

A closer look at Table 4 reveals that in 2011 the most frequently mentioned internet usage purpose was obtaining information, with 113,993 learners, whereas the least mentioned purpose was shopping, with 44,926 learners. In 2012 the most widely mentioned usage purpose was obtaining information, with 97,912 learners, while the least-mentioned purpose was shopping, with 43,194 learners. In 2013 the most frequently-cited internet usage purpose was obtaining information, with 47,731 learners, and the least-mentioned purpose was entertainment/chatting. In 2014 the most frequently-mentioned internet usage purpose was obtaining information, with 45,221 learners, while the least-mentioned purpose was entertainment and chatting with 18,618 learners. Learners used the internet most often for obtaining information between 2011 and 2014. The percentages of learners' internet usage purposes in the period 2011-2014 are presented in Figure 4.

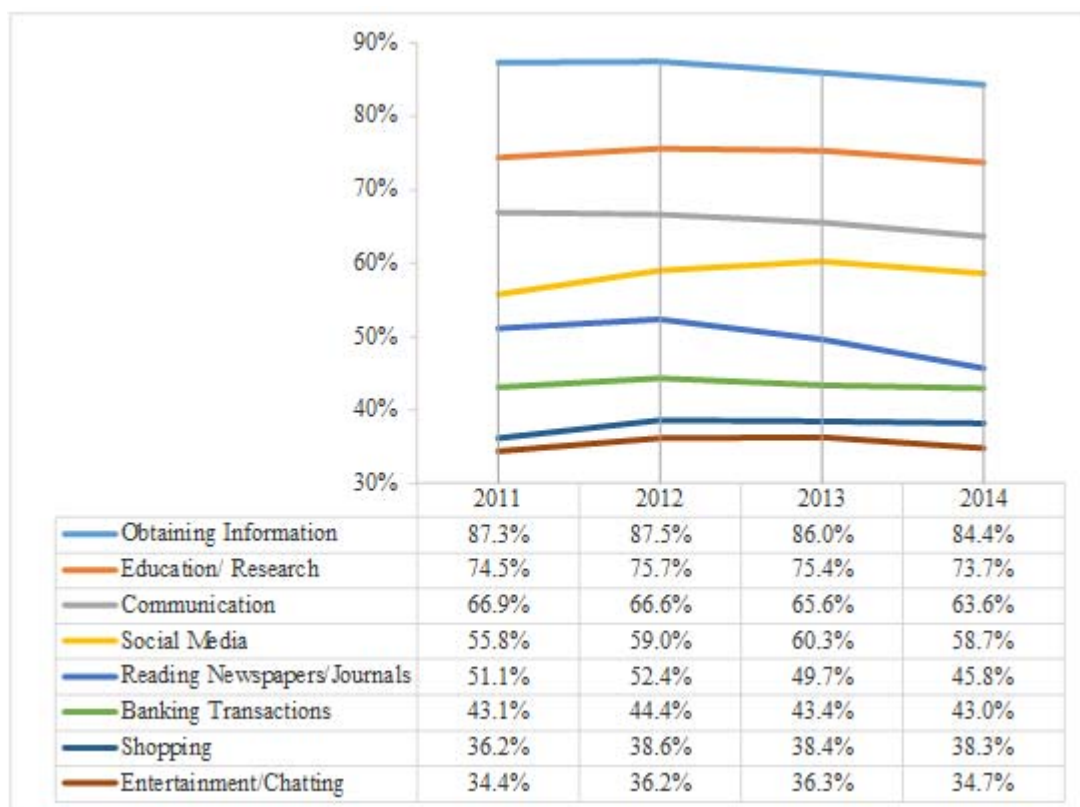|	2011	2012	2013	2014
Obtaining Information	87.3%	87.5%	86.0%	84.4%
Education/ Research	74.5%	75.7%	75.4%	73.7%
Communication	66.9%	66.6%	65.6%	63.6%
Social Media	55.8%	59.0%	60.3%	58.7%
Reading Newspapers/Journals	51.1%	52.4%	49.7%	45.8%
Banking Transactions	43.1%	44.4%	43.4%	43.0%
Shopping	36.2%	38.6%	38.4%	38.3%
Entertainment/Chatting	34.4%	36.2%	36.3%	34.7%

Figure 4. Internet usage purpose percentages of learners by years

Figure 4 reveals that, in descending order, the internet was used by learners for obtaining information, education and research, communication, social media, reading newspapers and journals, banking transactions, shopping, and entertainment/chatting purposes. The usage percentage of the internet for social media purposes increased. Using the internet particularly for obtaining information, education and research is in line with the characteristics of learners of open and distance learning systems. Learners' distributions with respect to their reception of television broadcast between 2011 and 2014 are presented in Table 5.

Table 5: *Reception of Television Broadcast of Learners by Years*

Reception of Television Broadcast	Years							
	2011		2012		2013		2014	
	Yes	No	Yes	No	Yes	No	Yes	No
Cable TV	36,945	178,051	36,665	170,121	19,602	89,638	17,628	79,254
Digiturk	32,018	182,978	32,906	173,880	15,956	93,284	13,423	83,459
Antenna	42,746	172,250	40,144	166,642	21,403	87,837	17,577	79,305
D-Smart	19,099	195,897	20,645	186,141	10,748	98,492	9,049	87,833
Satellite TV	118,063	96,933	109,737	97,049	56,649	52,591	50,400	46,482
Mobile TV	3,890	211,106	5,099	201,687	3,635	105,605	3,583	93,299

Table 5 shows that in the period 2011-2014 the most commonly used reception of television broadcast is satellite TV and the least used reception of television broadcast is mobile TV. The percentages of learners' reception of television broadcast between 2011 and 2014 are presented in Figure 5.
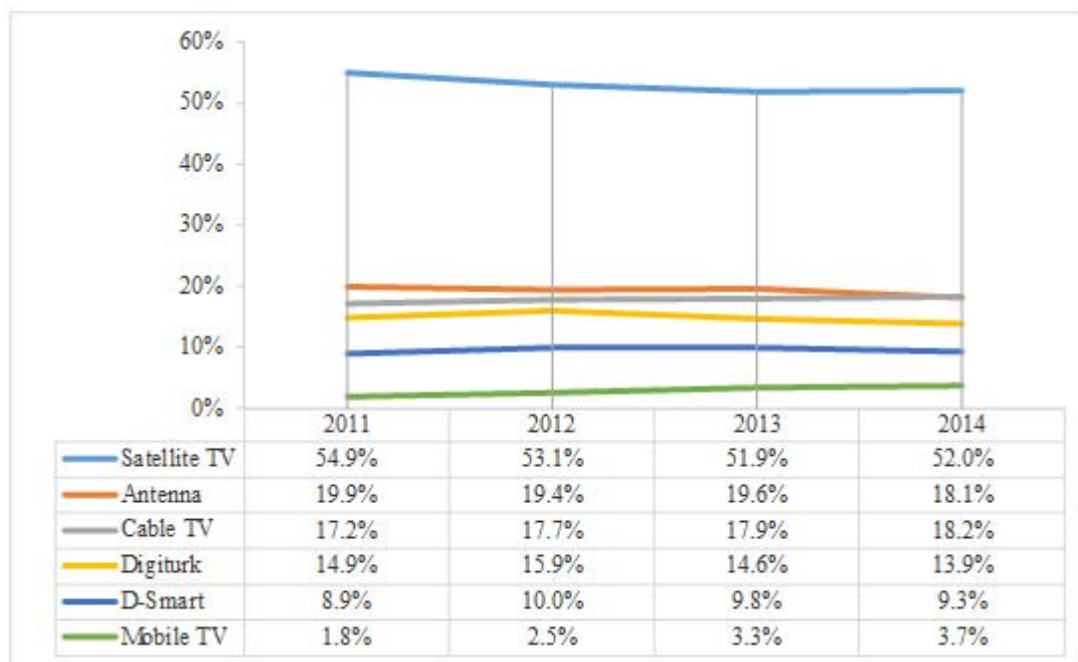

	2011	2012	2013	2014
Satellite TV	54.9%	53.1%	51.9%	52.0%
Antenna	19.9%	19.4%	19.6%	18.1%
Cable TV	17.2%	17.7%	17.9%	18.2%
Digiturk	14.9%	15.9%	14.6%	13.9%
D-Smart	8.9%	10.0%	9.8%	9.3%
Mobile TV	1.8%	2.5%	3.3%	3.7%

Figure 5. Percentages of learners' reception of television broadcast by years

An analysis of Figure 5 reveals that between 2011 and 2014 satellite TV usage decreased from 54.9% to 52%, antenna usage decreased from 19.9% to 18.1%, and Digiturk usage dropped from 14.9% to 13.9%. Contrarily, Cable TV usage increased from 17.2% to 18.2%, D-Smart usage increased from 8.9% to 9.3%, and mobile TV usage increased from 1.8% to 3.7%. It can be claimed that, in general, there is a downward trend in reception of television

broadcast of learners, however in line with the increase in usage of mobile devices, there is an increase in mobile TV usage. Table 6 shows numbers of learners enrolled in Anadolu University Open Education System who owned technological devices in the period 2011-2014 by years.

Table 6: *Learners' Technological Device Ownership by Years*

Technological Device	Years							
	2011		2012		2013		2014	
	Yes	No	Yes	No	Yes	No	Yes	No
Cell Phone	206,236	8,760	198,677	8,109	104,355	4,885	92,695	4,187
Handheld Computer	25,594	189,402	30,009	176,777	16,998	92,242	13,628	83,254
MP3/MP4 Player	40,744	174,252	34,463	172,323	14,050	95,190	9,577	87,305
VCD/DVD Player	38,838	176,158	29,506	177,280	11,427	97,813	7,665	89,217
Computer	184,760	30,236	176,761	30,025	89,643	19,597	74,989	21,893
Telephone	100,251	114,745	87,064	119,722	39,002	70,238	30,735	66,147
Television	143,094	71,902	131,040	75,746	64,242	44,998	53,481	43,401
Tablet PC	16,039	198,957	28,530	178,256	24,010	85,230	23,154	73,728

When the data is analyzed, it can be seen that in 2011 learners' cellphone ownership is the highest and the learners tablet computer ownership is the lowest; in 2012 learners' cellphone ownership is the highest and the learners tablet computer ownership is the lowest; in 2013 learners' cellphone ownership is the highest and the learners' VCD/DVD player ownership is the lowest; in 2014 learners' cellphone ownership is the highest and the learners VCD/DVD player ownership is the lowest. The percentages of learners' technological device ownership in the period of 2011-2014 are presented in Figure 6.
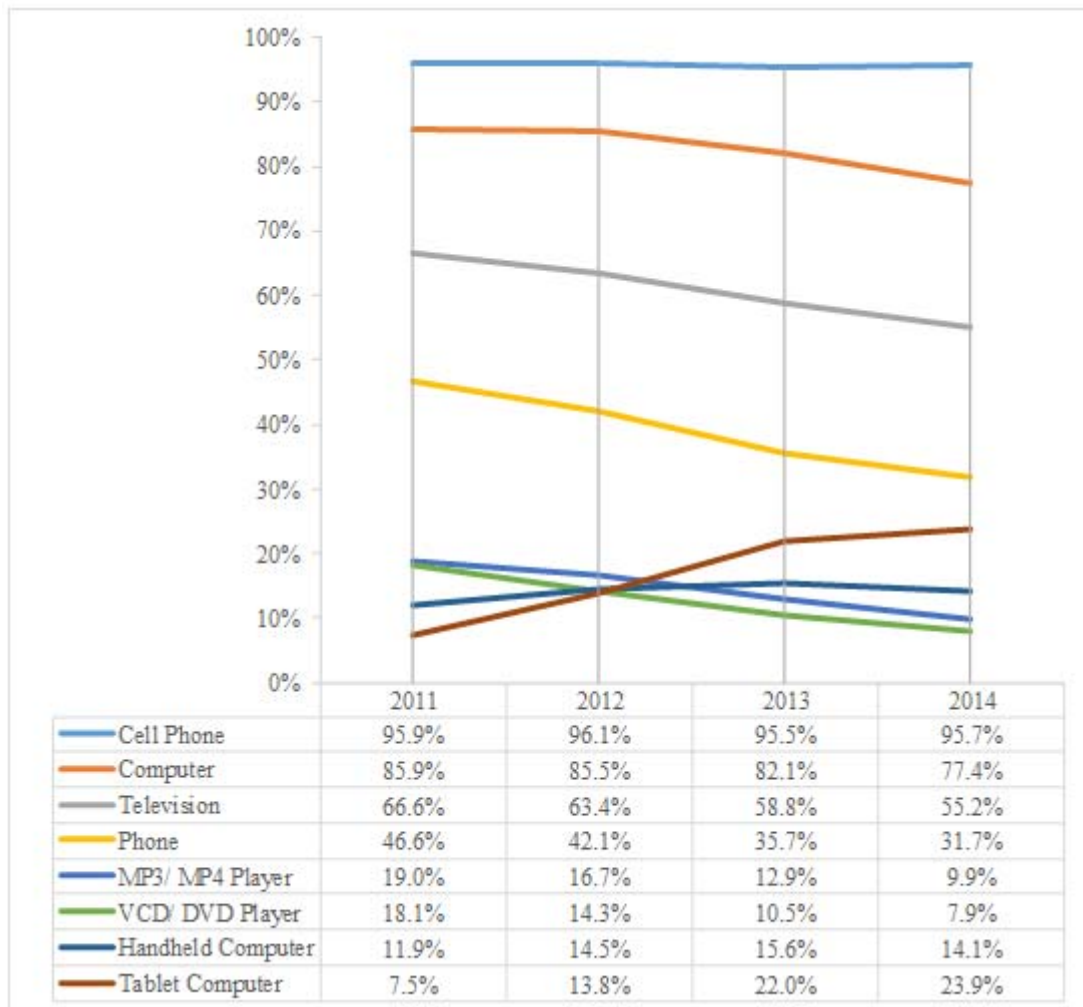
	2011	2012	2013	2014
Cell Phone	95.9%	96.1%	95.5%	95.7%
Computer	85.9%	85.5%	82.1%	77.4%
Television	66.6%	63.4%	58.8%	55.2%
Phone	46.6%	42.1%	35.7%	31.7%
MP3/ MP4 Player	19.0%	16.7%	12.9%	9.9%
VCD/ DVD Player	18.1%	14.3%	10.5%	7.9%
Handheld Computer	11.9%	14.5%	15.6%	14.1%
Tablet Computer	7.5%	13.8%	22.0%	23.9%

Figure 6. Percentages of technological device ownership

According to Figure 6, between 2011 and 2014 cellphone ownership stayed almost the same; tablet computer ownership increased dramatically; while computer, MP3/MP4 player, VCD/DVD player, telephone and television ownership percentages declined. Handheld computer ownership, however, increased between 2011 and 2013, but declined in 2014. The reason for changing trends in handheld computers might be that it is not a commonly used concept nowadays and learners might have confused it with tablet computers. The increases in portable device ownership such as cellphones and tablet computers are especially important for open and distance learning institutions to realize the objective of learning from anywhere and at any time. Widespread and effective use of these devices in academic environments can increase use of e-learning content and resources.

In this study, having determined learners' technology ownership percentages, t-tests were employed to test the research hypotheses and determine whether there was a difference between the academic achievement of the learners who own and do not own a technological device. Research hypotheses were analyzed by grouping learners' technological device ownership status and employing independent two sample t-test.

In order to test the hypothesis 1, which is "There is no difference between the academic achievement of learners who have computers and learners who do not have computers", independent two sample t-test was applied. According to the independent two sample t-test

results, out of 438,363 learners, the grade point average of 361,190 learners who own a computer was calculated as 1.938, while the grade point average of 77,173 learners who do not own a computer was calculated as 1.738. A significant difference is observed between the averages of these two groups. The scores of learners who own a computer (M= 1.938, SD= 0.826) turned out to be higher than for those who do not own a computer (M= 1.738, SD= 0.815). In the test for equality of variances the calculated F= 0.273 and p-value for this F is p = 0.601. Accordingly, since p= 0.601 is greater than significance level α= 0.05, the H_0 hypothesis that variances are equal is accepted. The t value which is calculated under the assumption that variances are equal is t= 61.384 and p-value for this t is p= 0.000 (t(438361)= 61.384, p<0.001). This result shows that there is a statistically significant difference between the academic achievement of learners in terms of computer ownership. In the 95% confidence interval, the significance value turned out to be less than 0.05. Therefore, the hypothesis 1 is rejected. The test results show that there is a difference between the academic achievement of learners who have computers and learners who do not have computers.

After this first analysis, the second hypothesis was tested. In order to determine the hypothesis 2, which is "There is no difference between the academic achievement of learners who have handheld computers and who do not have handheld computers", independent two sample t-test was applied. According to the results of these tests, out of 438,363 learners, the grade point average of 59,835 learners who own a handheld computer was calculated as 1.892, while the grade point average of 378,528 learners who do not have a handheld computer was calculated as 1.905. It is observed that there is a significant difference between the averages of these two groups. Scores of learners who have a handheld computer (M= 1.892, SD= 0.825) turned out to be lower than scores of learners who do not have a handheld computer (M=1.905, SD= 0.828). In the test for equality of variances the calculated F= 0.574 and p-value for this F is p= 0.109. Accordingly, since p= 0.109 is greater than the significance level α= 0.05, the H_0 hypothesis that variances are equal is accepted. The t value calculated under the assumption that variances are equal is t= -3.546 and p-value for this t is p= 0.000 (t(438361)= -3.546, p<0.001). This result shows that there is a statistically significant difference between academic achievement in learners in terms of handheld computer ownership. In the 95% confidence interval, the significance value has turned out to be less than 0.05. Therefore, the hypothesis 2 is rejected. Test results show that there is a difference between the academic achievement of learners who have handheld computers and learners who do not have handheld computers.

Finally, the third hypothesis was tested. In order to determine the hypothesis 3, which is "There is no difference between the academic achievement of learners who have tablet computers and who do not have tablet computers", independent two sample t-test was applied. According to the independent two sample t-test results, out of 438,363 learners, a grade point average of 72,343 learners who have a tablet computer was calculated as 1.952, while a grade point average of 366,020 learners who do not have a tablet computer was calculated as 1.893. It is observed that there is a statistically significant difference between the averages of these two groups. Scores of learners who own a tablet computer (M=1.952, SD= 0.839) turned out to be higher than scores of learners who do not own a tablet computer (M= 1.893, SD= 0.825). F value calculated in the test for equality of variances is F=7.483 and p-value for this F is p= 0.006. Accordingly, since p= 0.006 is less than significance level α= 0.05, the H_0 hypothesis that variances are equal is not accepted. The t value calculated under the assumption that variances are not equal is t=17.181 and p-value for this t is p= 0.000 (t(101913)=17.181, p<0.001). This result shows that there is a statistically significant difference between the academic achievement of learners who own a tablet computer and who

do not own a tablet computer. In the 95% confidence interval, the significance value turned out to be less than 0.05. Therefore, the hypothesis 3 is rejected. Test results show that there is a difference between the academic achievement of learners who have tablet computers and learners who do not have tablet computers.

CONCLUSION

In this study, in which 722,399 questionnaire data obtained from the learners who were enrolled in Anadolu University Open Education System between 2011 and 2014 were analyzed, it was found that learners think of themselves as intermediate level computer users, that they have internet access both at home and at work, that they use the internet for obtaining information, and that they prefer satellite TV. When their technological device ownership is analyzed, a majority of learners have cellphones and the biggest increase across the years was observed in tablet computer ownership. When the internet access possibilities and changes in technology ownership is analyzed, it can be said that learners can benefit from online services provided in the Open Education System through their mobile or other devices. When the hypotheses of the study were tested it was found that there is a difference at a 95% confidence interval between the academic achievement of learners who own a computer, a handheld computer or a tablet computer, and learners who do not own these devices.

In order to create a positive difference between technological device ownership and academic achievement, demographic, personal and behavioral characteristics of learners, their learning styles, needs and preferences can be determined and the most appropriate learning environments can be created, with the help of technological possibilities. Using technology and technological devices in an appropriate way to create the most suitable learning environments and to reach maximum learning outputs can enhance learners' success. If the content, environment and learner's characteristics are compatible with each other technology can help learners to be successful. Technology allows for the learning process to be more easily facilitated, sped up and diversified. Using technology, which is a powerful instrument for learning environments, in an effective way, it is possible to combine the qualities of the instructor and the learning environment, which will lead to the improvement of open and distance learning environments.

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