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Comparative Cross-Cultural Study in Digital Literacy*

Nazire Burcin HAMUTOGLU[1], Orhan GEMIKONAKLI[2], Clifford De RAFFAELE[3], Deniz Mertkan GEZGIN[4]

ARTICLE INFO	ABSTRACT
	Purpose: Due to the distinctive characteristics of developed countries differentiating them from the developing countries, it is expected that there may be differences between developed and developing countries' levels of digital literacies. Considering the cultural differences and approach to the gender problem, it is important to see how these differences manifest themselves when genders are considered. Therefore, this study aimed to investigate comparatively the level of digital literacy of university students in three culturally different countries.

Method: The study was based on descriptive survey research and consisted of 430 university students, studying on technological programs in three different countries: the first one was the United Kingdom (UK), a well-developed member of the European Union (EU), the second one was Malta, a less developed EU member, and the third one was the Republic of Turkey, a developing country and a candidate for EU membership. The data were collected through the Digital Literacy Scale. In the analysis of data, descriptive statistics and multivariate analysis of variance (MANOVA) test were used.

Findings: The only difference in the findings is in the technical sub-dimension of digital literacy; male students' average scores for this sub-dimension are higher than that of female students across three countries. The findings also indicated significant differences in terms of cognitive and social-emotional sub-dimensions of digital literacy between countries. Accordingly, participants studying in Turkey had a lower score than participants studying in Malta in terms of cognitive sub-dimension and had a higher score than the UK participants in the social-emotional sub-dimension. Moreover, it was found that neither gender nor country had any significant effect on the sub-dimensions of digital literacy.

Implications for Research and Practice: The findings of the study reveals that the participants from Turkey scored lower than other countries in the cognitive skills needed for digital literacy. This may well lead to a recommendation for improving digital literacy in different countries.

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[1] Corresponding Author: Dr., Eskisehir Technical University, The Center for Teaching and Learning Excellence, 26555, Tepebası/Eskisehir, TURKEY, nbhamutoglu@eskisehir.edu.tr, 0000-0003-0941-9070
[2] Prof. Dr., School of Science and Technology, Middlesex University, London, UNITED KINGDOM, o.gemikonakli@mdx.ac.uk, o.gemikonakli@gmail.com, 0000-0002-0513-1128
[3] Dr., Middlesex University, MALTA, c.deraffaele@mdx.ac.uk, 0000-0002-7081-702X
[4] Assoc., Dr., Computer and Instructional Technology Education, Trakya University, Edirne, TURKEY, mertkan@trakya.edu.tr, 0000-0003-4688-043X

Introduction

The latest figures from the International Telecommunications Union (ITU) shows the extent the world is covered with networks of connected devices (ITU, 2016) and the use of the Internet. According to these statistics, while 47% of the world's population is using the Internet, this number reaches 65%, and 79.1% for the Americas, and Europe respectively. Technological advancements and the increasing access to the Internet has rapidly changed not only teaching and learning but also the way people access information, communicate, collaborate, and socialize. The implication of this is that new knowledge and literacy skills beyond traditional literacy and even computer literacy have become a necessity to enable finding, evaluating and communicating information. The use of networked devices such as computers, smartphones, tablets etc. means that it is no longer sufficient to understand the software and hardware aspects of the use of computers but also an understanding of the underlying network is important. Again, the new literacy is not limited to knowledge and skills in using networked devices. The presence and wide acceptance of social networks such as Facebook®, Twitter®, and various other groups bring into question their behavioural protocols and ethical norms. All these put together forms the digital literacy; the knowledge, skills, and behaviours used in networked digital devices.

Since online access to information as well as social networks has become an essential part of daily life, digital literacy has consequently ingrained within every walk of life; teaching and learning, employment, leisure, commerce, production, creativity, social life and so on. Considering the role of online systems in education, social life, economy and so on, the importance of digital literacy shows itself as an undeniable fact. As put in (Europe's Information Society Thematic Portal, 2007), to participate and take advantage, citizens must be digitally literate -equipped with the skills to benefit from and participate in the digital society. This includes both the ability to use new ICT tools and the media literacy skills to handle the flood of images, text and audio-visual content that constantly pour across the global networks.

It should be noted that digital literacy can only build on literacy as it is traditionally understood. Sparks et al. prefer the term Digital Information Literacy (DIL); generally defined as the ability to obtain, understand, evaluate, and use information in a variety of digital technology contexts (Sparks et al., 2016). In their review, they stress the importance of this skill for success in higher education as well as in the global networked economy, highlighting the necessity to administer and use results from valid assessments of DIL. It should also be emphasised that digital literacy is essential in preventing plagiarism.

Gender is one of the most important variables affecting the access to and use of information and communication technologies (Basturk Akca & Kaya, 2016). Research shows that in developing countries, the percentage of women using technology is significantly less than that of men. Antonio and Tuffley (2014a) relate this to the role of women in society and the established socio-cultural behaviours. However, research shows that despite this belief, as women's interaction increases, individuals, families, and society all benefit from its outcomes (Antonio & Tuffley, 2014b). Hibert (2011)

argues that digital technologies have the potential of helping women to overcome the inequality between the genders through the provision of access to low-cost health services and education as well as employment opportunities to help increase income. Especially, social media can help women to increase their social capital, which can then be used in favour of individuals, family and society. Hence, access to technology, the conscious use of technology and a good level of digital literacy can all merit women. Trusts are established worldwide to offer digital literacy education to women (Women's Annex Foundation, 2014). These trusts provide digital literacy education to women and children in many countries. These activities aim to empower women for the development of sustainable economies for themselves and their families. Digital literacy education for women can be an enabling factor in eliminating gender differences (Antonio & Tuffley, 2014a). Developed and developing countries differ in the use of the Internet and the ownership of mobile subscriptions (Bal, Kalayci & Artan, 2015). Especially the English-speaking countries have an advantage in accessing ICT (Bal, Kalayci & Artan, 2015). The Report on the United Nations Development Program (2005) states that developed and developing countries do not differ much in literacy. However, despite this, developed countries have an advantage over the rest in terms of investment into ICT education and integration of ICT enabled projects into education (ITU, 2015). In this context, it is expected that in the UK and Malta where English is the official language (English is official Language in Malta alongside Maltese and is spoken by 88% of the population) and technology integration in education is effectively implemented, it is expected that digital literacy levels are high (Camilleri, Aquilina, Carabott & Seguna, 2018). It is fair to say that there is a lack of quantitative research comparing developed and developing countries in terms of digital literacy. Another developing country, Turkey, influenced by globalization and led by governmental policies, has an increasing acceleration in the use of ICTs. Several projects initiated by the Ministry of National Education can be given as examples. These are Basic Education, Accessing the Internet, No School without Computers, Collaboration in Education, and the latest one, The Movement of Increasing Opportunities and Improving Technology (FATIH) projects. (Islamoglu, Ursavas & Reisoglu, 2015). It is important to assess the gender factor in digital literacy and any differences in digital literacy from the viewpoint of cultural differences. This may well lead to a recommendation for improving digital literacy in different countries.

Educational institutions have witnessed, within the last decade, a relentless growth in the development and implementation of computing systems as educational technologies (Dabbagh et al., 2016). As stakeholders within the domain are seeking to adopt these platforms to facilitate their undertaking, technology has been morphing computer systems into interconnected portable and personal devices with an evermore enriched and diverse availability of information (Williams, 2002). As these platforms became the de facto standard for the attainment of information (Forsyth, 2001), the popularisation of social networking and open educational resources have consequently led users to directly share information and knowledge in synchronous and informal interactions (De Raffaele et al., 2015).

Alas, albeit the vast availability of information resources that is made available to educational stakeholders, it is becoming ever more challenging for users to find the right type of information and the time spent in retrieving the required knowledge is consistently increasing (Sopan et al., 2016). Consuming the presented data is considered an increasingly intimidating task, leading technology-enabled stakeholders to quickly end up being overloaded with information and unable to keep abreast with its rapid advancement (Chen et al., 2012). These challenges have led academia to recognise that the emergence of a suitable technological solution for education demands not only the availability of resources but also a well-designed study plan to aptly integrate and exploit the brought over advantages (Takahashi et al., 2015).

In the context of higher education institutions (HEIs), these advancements dictate that rather than delivering literacy content in the form of knowledge and data, the primary objective of educators is to provide the basic skills and competencies for students to progress through data and obtain the intended knowledge from available repositories (Jones & Sallis, 2013). This demand correlates closely with the definition of digital literacy as expressed by Gilster (1997), which characterises the need to understand and use information in multiple formats from a wide variety of computerised sources via the Internet. Articulated more specifically by the US Educational Testing Service (ETS) within the context of HEIs, digital literacy is defined as; "the ability to use digital technology, communication tools and/or networks appropriately to solve information problems". Thus, this presents HEIs with the demand that rather than being the recipient of data, students need to be educated into how to directly engage with the presented data and further their exposure in a dynamically meaningful manner (Sun et al., 2015). Consequently, this implies that from an educator's perspective, teaching with a technological context becomes a far more process-driven approach, in stark contrast to the knowledge transferring exercise which traditional lecture delivery used to provide (Vu et al., 2015).

Adopting modern technologies successfully within HEIs however, results in a transition period for both students and faculty members alike, during which new digital literacy skills and techniques may need to be developed and applied (Johnson et al., 2015; Ungerer, 2016). The importance of properly developing academic members of staff is essential for the successful integration of educational technology in a pedagogical manner within the curriculum (De Raffaele & Galea, 2014). Amongst the challenges, a contentious effort must be made in understanding the current digital literacy skills of the stakeholders, and nourish confidence in adopters by providing the necessary instruction and guidance (Casey & Haillissy, 2014). From the students perspective, developing digital literacy necessitates the latter to be more active and self-sufficient in their learning as opposed to the conventional process of instructor-led knowledge transfer (Dembo & Seli, 2004).

The demand for HEIs to focus on the provision of digital literacy skills to students is however imperative and critical for the success of students in modern society (Betts & Payne, 2016). As discussed by Bhatt (2015), apart from enriching the ability to interact with educational technology, digital literacy is essential for students to adapt

to new and emerging technologies as well as facilitate their ability to pick-up new semiotic communication languages. The enhancement of digital literacy skills within students is also critical for their holistic development, and as expressed by Jones and Hafner (2002), the affordance of digital tools facilitate not only ways of meaning, but also ways of doing, relating, thinking and being.

Various research work has been carried out on digital literacy in Turkey. In a study carried out by Karahan and Izci (1999), results were significantly in favour of men in terms of Internet applications. In their work where the participants were university students, Akdag and Karahan (2004) found similar results showing that in information literacy as it relates to digital literacy, the difference was in favour of men. The interpretation of this work suggested that female students are shy in the use of technology. Similarly, in another study carried out with the participation of prospective teachers from Turkey and Kazakhistan, again, the findings showed a difference between genders in favour of male students (Ozerbas & Kuralbayeva, 2015). On the other hand, work carried out by Ozden (2018) with the participation of Turkish computer teachers found no differences between genders. The research of Kozan and Ozek (2019) on digital literacy did not find any significant differences between genders either. There are studies showing differences in digital literacy between genders. These differences are important and should be considered with social environments and level of development. Today, in the era of technology, the development of ICTs and globalisation had a positive impact on the social and cultural equality of women and men. Hence, it may be useful to investigate the gender differences in digital literacy for the level of development.

The study addresses the following research question.

1. Does the level of digital literacy of the students show any significant difference in terms of attitude, technical, cognitive, and social-emotional sub-dimensions according to their sex and country of education?

Method

In this study, three countries were chosen for a cross-cultural study. The sample groups were chosen from university students studying engineering/technological subjects. The distinctive characteristics of these countries show some differences: while the UK is a well-developed EU member state, Malta is a less developed EU member, and finally, Turkey is a developing country and a candidate for EU membership. A summary of relevant statistics for these countries is given in Table 1 (i.g. literacy levels of different developed countries, and the differences on the use of the Internet, cited in PISA, 2015; ITU, 2016). In addition to the citations, national statistics are used for the table.

Table 1

Key Literacy Statistics of the Countries Compared (PISA 2015, ITU 2016)

	The use of the Internet (%)	PISA Mathematics mean score	PISA Reading mean score	PISA Science mean score	Literacy (%)
UK	94	492	498	509	99
Malta	60	454	467	455	92.8
Turkey	68	420	428	425	96.22

Research Design

The study was designed by relational survey model based on contrary/excessive case sampling is a kind of purposive sampling method. Contrary/excessive case sampling focuses on participants with unique or special characteristics. In this sampling method, countries with different development levels have been considered. The surveying model is a kind of approach aiming to describe a situation with its existing facts. The purpose of this model is making a description by depicting the existing state about the research topic (Buyukozturk et al., 2015). In surveying studies, no effort is done to change and influence the fact that is the subject of the study. The distribution of participants in the sample is more important than the reasons of properties and opinions (Fraenkel & Wallen, 2006). The necessary data for the relational surveying model was obtained from the individuals in the target population of the study by using measurement tools.

Research Sample

Participants were studying at the technological departments of universities in Turkey, Malta, and the UK. The study groups were selected from the Department of Computer and Teaching Technologies Education, University of Sakarya, Turkey, and Faculty of Science and Technology, Middlesex University, Malta and UK with a total number of 430 participants, giving a total of 107 female and 323 male students. The gender distribution is reflective of actual male-female ratios on the academic programmes chosen, and the students are 18-35 years old.

Table 2

Demographic Statistics of Students

		N	%
Gender	Female	107	24.9
	Male	323	75.1
Country	Turkey	201	46.7
	Malta	116	27.0
	United Kingdom	113	26.3

Research Instruments and Procedures

In data collection, the English and Turkish versions of the Digital Literacy Scale developed by Ng (2012) have been used. While the original English version of the scale was used in Malta and UK, the Turkish version for which validity and reliability work was carried out by Hamutoglu, Gungoren, Uyanik and Erdogan (2017) was used in Turkey. The Scale comprises of 17 items and 4 dimensions (attitude, technical, cognitive, and social-emotional). The attitude dimension of the scale comprises seven items. "I like using ICT for learning" is an example item for the attitude dimension. Within the technical dimension, there are six items, for example, "I can learn new technologies easily". The cognitive dimension included two items, and "I am familiar with issues related to web-based activities e.g. cyber safety, search issues, plagiarism" is an example. Finally, "ICT enables me to collaborate better with my peers on project work and other learning activities" is an example for the social dimension which included two items, as well. 5-point Likert scale was used ranging from Strongly Agree (5) to Strongly Disagree (1). Cronbach's Alpha calculation gave the reliability coefficient as 0.93 for the scale, and 0.88 and 0.89 and 0.7 and 0.72 and for attitude, technical, cognitive, and social-emotional dimensions for the adapted form of the scale, respectively. In addition to this, in this study, the calculated Cronbach's Alpha values were 0.91 for the scale, and 0.87 for attitude, 0.87 for technical, 0.60 for cognitive, and finally 0.62 for social-emotional dimensions. Internal consistency coefficients calculated using Cronbach's Alpha indicated acceptable to average reliability for 0.60-0.70, a good to a high degree of reliability for 0.70 and 0.90; and an excellent to a high level of reliability for values over 0.90 (George & Mallery, 2003; Ozdamar, 2002, p. 667). Furthermore, Sipahi, Yurtkoru and Cinko (2008) state that a value of Cronbach's Alpha higher than 0.70 indicates reliability for the scale; however, the authors also report that for sub-dimensions with a small number of questions, this value is 0.60 and over (p. 89). Cortina (1993) and Osburn (2000) confirm this statement that under certain

circumstances (when the number of items is small, the structure measured is one-dimensional etc.) the Cronbach's Alpha coefficient can have a lower value than normally stated. The study shows that when calculated at cognitive and social-emotional dimensions using the Cronbach's Alpha, the coefficient of internal consistency is lower compared to the values obtained for other dimensions. This can be seen in the version of the scale adapted to Turkish, too. This difference can be attributed to the smaller number of items cognitive and social dimensions have. Although lower coefficients were obtained for these dimensions, the values obtained were greater than 0.60, making these acceptable. While hard copies of the forms were presented to students in Turkey, online questionnaires are used in Malta and UK using Google Drive for data collection. These differences in collecting responses are based on the cultural differences of the participants which are identified through the experiences of the researchers involved in this work. Although in the IMD 2017 The Power of Digital Competitiveness Report the general performance of economies are measured in terms of three components; "information", "technology", and "readiness for the future", the ability of Turkish students to respond to online questionnaires is poor. Amongst these three components, the weakest side of Turkey is "information", in which Turkey sits at the 60th position in the table of countries of the world. The country's position concerning the sub-dimensions of "Information" is as follows: "skills" 49th, "teaching and learning" 63rd (the last position), and "scientific density" 48th. In terms of the technology component, Turkey occupies the 38th position. The questionnaire was given to 256 students out of 395 registered students of which 201 responded. In Malta, 116 responded out of 125, and 113 responses were received out of 160 students in the UK.

Data Analysis

The collected data were analyzed by SPSS 23 to relate cultural differences affecting digital literacy to independent parameters. In the analysis, a parametric method, Multivariate analysis of variance (MANOVA) was used to determine whether or not students' digital literacy skills varied according to gender and country of study. To do this, the data set was prepared for the analysis and extreme values were removed from the data set to meet the assumption of normality. Secondly, multicollinearity and singularity values between the dependent variables, VIF and tolerance values were controlled. Thirdly, Cook's distance and Leverage values were computed to meet the assumptions. Finally, three rows from the data set were removed. Table 3 shows the univariate normality confirmed for each dimension upon verifying hypotheses for MANOVA.

Table 3

Values for Normality Distribution in Each Dimension for each Variable

Dependent Variables			N	Skewness	Kurtosis
Attitude	Gender	Female	107	-.572	.085
		Male	323	-.961	2.318
	Country	Turkey	201	-.429	-.225
		Malta	116	-.209	-.794
		United Kingdom	113	-1.184	2.242
Technical	Gender	Female	107	-.096	-.491
		Male	323	-.462	-.155
	Country	Turkey	201	-.210	-.752
		Malta	116	-.334	-.053
		United Kingdom	113	-.426	-.384
Cognitive	Gender	Female	107	-.162	-.681
		Male	323	-.428	-.169
	Country	Turkey	201	-.302	-.388
		Malta	116	-.092	-.309
		United Kingdom	113	-.309	-.774
Social-emotional	Gender	Female	107	-1.251	2.093
		Male	323	-.354	-.333
	Country	Turkey	201	-.607	-.016
		Malta	116	-.280	-.285
		United Kingdom	113	-.441	-.340

Table 3 presents the normality distribution for gender and country variables under each factor by skewness and kurtosis values. Having values ranging between +2.5 and -2.5 indicates that distribution does not deviate extremely from a normal distribution (Mertler & Vannatta, 2005), and as known the values below zero show standard normal distribution. Accordingly, skewness and kurtosis coefficients for factor scores in Table 3 indicated no deviation from the normal distribution because of the variance between +2.5 and -2.5.

Other assumptions of outliers were detected via Mahalanobis Distance value considering the independent variables in the dataset (p<0.01) (Buyukozturk, 2005, p.99). Furthermore, multicollinearity and singularity values were seen at moderate levels (Akbulut, 2010, p.158; Buyukozturk, 2005, p.100; Field, 2005, p. 224; Pallant, 2005). Additionally, VIF values were smaller than 10 (=1.123) and tolerance values were higher than zero (=.890). Finally, Cook's distance should be smaller than 1 and Leverage values should be smaller than 0.02 to meet the assumptions. According to these results, the data met the multivariate normality assumption.

The relationship between dependent variables is the lack of multiple linear regression, and dependent variables must theoretically be related to each other (Leech, Barret & Morgan, 2005). In terms of meeting these assumptions, the high relationship (Correlation coefficients over .80 or .90) between dependent variables causes problems in MANOVA (Akbulut, 2010, p.158; Buyukozturk, 2005, p.100; Field, 2005, p. 224; Pallant, 2005). Correlation values were calculated in this study as rattitude&technical=.645; rattitude&cognitive=.575; rattitude&social-emotional=.426; rtechnical&cognitive=.650; rtechnical&social-emotioanl=.393; rcognitive&social-emotional=.363. Accordingly, it is possible to say that among dependent variables, there are no multiple linear relationships.

Another assumption, which is about the homogeneity of variance-covariance matrices in the use of MANOVA needs to be considered. To do this, the Box's M test was used, which shows the statistical significance and indicates that the assumption of homogeneity of variance-covariance matrices is provided, and the statistical insignificance of the Box's M test suggests that this assumption is violated. The number of participants is important in improving the significance of Box's M test. The significance level for this test is suggested to be taken as .025, or .01 (Mertler & Vannatta, 2010) or .001 (Pallant, 2005), and Wilks' Lambda row is interpreted. In this study, the significance level for the Box's M test was taken as .01. The findings of the study for the significance value was calculated for the dependent variable data set consisting of independent variables to show that the assumption of homogeneity of the variance-covariance matrices for the independent variables is met (gender [Box's M=4.801, p>.01] and country [Box's M=66.021, p>.01].

Results

Multivariate analysis of variance (MANOVA) was conducted to determine whether or not each factor score varied according to gender and country.

Table 4

MANOVA Results for Average Scores as of Variables

Independent Variable	Wilks' Lambda	F	Hypothesis sd	Error sd	p
Gender	.95	5.289	4.000	421.000	.00
Country	.91	4.963	8.000	842.000	.00

MANOVA results indicated a significant difference for each factor according to students' gender and country of students as [Wilks lambda (gender) =.95, F(4;421) =5.289 p<.05; Wilks lambda (country) =.91, F(8;842) =4.963, p<.05]. These findings suggest that scores received from the subscales changed according to the gender and country. Analysis has also covered the effect size η2 for gender and Cohen's f for country variables to show the extent of the independent variable's effect on the dependent variable. η2 is used to calculate the effect size of the difference between groups in the independent sample t-test. On the other hand, Cohen's f is a value used to calculate the effect size in variance analysis gives an estimate of the rate variance explained by the categorical variable and predicts the ratio of variance calculated by the sample. Firstly, Cohen's f formula was required to calculate η2 value as follows (1);

$$\eta^2 = Sum\ of\ Squares\ between \frac{groups}{Total} sum\ of\ squares \qquad (1)$$

Finally, to calculate Cohen's *f* value, following formula needs to be used (2);

$$Cohen's\ f = \sqrt{\eta^2 \Big/ 1 - \eta^2} \qquad (2)$$

The effect size for η2 is interpreted as 'small' for .01 ≤ η2 < .06, 'medium' for 0.06 ≤ η2 < .14, and 'large' for η2 ≥.14 (Cohen, 1988), and Cohen's f is interpreted as 'small' for .10, 'medium' for 0.25, and 'large' for .40 (Cohen, 1988; Kirk, 1996). Accordingly, Table 5 and Table 6 show the effect size of the results obtained from the subscales of digital literacy based on gender and country variables.

Table 5 gives mean and standard deviation values for the four factors of the scale along with factor-based one-way ANOVA results for gender.

Table 5

Mean, Standard Deviation and ANOVA Results for Gender

Dependent Variable	Gender	N	X	Sum of Squares	F	Sd	p	Differences	η 2
Attitude	Female	107	29.370	6.258	.377	1-428	.539		
	Male	323	29.763						
Technical	Female	107	23.261	89.051	6.481	1-428	.011*	Male>Female	0.014
	Male	323	24.747						
Cognitive	Female	107	8.344	1.149	.640	1-428	.424		
	Male	323	8.175						
Social-emotional	Female	107	7.801	3.414	1.185	1-428	.277		
	Male	323	7.510						

*<.05

As seen in Table 5, average scores for attitude, cognitive, and social dependent variables did not indicate a significant difference as of students' gender [$F_{attitude}$ (1;428)=.539, p>.05; $F_{cognitive}$ (1;428)=.424, p>.05; F_{social} (1;428)=.277, p>.05], whereas there was a significant difference among the average scores for technical dependent variable [$F_{technical}$(1;428)=.011, p<.05]. Accordingly, male students' average scores for technical sub-dimension of digital literacy were higher than that of female students, which might indicate that male students had a more tendency towards the technical dimension of digital literacy compared to female students. Besides, a review of the effect size based on Cohen's f value shows that gender may have a small effect on the average scores for the factor on technical dimension of digital literacy ($f_{technical}$=0.014).

Table 6 gives mean and standard deviation values for the four factors of the scale along with factor-based one-way ANOVA results for the country.

Table 6

Mean, Standard Deviation and ANOVA Results for the Country

Dependent Variable	Country	N	X	Sum of Squares	F	Sd	p	Differences	η^2	f
Attitude	Turkey	201	29.832	59.596	1.797	1-427	.167			
	Malta	116	30.210							
	United Kingdom	113	28.657							
Technical	Turkey	201	24.677	66.205	2.409	1-427	.091			
	Malta	116	23.944							
	United Kingdom	113	23.391							
Cognitive	Turkey	201	7.987	13.084	3.641	1-427	.027*	Malta>Turkey	0.017	0.13
	Malta	116	8.634							
	United Kingdom	113	8.158							
Social-emotional	Turkey	201	8.030	17.753	3.082	1-427	.047*	Turkey>UK	0.028	0.18
	Malta	116	7.433							
	United Kingdom	113	7.504							

*<.05

As seen in Table 6, average scores for attitude and technical dependent variables did not indicate a significant difference according to the country of students [$F_{attitude}$ (1;427)=.167, p>.05; $F_{technical}$ (1;427)=.091, p>.05], whereas there was a significant difference among the average scores for cognitive [$F_{cognitive}$(1;427)=.027, p<.05] and social-emotional dependent variables [$F_{social-emotional}$ (1;427)=.047, p<.05]. Accordingly, the male students studying in Malta had a higher average score than that of female students for cognitive subdimension, and the male students studying in Turkey had a higher average score than that of female students for social-emotional sub-dimension.

These results might indicate that students studying in Malta have a more tendency towards the cognitive dimension of digital literacy compared to students in Turkey. Moreover, considering the results that there might be a high tendency for students studying in Turkey to get high scored- in social-emotinal sub-dimension, but thiscould be different in actingwhen compared to the students in the UK. Besides, a review of the effect size showed that country may have a small effect on the average scores for the factor on cognitive ($f_{cognitive}$ =0.13), and social-emotional dimensions of digital literacy ($f_{social-emotional}$=0.18).

Discussion, Conclusion and Recommendations

This work presents a comparative study of the digital literacy levels of students studying in three different countries. The study focused on digital literacy levels in terms of attitude, technical, cognitive, and social-emotional sub-dimensions. The only difference in the findings was in the technical sub-dimension where male students scored higher. Basturk Akca and Kaya (2016) found similar results, and Antonio and Tuffley (2014a) argue that these findings are a result of women's role in society and prescriptive socio-cultural attitudes. However, it is possible to express that, this difference does not have much implication in practical life based on the calculated effect size (Cohen's f). Also, it was shown that when gender and country are considered together, there is no significant difference in digital literacy. The age of technology we live in has been a turning point for global gender equality. In Turkey, as well as in the rest of the world, an effort is put into engaging individuals and especially women in the use of technology in an attempt to promote equal opportunities. Turkish Statistical Institute (TUIK), the main stats organization of Turkey, reported that the use of computers by women doubled reaching 23% in 2007. This situation has seen an increase with the widening use of technology. Turkish Statistical Institute- TUIK (2019) reports support these findings, stating that in the same age groups, the use of the Internet is 81.8 per cent and 68.9 per cent for men and women, respectively.

In this respect, it is thought that the projects and studies offered to both sexes together have been effective in achieving this. The absence of significant differences in this area based on gender indicates that projects and other work promoting the skills of women have been effective (Camilleri et al., 2018; Durmuscelebi & Temircan, 2017; Intel, 2013; OECD, 2001). The findings of the study showed that all students can use a wide range of formal and informal communication technologies and software in classrooms or educational activities without any difference regardless of gender differences. These findings match the results of a similar research study stating that no significant gender difference was found in terms of self-efficacy of literacy levels (Dikmen & Tuncer, 2018). Individuals with self-efficacy are expected to give a positive opinion on digital literacy in terms of attitude and technique. On the other hand, attitude and digital literacy have generally been shown to support students' self-efficacy perceptions (Prior, Mazanov, Meacheam, Heaslip & Hanson, 2016). In a study conducted by Usluel (2006) on 1702 pre-service teachers and 289 teachers (1991 individuals in total), it was determined that there was no significant difference between the self-efficacy perceptions of the teachers and teacher candidates based on

gender differences. Based on a sample of 47, Korkut and Akkoyunlu (2008) concluded that self-efficacy perceptions of foreign language teachers did not show a significant difference according to gender either. Also, studies show that the increase in the frequency of the use of the Internet also affects information literacy (Ata, 2011). As known, the Internet is a powerful tool in the fight against gender differences in accessing and using information for education (Polat, 2012). In the globalizing world, online learning materials are now available to every individual. Especially, distance education portals and projects like Coursera help meeting experts of the world regardless of gender.

Differences between sub-dimensions were determined among countries. The findings showed that there was no difference in the attitude and technical sub-dimensions between Malta and Turkey, while a difference existed in the cognitive dimension in favour of Malta. The difference between the two countries' digital literacy can be explained by the levels of Turkey and Malta in different fields in PISA 2015. Digital literacy refers to an individual's ability to find, understand, evaluate, and use data obtained from digital platforms. PISA 2015 reports show that in Science and Mathematics that involves cognitive hard work, Turkey lags behind many other countries. Another finding is differences in social-emotional sub-dimension between Turkey and the UK, in favour of Turkey. The absence of differences in attitude and technical sub-dimensions can be explained by the fact that the students are part of the Y generation. This is because the Y generation was born into technology and were grown into social media experiences. This corresponds to a new era of globalization, where digital literacy and the use of social networks have led to the sharing of ideas and innovations in the world faster than ever (Gulbahar, Kalelioglu & Madran, 2010). The Y Generation differs from other generations in terms of interest in technology, and social, and emotional attitudes. Since they value technology and speed, they emerged as the generation most protected by their parents. However, while the Y Generation value freedom, the level of work and ambition is low. They may find it difficult to focus on anything. Research carried out in Turkey showed that the Y Generation's main use of technology is to access social media and social media is an unavoidable means of daily communication for them (Kuyucu, 2017). In this context, the cognitive differences indicate that the use of ICTs is less in Turkey compared to the other two countries. In the report, We are Social (2018), participants from all three countries believe that new technologies will bring new opportunities rather than risks. Approximately 80% of the participants were reported to have Internet access. This result in attitude and technique is thought to be caused by the fact that individuals have a positive attitude towards technology and technological tendency due to their generations. When analyzed for their cognitive dimensions, as the Human Development Index Report- UNDP, (2016) shows, Malta is the 33rd and is part of very high human development group while Turkey is the 71st and situated in the high human development category.

Statistical reports on the difference between Internet access and usage amongst women and men show that this difference is in a decline in developed countries (We Are Social, 2018). However, this is still biased towards men in developing countries.

Also, as stated by Keniston and Kumar (2003), the digital divide is not only between countries but also can be culturally present between different populations within a country. In this context, considering the access of individuals to ICT and their level of use of the Internet, cultural and gender-based digital divide (Akca, 2014; OECD, 2001), may well have affected the findings of this work in terms of digital literacy.

Students studying in the UK and Malta scored higher in cognitive dimension in terms of the use of ICT compared to students studying in Turkey. This can be explained by better infrastructure in these countries and investment in people as reflected in Human Development Reports. Especially in case of Malta, the job opportunities in software development encourage students' development of technical skills, especially in this domain. Thus, individuals who benefit more from technology, have higher literacy rates, and perhaps have better access to technology in terms of income. Opportunities encourage them to better use these technologies in education and self-development which benefits them further. It is obvious that even if you have a technological tool, those who cannot use it consciously and who do not have the knowledge and skills for this usage will be at risk. Also, the effects of the differences in the PISA 2015 reports, which include results in science, mathematics and reading area of 15-year-old students, are also thought to have an impact on the cognitive dimension of digital literacy. This is because of the positive effect of digital literacy on education (Mohammadyari & Singh, 2015; Tang & Chaw, 2016).
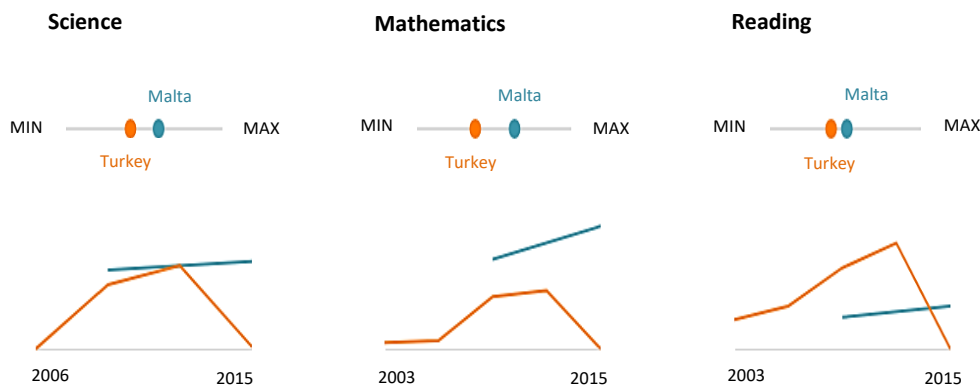
Figure 1. *Comparison of Turkey and Malta in PISA 2015 Reports*

Being a former British colony, Malta is known to have been influenced by many aspects of British culture and social life. Secondary and higher educations are no exception in this sense. For example, in Malta, undergraduate education and master's degree last three years and one year respectively, just like UK higher education. Similarly, yearly Human Development Reports based on means of income, education, health, and safety opportunities of the individuals show both countries in the same section; Most Advance Human Development, where the UK is the 16th and Malta is the 33rd in the most recent report. All these explain the absence of any differences in digital literacy between the two countries.

Considering the items of social-emotional dimension, a difference was detected between Turkey and the UK in favour of Turkey. In information and communication technology skills, cybersecurity, plagiarism, and research concepts (*as stated in the instrument*), students studying in Turkey obtained higher scores. Similarly, studies in the new media literacy covers topics such as cyberbullying, hate speech, digital observation, online security, freedom of expression (Bulus, 2017, p. 33). These topics relate to the social-emotional dimension as shown in digital literacy instrument used in this study. Since digital literacy focuses on the sociological, political, cultural, economical, and behavioural aspects of digital technologies, the difference is thought to arise from the structural differences between countries (Fransman, 2005; Green & Beavis, 2012; Kellner, 2004).

The results of the study show the importance of the informatics course that has lately been questioned. It is also argued that informatics courses enable students to become active participants in the digital world, preparing them for future jobs as digitally literate (developing and presenting their own ideas through the use of information and communication technologies) individuals (Barut & Kuzu, 2017). Furthermore, the importance of these courses in raising the digital literacy levels of teachers, prospective teachers, and students, implementation of teacher training programs and enabling teachers to lead their students in technology is stated (Ustundag, Gunes & Bahcivan, 2017). In this context, Computer Education and Instructional Technology (CEIT) departments providing ICT courses have higher responsibilities. The cognitive comparison of digital literacy between Turkey and the two other countries studied in this work showed that Turkey lags behind the two. This shows the need for CEIT departments and the essence of increasing ICT courses at different educational levels. Research carried out on digital literacy examined the relationship between the levels of digital literacy to use social networks in terms of different variables and found that students studying in the CEIT departments scored higher than the students in other departments (Hamutoglu, Gungoren, Uyanik & Erdogan, 2018). This finding is promising in the sense that the competence in digital literacy gained in the CEIT departments can be achieved by students of other departments through interaction between CEIT and demonstrates the importance of CEIT departments for education faculties. Students will be able to increase their awareness and skills in digital literacy by interacting with their colleagues who are competent in this. This interaction can be achieved during students' social and academic time-sharing activities.

Finally, various research showed that in the context of digital literacy, the use of computers, the skills in the use of computers, and the grasp of the fundamental concepts of computing shows differences based on gender. These differences may have an impact on student-tutor, and student-student interactions as well as learning processes. Hence, teachers using computer-assisted learning should pay attention to these differences (Ertl & Helling, 2011).

Future studies can focus on assessing the effects of experimental activities on digital literacy. Besides, teaming up individuals from various departments with those

more skilled in computer and instructional technologies to work collaboratively can be facilitated to increase individuals' digital literacy skills.

Limitations and Recommendations

This work is restricted by the dependent and independent variables it considers, sampling methodology, and sampling size. While the dependent variables are attitude, technic, cognitive and social-emotional sub-dimensions of digital literacy, gender and country formed the independent variables as accepted in the relevant literature. Future work may consider digital literacy with total points for different variables. Furthermore, different sampling methods can be used to identify cultural situations. Finally, future work may focus on interviews with participants based on qualitative research provided that time and distance limitations are resolved. It is expected that the findings of such interviews would support current findings.

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Dijital Okuryazarlık Üzerine Karşılaştırmalı Kültürlerarası Bir Çalışma*

Atıf:

Özet

Problem Durumu: Günümüzde bireyler artık dijital vatandaşlık kimlikleri ile dünyaya gelmektedirler. Gelişen teknoloji özellikle de İnternet'in gelişimi bu noktada dijital vatandaşlık kavramını kaçınılmaz kılmaktadır. Dijital vatandaşlığın, en önemli öğelerinden biri ise dijital okuryazarlık kavramıdır. Dijital okuryazarlık "genellikle çeşitli dijital teknoloji ortamlarından bilgi edinme, anlama, değerlendirme ve kullanma kabiliyeti" olarak tanımlanmaktadır. Dijital okuryazar birey, farklı teknolojileri doğru kullanmak, doğru bilgiye ulaşmak, üretmek ve paylaşımda bulunabilmek ve eğitim süreçlerinde teknolojiyi kullanabilme becerilerine sahip olan kişi olarak tanımlanmaktadır. Bilgi ve iletişim teknolojisi araçları ile İnternet'i kullanan bireylerin iyi birer dijital okuryazar olabilmesi için ülkeler bazı politikalar geliştirmektedir. Çünkü ülkeler, günümüzde bilgi ve iletişim teknolojisi araçlarının kullanımının toplumsal, ekonomik ve kültürel yapıya olumlu ve olumsuz etkilerini bilmektedir. Dijital okuryazarlık kavramı söz konusu olduğunda cinsiyet faktörünü

göz önüne almak ve dijital okuryazarlıktaki farklılıkları kültürel farklılıklar açısından değerlendirmek önemlidir. Bu, farklı ülkelerde dijital okuryazarlığın geliştirilmesine yönelik önerilere yol açabilir.

Bu çalışmada teknoloji alanında öğrenim görmekte olan öğrenciler ile kültürlerarası bir çalışma gerçekleştirmek için üç ülke seçilmiştir. Bu ülkeler birbirinden gelişmişlik anlamında farklılık göstermektedir ki ayırt edici özellikleri; birincisinin Birleşik Krallık iyi gelişmiş bir AB üyesi; ikincisi ise Malta olup İngiltere'ye göre daha az gelişmiş bir AB üyesi ve üçüncüsü ise Türkiye olup gelişmekte olan ve AB üyeliğine aday bir ülke olmasıdır.

Araştırmanın Amacı: Bu çalışma, farklı üç ülkede öğrenim görmekte olan üniversite öğrencilerinin okur-yazarlık düzeylerini tutum, teknik, bilişsel ve sosyal-duygusal alt boyutları açısından karşılaştırmalı olarak incelemeyi amaçlamaktadır. Bu amaç doğrultusunda aşağıdakileri sorulara yanıt aramaktadır:

1. Öğrencilerin dijital okuryazarlık düzeyleri, cinsiyetlerine ve eğitim gördükleri ülkelere göre tutum, teknik, bilişsel ve sosyal-duygusal alt boyutları açısından anlamlı bir farklılık göstermekte midir?

Araştırmanın Yöntemi: Bu çalışma tarama modellerinden ilişkisel tarama modeli ile amaçlı örnekleme yöntemlerinden aykırı durum örneklemesine uygun olarak tasarlanmış olup; mevcut durumu tanımlamayı amaçlayan bir tür yaklaşımdır. Bu yaklaşımın amacı, mevcut durumu araştırma konusu hakkında tasvir ederek bir açıklama yapmaktır (Büyüköztürk vd., 2015). Anket çalışmalarında, çalışmanın konusu olan gerçeği değiştirmek ve etkilemek için çaba gösterilmemektedir. İlişkisel tarama modeli için gerekli veriler, ölçüm araçları kullanılarak araştırmanın hedef popülasyonundaki bireylerden elde edilmiştir. Çalışma grubunu, Türkiye, Malta ve İngiltere'de teknoloji ile ilgili bölümlerde öğrenim gören 430 üniversite öğrencisi oluşturmaktadır. Nicel araştırma yöntemlerinden tarama yöntemi ile desenlenen çalışmada veri toplama araçları olarak (Ng, 2012) tarafından geliştirilen dijital okuryazarlık ölçeğinin İngilizce ve Türkçe sürümü kullanılmıştır. Geliştirilen ve uyarlanan ölçek 4 boyuttan oluşmakta olup toplam 17 madde içermektedir. Dijital okuryazarlık ölçeği tutum, teknik, bilişsel ve sosyal-duygusal alt boyutlarından oluşmaktadır. 5'li Likert tipinde olan ölçek, Kesinlikle Katılıyorum (5) ile Kesinlikle Katılmıyorum (1) arasında kategorilendirilmiştir. Türkçe'ye uyarlanan ölçeğin Cronbach Alpha ile hesaplanan, iç tutarlık katsayısı tüm ölçek için 0.93 iken; tutum, teknik, bilişsel ve sosyal boyutları için sırasıyla 0.88, 0.89, 0.7 ve 0.72'dir. Elde edilen veriler SPSS 23 programı ile analiz edilmiş olup; dijital okuryazarlığı etkileyen kültürel farklılıklar bağımsız parametrelerle ilişkilendirilerek analilz gerçekleştirilmiştir. Yapılan analizde, öğrencilerin dijital okuryazarlığa ilişkin durumlarının cinsiyete ve ülkeye göre değişip değişmediğini belirlemek için çok değişkenli varyans analizi (MANOVA) kullanılmıştır.

Araştırmanın Bulguları: Elde edilen bulgular teknik alt boyutunun cinsiyet açısından anlamlı bir farklılık oluşturduğunu ve erkeklerin kadınlara göre daha yüksek puana sahip olduğunu göstermektedir. Ayrıca elde edilen sonuçlar ülkeler açısından bilişsel ve sosyal-duygusal alt boyutu açısından da anlamlı farklılık göstermektedir. Buna

göre, Türkiye'de öğrenim görmekte olan katılımcılar bilişsel alt boyutunda Malta'da öğrenim görmekte olan katılımcılardan daha az; sosyal-duygusal alt boyutunda ise İngiltere'de öğrenim görmekte olan katılımcılardan daha yüksek puana sahiptir. Son olarak, çalışmada cinsiyet ve ülke değişkenlerinin birlikte dijital okuryazarlık alt boyutları üzerinde anlamlı bir etkiye sahip olmadığı da bulunmuştur.

Araştırmanın Sonuçları ve Öneriler: Elde edilen bulgular, sadece teknik alt boyutunda cinsiyet açısından bir farklılık olduğunu ve bu alandaki farklılık erkeklerin kadınlara göre daha yüksek olduğunu göstermektedir. Ancak, bu farkın pratik anlamda pek bir etkisinin olmadığı görülmektedir. Bununla birlikte çalışma sonuçları, cinsiyet değişkeninin ülke değişkeni ile birlikte değerlendirilmesi durumunda dijital okuryazarlık açısından anlamlı bir fark olmadığını göstermektedir. Buna göre, içinde yaşadığımız teknoloji çağının küresel cinsiyet eşitliği için bir dönüm noktası olduğu söylenebilir. Tüm dünyada olduğu gibi Türkiye'de de bireylerin ve özellikle de kadınların teknolojiyi kullanma konusunda eşit fırsatlar oluşturmaya teşvik edilmesi için çaba gösterilmektedir.

Elde edilen sonuçlar ülkeler arasında alt boyutlar açısından farklılıklar olduğunu; Malta ile Türkiye arasındaki tutum ve teknik alt boyutları arasında bir fark olmadığını, bilişsel boyutta ise Malta lehine bir fark olduğunu, Türkiye ile İngiltere arasında ise sosyal-duygusal alt boyutta Türkiye lehine farklılıklar olduğunu göstermektedir. Tutum ve teknik alt boyutlarındaki bulgular öğrencilerin Y kuşağının bir parçası olmasıyla açıklanabilir. Bu, Y kuşağının teknolojinin içine doğmuş olmasından kaynaklanmaktadır.

Elde edilen bulgular İngiltere ve Malta'da okuyan öğrencilerin, Türkiye'de okuyan öğrencilere kıyasla bilişsel boyutta BİT kullanımı bakımından daha yüksek puana sahip olduğunu göstermektedir. Bu sonuç, mevcut ülkelerin (İngiltere ve Malta) teknolojik anlamda gelişmiş bir alt yapıya sahip olmaları ile İnsani Gelişme Endeksi Raporlarına yansıdığı gibi insanlara yapılan yatırım ile açıklanabilir. Özellikle Malta'nın, yazılım geliştirmede öğrencilere tanıdığı iş fırsatları düşünüldüğünde; öğrencilerin bu alanda özellikle de bilişsel ve teknik beceriler açısından kendilerini geliştirmelerine destek olduğu söylenebilir. Dolayısıyla, teknolojiden daha fazla yararlanan bireyler ile teknolojiyi öğretim müfredatlarına entegre etmiş ülkelerin, okuryazarlık oranlarının daha yüksek olduğu söylenebilir.

Dijital okuryazarlığın sosyal-duygusal alt boyutu dikkate alındığında, Türkiye ile İngiltere arasında Türkiye lehine anlamlı bir fark olduğu görülmektedir. Bu boyutta bilgi ve iletişim teknolojisi becerileri, siber güvenlik, intihal ve araştırma konuları yer almaktadır. Buna göre elde edilen bulguların Türkiye'de öğrenim görmekte olan öğrenciler açısından farklılık arz etmesinin; ülkeler arasındaki yapısal farklılıklardan kaynaklı olduğunu düşündürmektedir.

Çalışmanın sonuçları, son zamanlarda sorgulanan bilişim derslerinin önemini göstermekte olup; bilişim derslerinin öğrencilerin dijital dünyada aktif birer katılımcı olmalarını sağlayarak, onları dijital okuryazar bir birey (Barut ve Kuzu, 2017) olarak geleceğe hazırlamada katkı sağladığı alanyazında tartışılmaktadır. Hamutoğlu ve diğerleri (2018), öğrencilerin dijital okuryazarlık düzeyleri ile sosyal ağları kullanma

amaçları arasındaki ilişkiyi farklı değişkenler açısından incelemiş ve Bilgisayar ve Öğretim Teknolojileri Eğitimi (BOTE) bölümünde okuyan öğrencilerin diğer bölümlerdeki öğrencilerden daha yüksek puan aldığını tespit etmiştir. Bu bulgu, BOTE bölümlerinde kazanılan dijital okuryazarlık konusundaki yeterliliğin, BOTE bölümleri ile diğer öğretmenlik programlarında öğrenim görmekte olan öğrenciler arasındaki etkileşimi arttıracağı düşüncesi ile BOTE bölümlerinin eğitim fakülteleri için önemini göstermesi açısından umut vericidir. Öğrenciler bu alanda yetkin meslektaşları ile etkileşime girerek dijital okuryazarlık konusundaki farkındalıklarını ve becerilerini artırabileceklerdir. Bu etkileşim, öğrencilerin sosyal ve akademik zaman paylaşımı aktiviteleri sırasında da gerçekleştirilebilir.

Anahtar Sözcükler: Karşılaştırma, gelişmiş ve gelişmekte olan ülkeler, dijital okuryazarlık, cinsiyet, bilgi ve iletişim teknolojileri (BIT).