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Exploring the Digital Divide in Open Education: A Comparative Analysis of Undergraduate Students

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Article abstract

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Abstract

In the 21st century, the widespread use of information technologies has made access to technology, technology usage skills, and the quality of technology services increasingly important. However, the digital divide—defined as a lack of access to telecommunications—remains a significant issue that separates developed countries from developing countries. This study aimed to explore the digital divide in open education by comparing the digital divide levels of first term and last term or graduate students enrolled in the Anadolu University Open Education System. The study also examined how factors such as gender, age, income level, and employment status impact digital competency by comparing the digital divide scores of participants in these groups. The findings of the study suggest that first-term students have higher levels of digital competency than final-term students. The study also found that males, people aged 30–40, those with high incomes, and those working in the private sector had the highest digital competency scores. These results can be used to inform the development and implementation of open and distance learning programs to reduce the digital divide, as well as to identify specific groups that may be at a disadvantage in terms of digital competency.

Keywords: open learning, distance learning, digital divide, digital competence, open education, Turkey

Introduction

Access to technology, technology usage skills, and Internet service quality create gaps between different segments of society all around the world. This phenomenon, referred to as the digital divide, digital separation, or digital inequality, is characterized by a lack of access to telecommunications (Dasgupta et al., 2001). The US National Telecommunications and Information Administration defined the digital divide as "the gap between those who have access to information technologies and those who do not" (1999, p. 20). Meanwhile, Bagchi (2005) suggested that the digital divide is not only determined by access to technology but also by the ability to effectively use the technology. The digital divide encompasses dimensions such as technology ownership, technology use, Internet access, and socioeconomic level. Recently, as Internet access has become standard for most Western populations, research on the digital divide has begun to focus on the determinants of Internet skills, uses, and outcomes (Scheerder et al., 2017). As stated by Ilomäki et al. (2011), the concept of digital skills is frequently connected to the concept of digital divide. When studying the digital divide, researchers often focus on concepts such as digital competence and digital skills. Initially, the term digital divide was used to describe the unequal access to digital services among different social groups, as well as their varying abilities to utilize digital opportunities (Norris, 2001; van Dijk & Hacker, 2003). However, nowadays, the concept of the digital divide also highlights abilities in using digital resources.

Socioeconomic conditions can greatly affect access and use of information technologies, and these differences have become even more pronounced during the COVID-19 pandemic (OECD, 2020). One of the most important ways to address the digital divide is through mass, technology-oriented applications and open education. In the 1903 article "Democracy in Education," Dewey highlighted the imperative of an inclusive educational system, a concept still relevant today, as the implementation of open education initiatives must address the digital divide to ensure equitable access to learning opportunities. Giebel (2013) argued that open source and, in particular, the open innovation movement provides opportunities to acquire knowledge and skills that can reduce the digital divide. Similarly, Ally and Samaka (2013) stated that open education resources can help bridge the digital divide by providing access to learning materials through mobile technology. In the case of this research, a study by Fırat and Güney (2020) found that the Anadolu University Open Education System contributes to social digital transformation in Türkiye. However, research on the effects of open and distance learning on the digital divide is limited, and further investigation with a larger number of participants, which is the focus of this research, is required.

Literature Review

There are various approaches to identifying, measuring, and comparing the digital divide across different variables. The OECD (2001) identified several variables, such as the number of computers an individual owns, Internet access opportunities, and telephone and television services. Factors that have been cited as contributing to the digital divide include gender, age, income level, lack of basic digital experience, lack of materials, lack of digital skills, lack of access for usage (van Dijk & Hacker, 2003), physical access to technology, availability of appropriate content, perceived usefulness of technology and its content (Baker & Panagopoulos, 2004), connectivity, freedom of access, and active computer use (Hawkins & Oblinge, 2006). The digital divide has been associated with access to and active use of IT and a range of demographic and socioeconomic characteristics: income, education, race, gender, geographic location (urban–rural), age, and political, cultural, and psychological attitudes. Gil-García

and et al. (2006) and Helbig et al. (2009) proposed that the digital divide could be examined at three different levels: the differences between individuals with and without access to technology at the first level, the differences between developing countries at the second level, and consideration of people's skills in technology at the last level, in which factors such as race, gender, and origin are taken into account. In this research, the digital divide is discussed in terms of four different demographic characteristics: gender, age, income level, and employment status.

While technology-supported education systems provide important opportunities, such as equal access to education for all, the digital divide caused by socioeconomic differences can pose a significant problem. The digital divide in education is not only about access to technology but is also related to competence and skill in using computers, technology, and the Internet (van Dijk, 2006). Therefore, simply increasing the number of computer and Internet users will not be sufficient to reduce the digital divide. Madhubhashini (2022) found that students at the Open University of Sri Lanka faced challenges during the COVID-19 pandemic due to both personal factors, such as information technology (IT) literacy and infrastructure, technical issues, health issues, and financial issues, as well as institutional factors, such as inadequate support from the supportive divisions, unreliable online platforms, and lack of resources and IT infrastructure. Similarly, Lembani et al. (2020) pointed out the digital divide between urban and rural distance learning students in South Africa for the same courses. Helsper (2010) similarly stated that Internet access is unevenly distributed among people from different demographic backgrounds such as age, gender, socioeconomic status, ethnicity, and geography. Öktem, et al. (2021) argued that socio-economic conditions such as access, equality, relatively low education and income levels prevent technology use. According to Bozkurt and Sharma (2020), many people are unable to take advantage of educational opportunities due to the digital divide. Victor (2010) argued that the digital divide should also be taken into account when designing courses. Journell (2007) suggested that developing e-learning activities and digital literacy will reduce the gap. Block (2010) emphasized the need for administrators to work on access to technology, which is still a major barrier for many distance learners. According to Gencer and Aktan (2021), the use of IT in education was expected to be realized before the pandemic, but now is an urgent matter. Therefore, it is important to make digital reforms in education.

Various studies in the literature indicate that the digital divide is very present especially in underdeveloped and developing countries. In their study, Mathrani et al. (2022) highlighted the digital inequalities that emerged during the COVID-19 lockdown in five developing countries: India, Pakistan, Bangladesh, Nepal, and Afghanistan. The research revealed that structural issues such as lack of access to digital media and supporting services, contributed to these inequalities. Additionally, the study found that female students are disproportionately affected by the digital divide, with cultural practices and gendered discriminatory rules exacerbating the issue. For example, female students reported experiencing more stress due to added household responsibilities, which negatively impacts their agency and ability to fully realize their learning potential. In their study, Liebenberg et al. (2020) examined the access to and use of IT among students at the University of South Africa (Unisa). Their findings confirmed that access to digital technologies is complex and that it is important to consider how access and skills can both amplify and perpetuate existing inequalities within and between countries. The primary problems are that people cannot access technologies due to financial difficulties, do not know how to use these technologies even if they have access, and do not know the benefits of technology (Öktem et al., 2021).

There have been various suggestions in the literature for addressing the digital divide among open education students. Lane (2009) discussed the concept of openness in higher education, specifically in relation to digital technologies and open education resources. Lane (2009) highlighted the potential for these technologies to increase access to education, but also noted that issues such as lack of access to technology and necessary skills can create or widen digital divides. Lane (2009) suggested that intermediaries, such as teachers, may be needed to help bridge these divides through the use of open education resources. Chaklader et al. (2013) proposed the use of a village wireless LAN, a low-cost network infrastructure solution for digital communication, information dissemination, and education. Wang and Huang (2022) suggested using IT for open education for elderly students. Arslan (2022) advised using educational television for inclusive education. Samancioglu et al. (2022) emphasized the need for information and strategic skills, even among academics, to bridge the digital divide.

In their research, Cruz-Jesus et al. (2016) addressed the relationship between education and the digital divide among members of the EU-28. Their findings highlighted the importance of assessing internal gaps in addition to cross-country analysis when addressing the relationship between education and the digital divide, as even the most digitally developed countries have internal divides, and using only aggregated data would probably cause losing some important insights. The research of Volungevičienė et al. (2020) demonstrated that open online learning should serve as a solution for curriculum change in higher education to respond to digital and network society learning needs. These studies suggest that open education can help reduce the digital divide, but it is important to consider gaps within countries when analyzing the relationship between education and the digital divide.

The literature review has highlighted the importance of understanding and addressing the digital divide in education. The digital divide is a complex phenomenon that encompasses dimensions such as technology ownership, technology use, Internet access, and socioeconomics. Studies have shown that the digital divide in education is not only about access to technology but also related to competence and skill in using technology. Factors such as gender, age, income level, and employment status play a role in the digital divide. Literature has suggested that open and distance learning can be an effective way to reduce the divide. However, research on the effects of these methods on the digital divide is limited and requires further investigation with a larger number of participants. Sims, Vidgen, and Powell (2008) also emphasized that the digital divide is not being adequately addressed by higher education institutions. Such investigations will help to understand the landscape of the digital divide among open education students and examine the effect of open education on the divide. This study addresses these limitations and contributes to the understanding of the digital divide in open education and the development of effective strategies to reduce it, ensuring equal access and success in education for all students.

Current Investigation

This research aims to explore the digital divide in open education. The digital divide is a problem in itself. However, while open education has significant potential to help overcome this problem, studies investigating the effects of open education on the digital divide are limited. For this purpose, digital competency scores of first term and last term or graduate students studying at Anadolu University Open Education System were compared in terms of demographic characteristics. The research questions were as follows:

1. How do digital divide levels of Open Education System students differ according to their gender, age, income level, and employment status (unemployed, public sector, private sector, retired)?

2. Is there a statistically significant difference in the digital divide levels of Open Education System students in their first and last terms?

Method

Participants

The participants were students enrolled in undergraduate and associate degree programs at the Anadolu University Open Education System. A total of 10,320 students participated in the study; however, data from 2,374 participants were excluded from the analysis because their responses were identical on all scale items or because they failed to specify their program type and study term. The final sample size used in the analysis was 7,945 students. Table 1 shows a breakdown of the demographic data of participants.

Table 1

Demographic Background of Participants (After Data Cleaning)

Characteristic	Grouping	*n*	%
Age	Under 30	3,647	46
	30–40	2,476	31
	Over 40	1,821	23
Gender	Female	3,184	40
	Male	4,761	60
Term	First term	3,224	41
	Last term	2,824	36
	Intermediate term	1,897	24
Degree	Associate	4,393	55
	Undergraduate	3,552	45
Income level	Low	2,420	31
	Middle	5,175	65
	High	350	4
Employment status	Unemployed	2,408	30
	Public sector	1,988	25
	Private sector	3,263	41
	Retired	286	4

Note. N = 7,945.

As seen in Table 1, 46% of participants were under 30, and 31% of participants were between the ages of 30 and 40; 60% of participants were male. While the rate of participants in the first term was 41%, the rate of the participants in the last term was 36%. For income levels, rather than numerical income data, participants were asked to provide categorical data as low, medium, and high. Middle-income level

participants were the highest rate at 65%. In terms of employment status, the highest proportion of participants were in the private sector (41%). Full-time students who are not employed in any paid job are included in the unemployed group.

Ethical Considerations

The research was conducted in accordance with the ethical principles of the American Psychological Association. The participants were informed about the research and the scale used in the study, and their consent was obtained. The data collected in the research was kept confidential and used only for this research. The participants were also informed that they could withdraw at any time without giving any reason.

Data Collection Tools

A quantitative data collection tool known as the Digital Competency Scale was used in this research. The scale, developed by Akkoyunlu et al. (2010), was designed to measure the digital divide level of university students and consists of 45 items, all of which are measured on a 7-point Likert scale. The four sub-factors of the scale are digital competency, technical access, motivation, and awareness. During their research, Akkoyunlu et al. applied the scale to 761 students enrolled in the final year of Hacettepe University's Faculty of Education. Cronbach's alpha coefficient, to measure reliability, was calculated as 0.83. Cronbach's alpha coefficients were calculated for the reliability of the 45-item scale and were found to be 0.86 for the whole scale, 0.94 for the first sub-dimension, 0.84 for the second, 0.78 for the third, and 0.81 for the fourth. The results of the study by Akkoyunlu et al. showed that the scale could be used as a valid and reliable measurement tool.

Data Collection Process

Permission to use the scale was obtained, and the items were then transferred to a Google Forms survey for administration. The data collection tool consisted of two parts: the first part included the 45 scale items, and the second part included demographic questions related to age, gender, income level, and employment status. The survey was distributed through the Open Education System's online platform. It was available to students from the beginning of July until mid-September.

Data Analysis

The collected data were analyzed with IBM SPSS Statistics (Version 24.0). In the analysis, descriptive statistics, *t*-test, and analysis of variance (ANOVA) were used to answer the research questions. The reliability of the scale used in the study was tested with the Cronbach's alpha coefficient, and the coefficient was found to be 0.94. This coefficient indicates that the scale had a high level of reliability.

Results

Means and standard deviations were analyzed according to the 4 sub-factors of the scale: digital competence, technical access, motivation, and awareness. It was found that the Open Education System students had a high level of awareness with a mean of 49.69 and a standard deviation of 14.416. Similarly, students' levels of motivation ($\bar{X}$ = 53.27; *SD* = 16.304) and digital competence ($\bar{X}$ = 80.58; *SD* = 26.576) were high. Finally, students were found to have a moderate level of technical access with a mean of 44.49 and a standard deviation of 15.754.

Comparison of Digital Divide Levels of First and Last Term Students

To compare the digital competencies of students by terms of their semesters, semester information was collected as "first term," "intermediate term," and "last term." The one-way ANOVA test was used to compare the scale scores according to the term. A significant difference resulted [$F_{(2, 7942)} = 4.511$, $p = .011 < 0.05$], as indicated in Table 2.

Table 2

One-Way ANOVA Statistics Comparing Digital Divide Levels Within and Between Participant Groups by Term

Source of variance	*SS*	*df*	*MS*	*F*	*p*
Between groups	40454.934	2	20227.467	4.511	.011*
Within groups	35612790.880	7942	4484.109		
Total	35653245.810	7944			

Note. ANOVA = analysis of variance.

*$p < .05$.

A Tukey post hoc test was used to determine between which groups this significant difference occurred and to make comparisons between groups. The Tukey comparisons are shown in Table 3. There was a statistically significant difference only between the first and last term groups.

Table 3

Tukey Post Hoc Test Comparing Groups

Term	*n*	*M*	*SD*	*p*
First	3,224	230	63.7	.008*
Last	2,824	225	70.4	
First	3,224	230	63.7	.483
Intermediate	1,897	228	67.0	
Last	2,824	225	70.4	.299
Intermediate	1,897	228	67.0	

Note. $N = 7{,}945$.

*$p < .05$.

In the subgroup analyses made with the Tukey test, it was seen that there was a statistically significant difference in favor of the first term only when comparing the first and last term ($\bar{X}_{\text{(first term)}} = 230 > \bar{X}_{\text{(last term)}} = 225$, $p = .008 < .05$). In other subgroup analyses, there was no statistically significant difference between the groups ($p = .483$, $p = .299 > .05$). This finding, contrary to expectations, shows that students who have just started at the Open Education System have more digital competence than students in the last semester.

Comparison of Digital Divide Levels by Demographic Characteristics

This section presents the findings for the first research question. The digital competence scale scores are compared according to each of the demographic characteristics collected in this research.

Comparison by Gender

In order to compare the digital competency scores of participants according to their gender, an independent two-sample *t*-test was used. Results are shown in Table 4.

Table 4

Independent t-*Test Comparing Digital Divide Levels by Gender*

Gender	*n*	*M*	*SD*	*p*
Female	3,184	225	69.2	0.003*
Male	4,761	230	65.4	

Note. N = 7,945.

*$p < .05$.

When female and male participants were compared, digital competence scale results were found to reach statistical significance in favor of males ($\bar{X}$ = 230 > $\bar{X}$ = 225, p = 0.003 < 0.05). The result shows that digital competencies of male participants were higher than those of female participants.

Comparison by Age

A one-way ANOVA test was used to compare the digital competence scores of participants according to age. The findings are given in Table 5.

Table 5

One-Way ANOVA Statistics Comparing Between and Within Participant Groups by Age

Source of variance	*SS*	*df*	*MS*	*F*	*p*
Between groups	26401.883	2	13200.941	2.943	.053
Within groups	35626843.930	7942	4485.878		
Total	35653245.810	7944			

Note. ANOVA = analysis of variance.

A Tukey test was used to make comparisons between groups. The comparisons are shown in Table 6.

Table 6

Tukey Post Hoc Test Comparing Groups

Age	*n*	*M*	*SD*	*p*
under 30	3,467	228	69.2	.310
30–40	2,476	230	65.9	
under 30	3,467	228	69.2	.416
over 40	1,821	225	63.8	
30–40	2,476	230	65.9	.043*
over 40	1,821	225	63.8	

Note. N = 7,945.

*$p < .05$.

When we compared participants by age, we found a statistically significant difference between the groups in terms of digital competence ($F_{(2)} = 2.943$, $p = .053 < .05$). In the subgroup analyses made with the Tukey test, we found a significant difference only between participants aged 30–40 and those over 40, in favor of those aged 30–40 ($\bar{X}_{(30–40)} = 230 > \bar{X}_{(over\ 40)} = 225$, $p = .043 < .05$). No significant difference was found in other subgroup analyses ($p = .310$, $p = .416 > .05$).

It is noteworthy that the averages of the first and last term comparisons ($\bar{X}_{(first\ term)} = 230$, $\bar{X}_{(last\ term)} = 225$) and the averages of students aged 30–40 and over 40 ($\bar{X}_{(30-40)} = 230$, $\bar{X}_{(over\ 40)} = 225$) are the same. The reason for this may be that age is related to whether a student is in first or last term.

Comparison by Income Level

A one-way ANOVA test was used to compare the digital competence scores of the participants according to their income level: low, middle, and high. The results are given in Table 7.

Table 7

One-Way ANOVA Statistics Comparing Digital Divide Levels Within and Between Participant Groups by Income Level

Source of variance	*SS*	*df*	*MS*	*F*	*p*
Between groups	251779.141	2	125889.571	28.242	.000*
Within groups	35401466.670	7942	4457.500		
Total	35653245.810	7944			

Note. ANOVA = analysis of variance.

*$p < .001$.

A statistically significant difference was found between the digital competence scores of participants according to their income ($F_{(2)} = 28{,}242$, $p = < .001$). The Tukey test was then used post hoc to determine between which groups this difference occurred and to compare groups. Tukey group comparisons are displayed in Table 8.

Table 8

Tukey Post Hoc Test Comparing Income Levels

Income level	*n*	*M*	*SD*	*p*
Low	2,420	220	69.5	.001*
Middle	5,175	231	66.0	
Low	2,420	220	69.5	.001*
High	350	240	57.7	
Middle	5,175	231	66.0	.039*
High	350	240	57.7	

Note. $N = 7{,}945$.

*$p = < .05$.

We found a statistically significant difference in each of the subgroup analyses made with the Tukey test. There is a significant difference between participants with low and middle incomes, in favor of

those with middle incomes ($\bar{X}_{(middle)} = 231 > \bar{X}_{(low} = 220$, $p = .001 < .05$). There is also a significant difference in favor of those with high incomes ($\bar{X}_{(high)} = 240 > \bar{X}_{(low)} = 220$, $p = .001 < .05$) among participants with low and high incomes. Finally, there is additionally a significant difference between high and middle income students in terms of digital competence scores ($\bar{X}_{(high)} = 240 > \bar{X}_{(middle)} = 231$, $p = .039 < .05$). This finding shows that as income level increases, digital competence also increases, and therefore, the digital divide decreases. This is an expected finding.

Comparison by Working Status

A one-way ANOVA test was used to compare the digital competency scores of participants according to their employment status: employed in the private sector; employed in the public sector; unemployed or retired. The results of the one-way ANOVA test are given in Table 9.

Table 9

One-Way ANOVA Statistics Comparing Digital Divide Levels Within and Between Participant Groups by Working Status

Source of variance	*SS*	*df*	*MS*	*F*	*p*
Between groups	129473.325	3	43157.775	9.648	.000*
Within groups	35523772.490	7941	4473.463		
Total	35653245.810	7944			

Note. ANOVA = analysis of variance.

*p = < .001.

A statistically significant difference was found between the digital competence scores of participants according to their employment status ($F_{(2)} = 9.648$, $p = .000 < .05$). The Tukey test was used post hoc to determine between which groups this significant difference occurred and to make comparisons between groups. Tukey group comparisons are presented in Table 10.

Table 10

Tukey Post Hoc Test Comparing Groups

Working status	*n*	*M*	*SD*	*p*
Unemployed	2,408	225	69.9	.998
Public sector	1,988	225	69.7	
Unemployed	2,408	225	69.9	.001*
Private sector	3,263	233	63.3	
Unemployed	2,408	225	69.9	.100
Retired	286	224	60.2	
Public sector	1,988	225	69.7	.001*
Private sector	3,263	233	63.3	
Public sector	1,988	225	69.7	.998

Retired	286	224	60.2	
Private sector	3,263	233	63.3	.152
Retired	286	224	60.2	

Note. N = 7,945.

*$p < .05$.

In the subgroup analyses made with the Tukey test, there is a significant difference between participants who work in the private sector and those who are unemployed, in favor of those working in the private sector ($\bar{X}_{(\text{private sector})} = 233 > \bar{X}_{(\text{unemployed})} = 225$, $p = .001 < .05$). Also, there was a significant difference between private and public sector working students ($\bar{X}_{(\text{private sector})} = 233 > \bar{X}_{(\text{public sector})} = 225$, $p = .001 < .05$). In other subgroup analyses, there was no statistically significant difference between the groups ($p = .998$, $p = .100$, $p = .998$, $p = .152$, all $> .05$) in terms of digital competence scores.

Discussion

The findings of this research are presented separately for each research question.

As for the first research question, the digital divide levels of Open Education System students were compared according to demographic characteristics including gender, age, income level, and employment status. The comparison by gender showed that male participants had higher digital competency levels than female participants. Antonio and Tuffley (2014) noted that women in developing countries have significantly lower levels of technology participation than men. The comparison by income level revealed that those with high incomes had lower digital divide scores and those with low incomes had higher digital divide scores. The United Nations (2012) and the World Bank (2016) have acknowledged that income level is a fundamental component of digital inequality and that reducing income inequality is expected to narrow the digital divide (Richmond & Triplett, 2017). As stated by Rodriguez and Wilson (2000), there is a strong relationship between the per capita income of countries and the level of IT use. In the comparison of participants' digital competence by work status, it was found that students employed in the private sector had the highest digital competency scores, followed by those working in the public sector, and last, those who were not working. All in all, as stated by DiMaggio et al. (2007), factors that affect the digital divide include region and location, income, education, ethnicity, age, gender, family structure, and employment status. In addition, Blank and Groselj (2014) stated that most of the differences are due to age, education level, and working status. Differences in access to IT are related to individuals and their characteristics such as income and education level, employment, age, gender, and ethnicity (van Dijk, 2012).

In response to the second research question, the digital divide levels of first term students were found to be lower than those of last-term students, contrary to expectations. This may be due to the fact that the proportion of younger students in the first term is higher, and their use of technology is therefore more prevalent. This is supported by the findings of the comparison of age groups, which showed that the digital divide levels of students aged over 40 were higher than those of students aged 30–40. The United Nations (2012) has noted that the digital divide is related to age and that age is one of the most significant factors in the adoption of IT. As technology becomes increasingly pervasive, the underuse of IT by older individuals remains observable (Niehaves & Plattfaut, 2014). This age-related digital divide

highlights that many older people are less likely to use Internet-based services (Niehaves & Plattfaut, 2014).

As Hynes (2021) emphasized, it is true that ICT connects people better. In building and maintaining relationships that are essential to our overall well-being and happiness, the benefits of this type of hyperconnection are undeniable. However, digital technologies may also divide society because of location, gender, ethnicity, or income, and it is probable that some people will continue to be left behind.

Conclusions

This research found that the digital divide levels of first term Open Education System students were lower than those of last-term students, which was contrary to expectations. This is likely due to the higher proportion of younger students in the first term who have greater access to and proficiency in technology. The comparison by age groups also revealed that students aged 30–40 had significantly higher digital competencies than those aged 40 and over.

We have found that the digital divide levels of Open Education System students vary according to demographic characteristics such as gender, age, income level, and employment status. The comparison by gender revealed that male participants had higher digital competencies than female participants, which is consistent with previous research that has shown that men have greater access and proficiency in technology than women. The comparison by income level found that those with higher incomes had lower digital divide scores, while those with lower incomes had higher digital divide scores. This supports the notion that income level is a significant factor in digital inequality and that a higher economic status leads to a reduction in the digital divide.

Finally, the comparison by employment status found that students working in the private sector had the highest digital competency scores, followed by those working in the public sector, and lastly, those who were not working. This suggests that employment status is a demographic feature that affects the digital divide and that those working in the private sector have the greatest access to digital technologies and proficiency in using them. Based on the research findings and current knowledge in the literature, it was concluded that working status is a demographic feature that affects the digital divide. In addition, it was concluded that the most advantageous group in terms of access to digital technologies and competence are those who work in the private sector, and the most disadvantaged group is unemployed persons.

The results of this study are limited to the digital competency scale scores of 7,945 university students studying in the Anadolu University Open Education System. The data was collected online. While the self-assessment approach to competency provides valuable insights, its limitations include susceptibility to biased self-assessments, potential divergence from objective measures, susceptibility to variability based on individual factors, and its inability to fully capture complex competencies that are better assessed through external observation or standardized testing. Also, during the course of this research, it was discovered that there is a lack of studies that provide a global comparison of the digital divide by country, region, or level of development. The literature is limited to local or bilateral comparisons. It is recommended that international organizations conduct comprehensive studies in this direction.

Recommendations

The following are recommendations for future research:

- development of new digital divide scales that take into account the latest technologies, such as mobile technology and mobile Internet usage, in order to provide more up-to-date data collection tools for future research,
- conducting comprehensive research in other universities that provide open education services, in order to compare digital competence levels across institutions,
- making comparisons between students studying face-to-face and those in the open education system to determine the digital divide levels across different characteristics,
- investigating how the digital divide varies across different levels of education, and
- examining the impact of programs such as Refreshment University, which is offered at Anadolu University to adults over the age of 60, on the digital divide.

Within the parameters of this study, the following are suggestions for future applications:

- implementing digital-competency supportive activities and programs, such as Anadolu University's Refreshment University, to address the digital divide among older students,
- providing training and support for public sector employees to improve their digital competency scores and reduce the digital divide in this group,
- developing projects to address the digital divide experienced by low-income individuals, such as providing affordable Internet access and training programs, and
- organizing digital competency-supportive activities, programs, and projects targeted toward women through social media to address the gender-based digital divide.

To effectively pursue both these sets of recommendations, it is critical for researchers and educators to build strong collaborative partnerships with relevant public institutions and stakeholders. Collaborative efforts can significantly enhance the feasibility and impact of the proposed initiatives, from the development of new digital divide metrics and cross-institutional research to addressing the digital divide among older students, public sector workers, low-income individuals, and women. These partnerships will facilitate access to the datasets, funding sources, and expertise needed to conduct large-scale, multi-agency studies and to implement tailored training programs, support initiatives, affordable Internet access projects, and gender-inclusive digital literacy activities.

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