

## Internet uses by young students during the covid-19 pandemic in Mexico

### *Usos del internet por jóvenes estudiantes durante la pandemia de la covid-19 en México*

<http://dx.doi.org/10.32870/Pk.a12n22.724>

Dulce Angélica Gómez Navarro\*

<http://orcid.org/0000-0003-3245-7083>

Cátedras CONACYT-CIESAS Pacífico Sur, México

Received: November 16, 2021

Accepted: February 14, 2022

Marlen Martínez Domínguez\*\*

<http://orcid.org/0000-0001-9840-0149>

Cátedras CONACYT-CIESAS Pacífico Sur, México

#### ABSTRACT

The Covid-19 pandemic caused the closure of educational centers in Mexico and the adoption of a model of distance classes, that showed wide technological inequalities between individuals. This work examines the uses of the internet by young Mexican students between the ages of 15 and 23 during the health contingency. A bivariate probit regression was estimated, with information from the National Survey on the Availability of Information Technologies in Households (ENDUTIH) 2020. The results show that during confinement, young students used cyberspace despite the digital divide, conditioned by socioeconomic and demographic factors, where less favored households have less chances of access. The findings show two types of uses: productive (tasks and courses complementary to education) and leisure (online games, listening to music, watching videos, and using social networks). The results show a lower use of digital technologies by women, which suggests gender differences. Likewise, the importance of higher education in a greater productive use of the internet and in the acquisition of digital skills is revealed.

#### Keywords

Digital divide; ICT; Young; educational levels; pandemic

\* Researcher in the field of anthropology of education and technology, with particular interests in intercultural higher education and the use and social appropriation of ICTs by indigenous peoples and women. Email: [dgomeznavarro@ciesas.edu.mx](mailto:dgomeznavarro@ciesas.edu.mx)

\*\* Researcher in the field of rural economics, with particular interests in poverty, gender and ICT in rural contexts. He is a member of the council of the Network of Researchers on the Appropriation of Digital Technologies and the CONACYT Thematic Network "Convergence of Knowledge for the benefit of society". Email: [mmartinez@ciesas.edu.mx](mailto:mmartinez@ciesas.edu.mx)

## RESUMEN

*La pandemia por la covid-19 provocó el cierre de los centros educativos en México y la adopción de un modelo de clases a distancia que mostró amplias desigualdades tecnológicas entre los individuos. Este trabajo examina los usos del internet por jóvenes estudiantes mexicanos de 15 a 23 años durante la contingencia sanitaria. Se estimó una regresión probit bivariada, con información de la Encuesta Nacional sobre Disponibilidad de Tecnologías de la Información en los Hogares (ENDUTIH) 2020. Los resultados reflejan que durante el confinamiento los jóvenes utilizaron el ciberespacio a pesar de la brecha digital, condicionada por factores socioeconómicos y demográficos, donde los hogares menos favorecidos tienen menores probabilidades de acceso. Los hallazgos muestran dos tipos de usos: productivos (tareas y cursos complementarios a la educación) y de ocio (juegos en línea, escuchar música, ver videos y usar redes sociales). Los resultados evidencian un menor uso de las tecnologías digitales por parte de las mujeres, lo que deja entrever diferencias por razón de género. Asimismo, se revela la importancia de la educación superior en un mayor uso productivo del internet y en la adquisición de las habilidades digitales.*

### Palabras clave

Brecha digital; TIC; joven; nivel de enseñanza; pandemia

## INTRODUCTION

The arrival of the covid-19 pandemic in Mexico brought with it the implementation of social distancing, which led to closing educational centers and the adoption of a distance learning model. In this way, Information and Communication Technologies (ICT) became relevant in school continuity, which represented a challenge for students with limited access to the internet due to the technological inequality that mainly affects the country's less favored households.

The digital divide in education is due to the lack of technological infrastructure, the existence of few digital literacy and learning programs and the lack of technological devices. Lloyd (2020) points out that 55% of students do not have internet or a computer at home; according to the National Survey of Household Income and Expenditure (ENIGH) 2018, this percentage increases in rural and indigenous areas (National Institute of Statistics and Geography [INEGI], 2018), so the contingency had deeper effects on young people with fewer resources and the most vulnerable groups (Villela and Contreras, 2021).

The new educational reality evidenced the uses that young people make of the internet: productive, such as the preparation of school assignments and access to online courses; and leisure, such as entertainment, where the skills to use social networks, listen to music and play video games stand out, key elements of belonging to a global digital culture.

In this scenario, the questions that guided the study were: what are the uses that young students make of the internet during the pandemic and what factors of the digital divide affect the types of uses? Thus, the objective of this study was to analyze the uses of the internet by students aged 15 to 23 years during the covid-19 pandemic in Mexico

in 2020, taking into account the demographic and socioeconomic characteristics that determine these uses. The contributions are focused on knowing the behavior of the digital divide in Mexico in a population sector, and the access to ICT in a conjunctural context such as confinement, which moved school activities to the home and the online mode.

The manuscript is organized as follows: section two presents the issues that link education and ICTs with the digital divide and digital literacy, as well as with young people and the differences in their uses of the internet according to gender. Section three describes the data and the empirical model used in the analysis of information. Section four shows the empirical results of students' uses of the internet. Discussion based on the findings is raised in section five. Finally, section six presents the conclusions.

## Literature review

### *Digital divide and digital literacy*

The concept digital divide refers to the existing difference to access ICTs among users, and this is due to both the technological infrastructure existing conditions in locations and the digital skills of people to use them, the use they give to them and the impact of their use on personal, family and community well-being (Scheerder, Van Deursen & Van Dijk, 2017).

Three levels are identified in the digital divide: access, use and appropriation. The first one refers to the distinction between those who have computers and the internet and those who do not (Forenbacher et al., 2019; Scheerder, Van Deursen & Van Dijk, 2017; Srinuan & Bohlin, 2013). Usability focuses on the ability to use digital technologies and skills. Hargittai (2002) defines usage as a cognitive gap between internet users who can effectively search online. On the other hand, appropriation refers to the benefits obtained from the use of ICTs and depends on the capabilities to achieve specific objectives. In this regard, DiMaggio et al. (2004) affirm that high levels of income and schooling are associated with more productive uses of the internet.

In Mexico, research on the digital divide shows sociodemographic and economic indicators such as income, gender, age, educational level and geographic location to explain access, use and its benefits (Martínez-Domínguez & Fierros-González, 2021; Grishchenko, 2020; Scheerder, Van Deursen & Van Dijk, 2017). Among households, differences in ICT adoption are mainly due to economic, social and demographic factors (Ovando & Olivera, 2018).

Some of the most noteworthy data regarding the availability of internet in households is that seven out of every ten urban households have internet, while only three out of every ten rural households have this service. Regarding internet use by

age group, the main users are concentrated in the 12 to 23 age group, and the age group that uses it the least is 55 years and older (INEGI, 2020).

Regarding ICT infrastructure in the Mexican education system, basic, middle and higher education schools in rural and indigenous contexts are the ones with the greatest technological deficiencies in their headquarters (López & Medina, 2021), especially in rural and indigenous areas in the south of the country, in states such as Guerrero, Oaxaca, Chiapas and Veracruz. In addition, students who come from less favored households lack computer equipment and internet and present discontinuous educational and technological trajectories that affect the level of acquisition of more advanced digital skills (Lloyd, 2020). This is due to the unequal distribution of resources and mainly affects lower-income or more vulnerable sectors (Economic Commission for Latin America and the Caribbean and United Nations Educational, Scientific and Cultural Organization [ECLAC-UNESCO], 2020).

Precarious digitalization prevails despite the fact that the federal government has sought to incorporate ICTs into education through a series of public policies in the last two decades, which have been instrumentalist in nature and, therefore, have not had significant impacts on reducing the digital divide (Martínez-Domínguez & Fierros-González, 2021; Martínez-Domínguez, Gómez & Morales, 2021).

The digital divide is closely linked to the educational divide, and digital illiteracy refers to the inability to use technology in daily activities, whether at school or at work. Thus, the development of technological capabilities requires that people have full mastery of ICTs; however, the lack of equipment and technological services are an obstacle to the appropriation of these resources; that is, limited access to and use of ICTs prevents greater use of digital technologies (Villela & Contreras, 2021; Guzmán & Velázquez, 2020).

Digital skills are defined as “users' abilities to locate content on the web in an effective and efficient manner” (Hargittai, 2005, p. 372). Three types of skills are identified: basic, intermediate and advanced. The first one allows a minimum level of performance in society and includes the use of hardware (keyboard and touch screen), software (file management and word processing) and online activities (use of e-mail and information search), which facilitate interaction with other people and access to government, commercial and financial services. On the other hand, intermediate skills are related to content creation, digital design and the use of cloud services. Finally, advanced skills are geared towards digital professionals and include artificial intelligence, big data, cybersecurity, internet of things (IoT) and mobile application development (International Telecommunication Union [ITU], 2018).

One of the strategies to address the digital divide is to promote digital literacy among children and young people in schools through continuing media education programs; however, structural inequalities between the various educational centers in the country prevent these objectives from being met, especially in the most marginalized sectors (Vázquez, Martínez & Mendoza, 2020).

Higher education is a training level that provides the acquisition of skills that allow the specialized use of ICTs in the disciplinary area which is being studied, but it is not the only training space. Learning to use ICTs is carried out in a heterogeneous manner and often in a self-taught way, especially in contexts with a digital divide and a low level of schooling (Gómez, 2021). In order to promote digital learning, a set of technological, social and educational conditions are needed to guarantee access to digital culture.

### ***Young people and Internet use by gender***

The analogic paradigm shifts to the ICT era brought a restructuring of economic and social life along (Sola, 2017). With the use of social networks, socialization experiences expanded through digital social networks, as they are “reproducers and generators of an online reality parallel to offline reality” (Gallego, 2016, p. 33).

Digital social networks such as WhatsApp, Facebook, Instagram, Twitter, among others, provide a sense of community where patterns are modeled and reproduced for different groups with a border mass transcending effect, but it is circumscribed to local infrastructure conditions, acquired digital skills and common uses that are established by gender, age and social group. In this sense, young people with more academic background are more likely to use ICTs, while in young people from rural communities, significant digital divides are identified that are related to their economic context and their educational trajectories (Guzmán & Velásquez, 2020); however, despite these barriers, young people generate multiple strategies to connect to the network and be part of the global digital culture (Gómez, 2021).

Two types of internet uses are distinguished: 1) productive, those that expand the personal autonomy of young people to favor their human action and participation in social life, in order to develop their personal and collective potential (Zermeño, Navarrete & González, 2019); and 2) leisure, which includes online activities related to fun (Aguilar, Rubio & Viñals, 2013). In this regard, Primo (2017) points out that leisure has increased due to the growing use of the internet, electronic devices and online games.

The fact that students have access to ICTs does not mean that young people develop the technological skills necessary to make the most of them (Vázquez, Martínez & Mendoza, 2020). Although there is a significant presence of cellular telephony among the younger population, it is mainly used for entertainment and leisure purposes; that is, it has not been promoted as a learning tool in formal education (López & Medina, 2021). Casales (2021) refers that middle and higher level students have a positive attitude towards the use of mobile applications for daily life and learning, where activities such as communication and interaction, search and verification of learning materials, and reference and exchange of information stand out.

Regarding the gender difference between young people's internet uses, men spend more time browsing, using social networks and consuming political information, while women carry out communicative and socializing activities, which is related to their inclination to maintain family and friendship networks (Lemus-Pool, Bárcenas-Curtis and Barranquero-Carretero, 2020). In this regard, Morales et al. (2020) found that men tend to play online to a greater extent than women.

Likewise, in the case of the use of social networks by teachers and students in Mexico, Valencia-Ortiz, Garay and Cabero-Almenara (2020) highlight that men are more frequent users of networks than women, and that they use them for consumption and leisure, while women use them to communicate. The above is consistent with studies by Lemus-Pool, Bárcenas-Curtis and Barranquero-Carretero (2020) and Morales et al. (2020).

## Methodology

### *Data*

Data used in the quantitative analysis come from the National Survey on Availability of Information and Communication Technologies (ENDUTIH) 2020 (INEGI, 2020). The quantitative analysis is based on a final sample of 13,147 individuals between 15 and 23 years of age who belong to the high, upper-middle, lower-middle and low socioeconomic strata. The stratification considered the socioeconomic characteristics of the inhabitants, as well as the characteristics of their dwellings and their equipment, based on information from the 2010 Population and Housing Census (INEGI, 2020).

Table 1 shows that social networks, the search for information for the development of school activities and entertainment, were the most frequent uses among students. Likewise, it has been found that as young people get older, the use of the Internet for these three purposes intensifies. On the other hand, the activity that students at all levels perform to a lesser degree is related to online games; the higher the level of education, the lower this type of use decreases.

As for the intensity of Internet use, the number of hours varies according to the age and level of academic background of individuals. High school students spend six hours a day in cyberspace, while students in higher education devote more than eight hours to this activity.

The level of students' digital skills is shown in Table 2, where basic skills are the predominant ones. A higher level of academic background of the students increases the basic, intermediate and advanced digital skills; however, it is worth mentioning that the advanced ones are related to professions in the digital sector, such as computer engineering and telecommunications.

**Table 1.** Types of Internet use by young students between the ages of 15 and 23 in Mexico

Online activities	Student education levels		
	Junio high school (%)	High school (%)	College (%)
Look up education information, do research, and do homework	95.1	97.5	97.1
Take courses	61.4	67.4	78.7
Play online	54.0	52.2	39.9
Listen to free and paid music, as well as AM and FM radio	66.5	70.2	77.6
Watch free and paid videos	84.3	86.0	92.7
Use social networks	95.1	98.5	99.0
<i>Internet usage intensity</i>			
Hours a day	<b>6.3</b>	<b>7</b>	<b>8.2</b>

Source: developed by the author.

**Table 2.** Types of digital skills of students from 15 to 23 years old in Mexico

Online activities	Student education levels		
	Junio high school	High school	College
	Average skills		
Basic digital skills <sup>a</sup>	3.5	4.9	6.4
Intermediate digital skills <sup>b</sup>	1	1.3	1.5
Advanced digital skills <sup>c</sup>	0.3	0.5	0.9

Notes: <sup>a</sup> Seven basic digital skills: sending and receiving emails, downloading content from the Internet (music, videos, documents, etc.), copying files between directories (folders), creating text files, creating spreadsheets, creating presentations, and installing peripheral devices (printer, projector, etc.). <sup>b</sup> Three intermediate digital skills: website development, downloading software and applications, and use of cloud services. <sup>c</sup> Two advanced digital skills: creating and using databases and using programming language.

Source: developed by the author.

### ***Specified model***

The purpose of this study was to identify the internet uses of students aged 15 to 23 years during the covid-19 pandemic in Mexico in 2020, taking into account the demographic and socioeconomic characteristics that determine these uses. Six types of uses were established: 1) homework, 2) courses, 3) online games, 4) music and radio, 5) videos, and 6) social networks.

The selection of the six online uses is conditioned by the adoption of the internet, i.e., the observations used in the estimates of uses are not a random selection of the sample, but they are only observed for individuals who adopted the Internet. This situation is known as incidental truncation and can generate biased estimates. To correct for this bias in the empirical analysis, the Heckman (1979) method is applied, a procedure comprising two stages: the first one includes estimating a probit model, in which the student adopts or does not adopt the Internet. The utility of adoption of the internet by student, i.e.

$$y_i^* = X_i\beta_i + \varepsilon_i$$

Where  $X_i$  is a set of individual and household level variables (socio-demographic, economic, internet usage characteristics, digital skills and geographical location of the household) that explain the adoption decision.  $\beta_i$  is the vector of coefficients and  $\varepsilon_i$  is the random error (normally distributed). Total utility is not observable, but the decision to adopt or not to adopt to the internet is observable. Thus,  $y_i$  is the outcome of the decision process influenced by the independent variables  $X_i$ . Therefore,  $y_i = 1$  when the student uses the internet and  $y_i = 0$ , otherwise.

After students decide to adopt the internet, they can choose what types of uses they can carry out. Thus, the type of online use  $k$  (with  $k=1,2,\dots,6$ ) is defined by the equation  $y_{ik} = X_{ik}\beta_{ik} + \varepsilon_{ik}$  where  $y_{ik}$  measures the type of use,  $X_{ik}$  is a set of independent variables (sociodemographic, economic, characteristics of internet use, digital skills and geographic location of the household) and  $\varepsilon_{ik}$  is the random error term (with a normal distribution). The Heckman method is estimated using the maximum likelihood procedure, by assuming that  $\varepsilon_i$  and  $\varepsilon_{ik}$  are drawn from a bivariate normal distribution, with zero mean and correlation  $((\varepsilon_i, \varepsilon_{ik}) = \rho$ . It is worth mentioning that if the coefficient  $\rho$  is significantly different from zero, it indicates the presence of selection bias (Maddala, 1983).

### **Empirical model**

There are two dependent variables: the first is the availability of internet at the student's home, which is equal to 1 if the student's home has internet connection and 0 otherwise. The second refers to the use of the internet for online activities. The independent (explanatory) variables are divided into three levels of characteristics: individual,

household and geographic location, defined in Table 3. The regionalization of the country was based on the division proposed by the Internet Association (2020).

**Table 3.** Socioeconomic factors and the variables used in the empirical model

Socioeconomic factors	Variable	Description and values
Demographic characteristics	Woman	If the student is female (1=yes, 0=no)
	Age	Age in years (15-23 years)
	Age squared	Age (years squared)
Schooling level	Junio high school	If it's in junior high school
	High school	If it's in high school
	College	If it's in college
Tipos de usos del internet	Homework	Using the internet to do homework (1=yes, 0=no)
	Courses	Use of the internet for courses (1=yes, 0=no)
	Online games	Using the internet to play online (1=yes, 0=no)
	Music and radio	Using the internet to listen to music and radio (1=sí, 0=no)
	Videos	Using the internet to watch videos (1=yes, 0=no)
	Social networks	Use of the internet for social networks (1=yes, 0=no)
Digital skills	Basics	Management of hardware, software and basic online operations
	Intermediates	Content creation, use of cloud services, download of software and applications
	advanced	Creation and management of databases and use of programming language
Internet usage intensity	intensity of use	Number of hours of internet use
Place of use of the internet	Home	Internet use at home (1=yes, 0=no)
	School	Internet use at school (1=yes, 0=no)
	site with cost	Use of the internet in a paid site (1=yes, 0=no)
	Someone else's house	Using the internet at someone else's home (1=yes, 0=no)
Internet connection means	Computer	It connects through a computer (1=yes, 0=no)

Socioeconomic factors	Variable	Description and values
	Smartphone	It connects through a smartphone (1=yes, 0=no)
	Smart TV or video game console	It connects through Smart TV or a game console (1=yes, 0=no)
Home features	Internet connection	Home internet connection (1=yes, 0=no)
	Age of the head of household	age in years
	Head of household education	Average years of schooling
Socioeconomic level	Low	Low class household (1=yes, 0=no)
	Medium low	Low middle class household (1=yes, 0=no)
	Medium high	High middle class home (1=yes, 0=no)
	High	High class home (1=yes, 0=no)
	Income	Wealth index
	Children under twelve years of age at home	Number of children under twelve in the household
Geographic characteristics	Rural	Rural area (1=yes, 0=no)
	Northwest	Home located in the region (1=yes, 0=no)
	Northeast	Home located in the region (1=yes, 0=no)
	Rwest	Home located in the region (1=yes, 0=no)
	Rsouth central	Home located in the region (1=yes, 0=no)
	Rcnorth cetral	Home located in the region (1=yes, 0=no)
	Reast	Home located in the region (1=yes, 0=no)
	Rsoutheast	Home located in the region (1=yes, 0=no)
	Rsouthwest	Home located in the region (1=yes, 0=no)

Source: developed by the author.

## Results

Table 4 shows the descriptive statistics of the students. Regarding gender, it is noticed that the distribution of the sample was symmetrical because it included a similar proportion of men and women. Regarding educational level, out of every 100 young people, 25 attended junior high school, 50 attended high school and 25 attended university. In household characteristics, the head of household has an average age of 49 years and 9.5 years of schooling.

**Table 4.** Descriptive statistics on the use of digital technologies by young students in Mexico

Variables	Media	Standard deviation	Minimum	Maximum
Woman	0.54	0.498	0	1
Age	17.66	2.316	15	23
Age squared	317.33	85.392	225	529
Junio high school	0.25	0.433	0	1
High school	0.50	0.500	0	1
College	0.25	0.431	0	1
Using the internet to do homework	0.23	0.423	0	1
Use the internet for courses	0.17	0.373	0	1
Use the internet to play online	0.12	0.326	0	1
Use the internet to listen to music and radio	0.18	0.382	0	1
Use the internet to watch videos	0.21	0.408	0	1
Use the internet for social networks	0.24	0.425	0	1
Basic digital skills	1.22	2.519	0	7
Intermediate digital skills	0.32	0.704	0	3
Advanced digital skills	0.14	0.444	0	2
Internet usage intensity	1.75	3.542	0	12
Internet use at home	0.23	0.419	0	1
Internet use at school	0.11	0.318	0	1
Use of the internet in a paid site	0.09	0.281	0	1
Using the internet at someone else's home	0.15	0.356	0	1
Connection from a computer	0.17	0.378	0	1
Connection from a smartphone	0.24	0.424	0	1

Variables	Media	Standard deviation	Minimum	Maximum
Connection from Smart TV or video game console	0.07	0.262	0	1
Internet availability	0.82	0.385	0	1
Average age of the head of household	48.67	10.921	15	98
Average schooling of the head of household	9.50	4.108	0	23
Low status	0.15	0.352	0	1
Medium low status	0.52	0.500	0	1
Medium high status	0.23	0.418	0	1
High status	0.11	0.309	0	1
Wealth index	0.35	1.209	-9.68	1.19
Number of children under twelve in the household	0.61	0.856	0	7
Rural	0.19	0.393	0	1
Rnorthwest	0.19	0.394	0	1
Rnortheast	0.09	0.284	0	1
Rwest	0.11	0.309	0	1
Rsouth central	0.10	0.306	0	1
Rnorth central	0.15	0.362	0	1
Reast	0.13	0.339	0	1
Rsoutheast	0.13	0.332	0	1
Rsouthwest	0.09	0.292	0	1
Total observations	13 147			

Source: developed by the author.

Regarding the characteristics of internet use, most students use this technology at home; the most common means of connection is the smartphone and, to a lesser extent, the computer. Similarly, seven out of ten young people live in households of low and lower-middle socioeconomic strata. In relation to geographic location, two out of ten young people reside in rural areas.

Tables 5 and 6 present the uses of the internet by young students aged 15 to 23 during the covid-19 pandemic. For the analysis of internet uses, these are classified into two categories: a) productive, which include the use of cyberspace for homework and courses that complement education, and b) leisure, linked to entertainment, online games and social networks.

Table 5 shows the productive uses, where homework at home, at a fee-based site (such as a cybercafé) and at other people's homes (family or friends) stand out. The most

commonly used means of connecting to the internet have been the smartphone and the computer. In addition, students from households located in the lower stratum are more likely to do homework, compared to those in the lower middle stratum. The above reflects that, in the case of less favored households, the availability of ICTs is lower and, therefore, the uses of the Internet tend to be more efficient for educational use.

**Table 5.** Factors that influence the use of the Internet by Mexican students between the ages of 15 and 23

Variables	Internet uses								
	Homework			Courses			Play online		
	Marginal effect	ee	Significance	Marginal effects	ee	Significance	Marginal effects	ee	Significance
Woman	-0.13	0.0016		-0.72	0.0038	*	-6.33	0.0041	***
Age	0.32	0.0076		-3.27	0.0156	**	-2.14	0.0165	
Age <sup>2</sup>	-0.01	0.0002		0.09	0.0004	**	0.04	0.0004	
Junio high school	Reference								
High school	-0.11	0.0025		0.56	0.0062		-0.74	0.0066	
College	-0.08	0.0050		2.08	0.0096	**	-2.67	0.0102	**
Basic digital skills	0.09	0.0005	*	0.53	0.0013	***	0.24	0.0013	*
Intermediate digital skills	0.44	0.0015	***	1.09	0.0028	***	1.61	0.0029	***
Advanced digital skills	-0.08	0.0022		0.53	0.0034		0.29	0.0034	
Internet use intensity	0.11	0.0004	***	0.15	0.0007	**	0.37	0.0007	***
Internet use at home	2.10	0.0029	***	5.77	0.0100	***	4.3	0.0108	***
Internet use at school	0.35	0.0026		1.6	0.0045	***	0.68	0.0047	
Use of the internet in a paid site	0.76	0.0031	***	0.78	0.0047	*	0.21	0.0047	
Using the internet at someone else's home	0.76	0.0023	***	-0.02	0.00047		1.16	0.0048	**
Connection from a computer	1.75	0.0036	***	0.43	0.0067		-0.0003	0.0068	
Connection from smartphone	4.62	0.0038	***	15.05	0.0121	***	13.65	0.0128	***

Variables	Internet uses								
	Homework			Courses			Play online		
Connection from Smart TV or video game console	-0.29	0.00 35		0.48	0.005 0		3.82	0.00 52	***
Average age of the head of household	0.002	0.00 01		0.02	0.000 2		-0.004	0.00 02	
Average schooling of the head of household	0.01	0.00 02		0.01	0.000 5		-0.01	0.00 06	
Low status	0.50	0.00 28	*	-0.42	0.007 4		-1.61	0.00 82	**
Medium low status	Reference								
Medium high status	0.05	0.00 24		1.32	0.005 0	**	0.87	0.00 53	*
High status	-0.39	0.00 35		0.12	0.006 7		1.11	0.00 67	*
Rural	0.17	0.00 25		0.59	0.006 2		0.99	0.00 69	
Rnorthwest	-0.52	0.00 33		-1.93	0.008 1	**	-0.65	0.00 88	
Rnortheast	-0.40	0.00 37		-3.26	0.009 1	***	0.29	0.00 99	
Rwest	-1.19	0.00 38	***	-2.80	0.008 7	***	-0.93	0.00 97	
Rsouth central	-0.61	0.00 36	*	-2.21	0.008 9	**	-0.32	0.01 02	
Rnorth central	-0.26	0.00 31		-2.1	0.008 3	**	-0.95	0.00 90	
Reast	-0.08	0.00 27		-0.78	0.008 1		-1.11	0.00 92	
Rsoutheast	-0.47	0.00 31		-1.3	0.008 2		-0.53	0.00 91	
Rsouthwest	Reference								
Log pseudolikelihood	-	1975. 4		-	3443. 6		-3371		
Rho	0.309 2		***	0.555 5		**	-	0.963 7	***
Number of observations	13,14 7			13,14 7			13,14 7		

Note: Standard errors (ee) were corrected for heteroscedasticity.

\*, \*\*, \*\*\* it means that the coefficient is statistically different from zero at 10%, 5%, and 1%, respectively.

Source: developed by the author.

**Table 6.** Socioeconomic factors of the types of Internet use of students aged 15 to 23

Variables	Uses of the internet								
	Music and radio			Free and paid videos			Social networks		
	Marginal effects	Standard error	Significance	Marginal effects	Standard error	Significance	Marginal effects	Standard error	Significance
Woman	-0.21	0.0036		-0.63	0.0026	**	-0.32	0.0014	**
Age	-1.64	0.0150		0.28	0.0111		0.49	0.0062	
Age <sup>2</sup>	0.04	0.0004		-0.01	0.0003		-0.01	0.0002	
Junior high school	Referencia								
High school	-0.1	0.0059		-0.64	0.0040		0.005	0.0018	
College	-0.52	0.0090		-0.39	0.0066		-0.17	0.0030	
Basic digital skills	0.38	0.0012	***	0.34	0.0009	***	0.1	0.0004	**
Intermediate digital skills	2.08	0.0025	***	1.06	0.0020	***	0.24	0.0012	**
Advanced digital skills	0.14	0.0031		-0.16	0.0028		0.11	0.0026	
Internet usage intensity	0.14	0.0006	**	0.3	0.0005	***	0.09	0.0004	**
Internet use at home	4.77	0.0085	***	3.74	0.0050	***	1.45	0.0025	***
Internet use at school	1.69	0.0041	***	-0.33	0.0034		0.11	0.0023	
Use of the internet in a paid site	0.81	0.0043	*	0.16	0.0034		0.48	0.0024	**
Using the internet at someone else's home	1.16	0.0042	**	1.32	0.0032	***	0.64	0.0020	***
Connection from a computer	0.12	0.0060		0.71	0.0046		0.91	0.0030	***
Connection from smartphone	13.9	0.0108	***	8.12	0.0059	***	3.47	0.0034	***
Connection from Smart TV or video game console	1.5	0.0048	***	2.76	0.0052	***	0.03	0.0037	
Average age of the head of household	0.01	0.0002		-0.02	0.0001		0.01	0.0001	

Variables	Uses of the internet								
	Music and radio			Free and paid videos			Social networks		
Average schooling of the head of household	0.13	0.00	**	-0.03	0.00		-0.01	0.00	
		05			04			02	
Low status	0.31	0.00		0.65	0.00		0.26	0.00	
		69			48			23	
Medium low status	Reference								
Medium high status	0.07	0.00		0.95	0.00	**	-0.17	0.00	
		48			35			21	
High status	0.49	0.00		0.66	0.00		-0.64	0.00	**
		64			47			30	
Rural	0.09	0.00		-0.29	0.00		0.20	0.00	
		59			41			23	
Rnorthwest	0.07	0.00		0.92	0.00	*	0.22	0.00	
		74			55			26	
Rnortheast	-0.59	0.00		-0.12	0.00		-0.02	0.00	
		86			65			32	
Rwest	-2.36	0.00	***	0.63	0.00		-0.12	0.00	
		82			61			34	
Rsouth central	-0.09	0.00		0.7	0.00		0.09	0.00	
		82			60			31	
Rnorth central	0.12	0.00		0.49	0.00		0.15	0.00	
		78			58			27	
Reast	-0.21	0.00		-0.79	0.00		0.12	0.00	
		77			58			30	
Rsoutheats	-0.42	0.00		0.01	0.00		0.28	0.00	
		76			58			26	
Rsouthwest	Reference								
Log pseudolikelihood	-		*	-			-		***
	3229.07			2555.2			1825.5		
Rho	.5340			.1751			.2898		
Number of observations	13,147			13,147			13,147		

Note: Standard errors (ee) were corrected for heteroscedasticity.

\*, \*\*, \*\*\* it means that the coefficient is statistically different from zero at 10%, 5%, and 1%, respectively.

Source: developed by the author.

Using internet to take courses that broaden educational training is carried out to a greater extent by men who attend university, which reinforces the idea that this population group uses the internet mainly to search for information and for training (Lemus-Pool, Bárcenas-Curtis and Barranquero-Carretero, 2020). This activity is carried out through the smartphone at home, at school and, to a lesser extent, in cybercafés, and highlights belonging to the upper middle stratum, which means greater access to higher education in high-income households.

Table 6 refers to the recreational use of the internet, where online games are mainly played by young non-university men in places such as at home, at someone else's house and at school, by means of smartphones and video game consoles. This result is consistent with the finding of Morales et al. (2020), who found that women tend to play less online due to gender roles that carry over into digital life, in addition to the fact that video games are designed to appeal to men because of the cultural content of hegemonic masculinity they present (Ruiz and Molina, 2021).

From the data in the table, it can be observed that the use of the internet to listen to music and AM and FM radio by young people is influenced by the average schooling of the head of household, and that the predominant places of internet access are school, cybercafés and other people's homes.

Entertainment by watching free and fee-based videos is mostly done by men, in places such as at home or at someone else's home and through computers, smartphones or other devices. For the most part, young people belong to middle-income households, due to the cost involved in using mobile data, which individuals from less well-off households have greater difficulty paying for.

Social networks are used to a greater extent by men both at home and in other people's homes and cybercafés, using smartphones and computers. From the above results, it can be inferred that greater internet access is possible for young people, but its use is influenced by socioeconomic and geographic contexts (Andrade-Vargas et al., 2021).

## Discussion

The results of estimates of the productive and recreational uses of the internet have relevant differences. First off, there is a gender gap in online activities, such as taking courses to supplement education, playing online games, watching videos and using social networks, where women use this at a lesser extent. The variables of internet use to perform tasks and listen to music and radio by women, although not significant, reflect gender roles, where women prefer leisure associated with communicative activities and men to actions that contribute to the construction of their masculinity (Lemus-Pool, Bárcenas-Curtis and Barranquero-Carretero, 2020; Morales et al. 2020).

The results of the estimates reflect that a higher level of schooling is an important incentive for the productive use of the internet. Likewise, the older the age of the students, the greater the access to online courses as a supplement to education. In terms of basic, intermediate and advanced digital skills, most students have basic and intermediate competencies, although their acquisition has been heterogeneous, as a result of their previous school and social trajectories. Hence the importance of the school as a space for the development of skills that lead to the efficient use of the internet (Martínez-Domínguez and Fierros-González, 2021).

During the pandemic, students spent seven hours a day performing activities on the internet, which can trigger other emotional and psychological problems such as those derived from video game addiction (Ruiz & Molina, 2021).

Home was the predominant space in which productive and leisure activities were performed by students, which was a result of social distancing and which forced people to stay at home. It is also seen that for homework and courses students went to cybercafés, which reflects the strategies used for connection –especially by low-income youths–, such as purchasing data to fulfill school activities online.

Thus, the results of this study show that the smartphone is the digital technology with the greatest dissemination, since nine out of ten users have this device. Finally, in terms of geographic location, households in states such as Chiapas, Guerrero and Oaxaca are the furthest behind in ICT access and use, due to low economic development, lack of telecommunications infrastructure, educational lag and poverty (The Social Intelligence Unit [SIU], 2018).

The covid-19 pandemic evidenced the structural inequalities that impacted the school continuity of young students (Lloyd, 2020; Díaz, 2020). It is worth mentioning that, although the digital divide impacts the uses of the Internet, students sought various strategies to continue with distance classes, and different school and family support networks were activated (Cárdenas, Lomelí & Ruelas, 2022).

## **Conclusions**

From the results of this study, it can be concluded that young people's access to and use of the internet is conditioned by their educational level and economic condition. Income is essential for contracting this digital service and acquiring electronic devices –such as desktop or personal computers and smartphones–. Due to socioeconomic factors, the population located in the southern states of the country has a lower income to incorporate ICTs into school activities.

The findings of the analysis show that internet uses are influenced by variables such as gender, schooling, level of digital skills and place of internet use. In this sense, a differentiated use by gender is observed, with women using the internet for communication and men for entertainment purposes. Regarding school education, it is concluded that the higher the educational level of young people, the higher the productive use of the web.

In terms of digital literacy, students show few digital skills related to productive uses, while the opposite is true for leisure activities. On the place where internet is used, by the implementation of social distancing as a preventive measure to mitigate the spread of the SARS-CoV2 virus, the home was the main space to connect and carry out productive and leisure uses of the internet.

A crucial result was to identify the increased use of cell phones by young people due to their low cost and the possibility of purchasing mobile data. At the same time,

most of the student population has digital skills to engage in leisure and entertainment activities, due to the need to belong to the global digital culture.

The University excels in the acquisition of more advanced tools and young university students are more likely to take supplementary online courses. Thus, it is proven that higher education institutions play an important role in the digital literacy of young people and in guiding them in the productive use of the internet.

Although this empirical analysis provides elements to understand the phenomenon of the digital divide in secondary, high school and university students, by differentiating the uses of the internet (homework, courses, online games, music and radio, videos and social networks), future research needs to delve deeper into the local context, due to the geographic, economic, social and cultural differences that affect the adoption and use of digital technologies.

---

## REFERENCES

---

- Aguilar, E.; Rubio, I. y Viñals, A. (2013). El ocio digital como recurso para el aprendizaje, la socialización y la generación de capital social. *Revista de Sociología de la Educación-RASE*, 6(2), 196-209. <https://ojs.uv.es/index.php/RASE/article/view/8354>
- Andrade-Vargas, L.; Iriarte-Solano, M.; Rivera-Rogel, D. y Yunga-Godoy, D. (2021). Jóvenes y redes sociales: Entre la democratización del conocimiento y la inequidad digital. *Comunicar: Revista Científica de Comunicación y Educación*, 29(69), 85-95. <https://www.revistacomunicar.com/index.php?contenido=detalles&numero=69&articulo=69-2021-07>
- Asociación de Internet. (2020). 14° Estudio sobre los Hábitos de los Usuarios de Internet en México AIMX 2020. <https://www.asociaciondeinternet.mx/estudios/habitos-de-internet>
- Cárdenas, S.; Lomelí, D. y Ruelas, I. (2022). Covid-19 and Post-pandemic Educational Policies in Mexico. What is at Stake? In F. M. Reimers (ed.), *Primary and Secondary Education During Covid-19* (pp. 153-175). Cham: Springer. [https://link.springer.com/chapter/10.1007/978-3-030-81500-4\\_6](https://link.springer.com/chapter/10.1007/978-3-030-81500-4_6)
- Casales, A. (2021). El papel de las tecnologías educativas durante la pandemia. *Reencuentro. Análisis de Problemas Universitarios*, 31(78), 293-316. <https://reencuentro.xoc.uam.mx/index.php/reencuentro/article/view/1032>
- Comisión Económica para América Latina y el Caribe y Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura (CEPAL-UNESCO). (2020). La educación en tiempos de pandemia de Covid-19. CEPAL-UNESCO. <https://www.cepal.org/es/publicaciones/45904-la-educacion-tiempos-la-pandemia-covid-19>

- Díaz, A. (2020). La escuela ausente, la necesidad de replantear su significado. En H. Casanova Cardiel (coord.), *Educación y pandemia: una visión académica* (pp. 19-29). Ciudad de México: UNAM-IISUE. [http://132.248.192.241:8080/xmlui/handle/IISUE\\_UNAM/535](http://132.248.192.241:8080/xmlui/handle/IISUE_UNAM/535)
- DiMaggio, P.; Hargittai, E.; Celeste, C. y Shafer, S. (2004). Digital inequality: From unequal access to differentiated use. En K. Neckerman (ed.), *Social Inequality* (pp. 355-400). New York: Russell Sage Foundation. <http://www.webuse.org/pdf/DiMaggioEtAl-DigitalInequality2004.pdf>
- Forenbacher, I.; Husnjak, S.; Cvitić, I. y Jovović, I. (2019). Determinants of mobile phone ownership in Nigeria. *Telecommunications Policy*, 43(7). <https://doi.org/10.1016/j.telpol.2019.03.001>
- Gallego, S. (2016). *Redes sociales: información, comunicación y sociedad en el siglo XXI (2000-2010)* (tesis de doctorado). Madrid: Universidad Complutense de Madrid. <https://eprints.ucm.es/44233/1/T39077.pdf>
- Gómez Navarro, D. A. (2021). Apropiación social de tecnologías digitales por jóvenes universitarios mayas de Quintana Roo. *RIDE Revista Iberoamericana para la Investigación y el Desarrollo Educativo*, 12(23). <https://doi.org/10.23913/ride.v12i23.1055>
- Grishchenko, N. (2020). The gap not only closes: Resistance and reverse shifts in the digital divide in Russia. *Telecommunications Policy*, 44(8). <https://doi.org/10.1016/j.telpol.2020.102004>
- Guzmán, F. J. y Velázquez, M. (2020). Saberes digitales de estudiantes universitarios de pueblos originarios en México. *Revista Latinoamericana de Estudios Educativos*, 50(3), 189-216. <https://doi.org/10.48102/rlee.2020.50.3.125>
- Hargittai, E. (2002). Beyond logs and surveys: In-depth measures of people's web use skills. *Journal of the American Society for Information Science and technology*, 53(14), 1239-1244. <https://doi.org/10.1002/asi.10166>
- Hargittai, E. (2005). Survey Measures of Web-Oriented Digital Literacy. *Social Science Computer Review*, 23(3), 371-379. <https://doi.org/10.1177/0894439305275911>
- Heckman, J. J. (1979). Sample selection bias as a specification error. *Econometrica: Journal of the Econometric Society*, 47(1) 153-161. <https://doi.org/10.2307/1912352>
- Instituto Nacional de Estadística y Geografía (INEGI) (2018). Encuesta Nacional de Ingreso y Gastos de los Hogares. <https://www.inegi.org.mx/programas/enigh/nc/2018/>
- Instituto Nacional de Estadística y Geografía (INEGI) (2020). Encuesta Nacional sobre Disponibilidad de Tecnologías de la Información en los Hogares. <https://www.inegi.org.mx/programas/dutih/2020/>
- International Telecommunication Union (ITU). (2018). Digital skills toolkit. Recent jobs for youths. <https://www.itu.int/en/ITU-D/Digital-Inclusion/Youth-and-Children/Pages/Digital-Skills-Toolkit.aspx>
- Lemus-Pool, M. C.; Bárcenas-Curtis, C. y Barranquero-Carretero, A. (2020). Evolución de la navegación de los jóvenes en internet: el caso de los estudiantes de la zona sur de Tamaulipas. *EDMETIC, Revista de Educación Mediática y TIC*, 9(2), 28-50. <https://doi.org/10.21071/edmetic.v9i2.12688>

- Lloyd, M. (2020). Desigualdades educativas y la brecha digital en tiempos de Covid-19. En H. Casanova Cardiel (coord.), *Educación y pandemia. Una visión académica* (pp. 55-65). Ciudad de México: UNAM-IISUE. [http://132.248.192.241:8080/xmlui/handle/IISUE\\_UNAM/546](http://132.248.192.241:8080/xmlui/handle/IISUE_UNAM/546)
- López, P. M. y Medina, A. (2021). Educación en línea: una revisión de las limitaciones en México ante la crisis del Covid-19. *Tlatemoani: Revista Académica de Investigación*, (36), 58-72. <https://www.eumed.net/es/revistas/tlatemoani/ano-12-numero-36-abril-2021/educacion-linea>
- Maddala, G. S. (1983). Methods of estimation for models of markets with bounded price variation. *International Economic Review*, 24(2), 361-378. <https://doi.org/10.2307/2648751>
- Martínez-Domínguez, M. y Fierros-González, I. (2021). Determinants of internet use by school-age children: The challenges for Mexico during the Covid-19 pandemic. *Telecommunications Policy*. <https://doi.org/10.1016/j.telpol.2021.102241>
- Martínez Domínguez, M.; Gómez Navarro, D. A. y Morales López, J. U. (2021). Determinantes de la brecha digital en comunidades indígenas de Oaxaca. *Controversias y Concurrencias Latinoamericanas*, 12(22), 45-69.
- Morales, A.; Zacatenco, J. D.; Luna, M.; García, R. Z. e Hidalgo, C. (2020). Acceso y actitud del uso de Internet entre jóvenes de educación universitaria. *Revista Digital de Investigación en Docencia Universitaria*, 14(1). <https://doi.org/10.19083/ridu.2020.1174>
- Naciones Unidas. (s/f). Desafíos globales Juventud. <https://www.un.org/es/global-issues/youth>
- Ovando, C. y Olivera, E. (2018). Was household internet adoption driven by the reform? Evaluation of the 2013 telecommunication reform in Mexico. *Telecommunications Policy*, 42(9), 700-714. <https://doi.org/10.1016/j.telpol.2018.03.005>
- Primo, W. J. (2017). Ocio productivo, entretenimiento e industria cultural: del ocio tradicional al ocio digital. *Management Review*, 2(2). <https://doi.org/10.18583/umr.v2i2.65>
- Ruiz, J. y Molina, S. A. (2021). La reafirmación de la masculinidad hegemónica a través de los videojuegos. *PAAKAT: Revista de Tecnología y Sociedad*, 11(20). <https://doi.org/10.32870/Pk.a11n20.547>
- Scheerder, A.; Van Deursen, A. y Van Dijk, J. (2017). Determinants of Internet skills, uses and outcomes. A systematic review of the second-and third-level digital divide. *Telematics and Informatics*, 34(8), 1607-1624. <https://doi.org/10.1016/j.tele.2017.07.007>
- Sola, I. (2017). *Tecnologías sin fronteras. De las telecomunicaciones en la época de la globalización*. México: Fondo de Cultura Económica.
- Srinuan, C. y Bohlin, E. (2013). Analysis of fixed broadband access and use in Thailand: Drivers and barriers. *Telecommunications Policy*, 37(8), 615-625. <https://doi.org/10.1016/j.telpol.2013.03.006>
- The Social Intelligence Unit [SIU]. (2018). Índice de desarrollo de TIC en México y brecha digital. <http://www.the-siu.net/wordpress/>

- Valencia-Ortiz, R.; Garay, U. y Cabero-Almenara, J. (2020). Percepciones de estudiantes y docentes del uso que los estudiantes hacen de internet y su relación con la modalidad de estudio. *Revista de Educación a Distancia (RED)*, 20(62). <https://doi.org/10.6018/red.411781>
- Vázquez, M. L.; Martínez, A. y Mendoza, M. M. (2020). Aproximación teórica de la brecha digital en el contexto universitario de Oaxaca. En J. Gasca Zamora y H. E. Hoffmann Esteves (coords.), *Factores críticos y estratégicos en la interacción territorial. Desafíos actuales y escenarios futuros. Volumen III* (pp. 271-286). UNAM y AMECIDER A.C. <http://ru.iiec.unam.mx/id/eprint/5157>
- Villela F. y Contreras, D. S. (2021). La brecha digital como una nueva capa de vulnerabilidad que afecta el acceso a la educación en México. *Academia y Virtualidad*, 14(1), 169-187. <https://doi.org/10.18359/ravi.5395>
- Zermeño, A. I.; Navarrete, M. A. y González, R. (2019). Desarrollo humano de estudiantes universitarios. Explorando la relación entre usos y aprovechamiento de las TIC y la autonomía personal. *Signo y Pensamiento*, 38(74). <https://doi.org/10.11144/Javeriana.syp38-74.dheu>