Perceptions of online education among 16-18-year-olds: Differences and similarities in their interests and preferred formats according to where they live

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Abstract

This research employs a quantitative and cross-sectional approach, utilizing an online survey (N=600), to examine the preferences of Spanish students aged 16 to 18 regarding different modes of education (face-to-face or online). It also explores potential variances based on their place of residence. Additionally, the study identifies the subjects of interest to these students for integration into formal learning and determines their preferred online learning formats. The findings reveal significant differences between students residing in cities with a population of 50,000 or more and those in smaller habitats, particularly in relation to their experiences and evaluations of online education, precisely specific training in received digital technologies, their topics of interest, their self-study learning methods, and their preferred online learning formats. These study outcomes can contribute to the enhancement of online education and better preparedness of the educational system for future challenges that may necessitate the adoption of this instructional mode. Based on our study, several recommendations for online education can be made. Firstly, there is a need for teachers to acquire enhanced digital skills. Secondly, it is important not to assume that young individuals possess inherent digital skills due to their age; instead, it is crucial to emphasize the acquisition of critical digital skills during their education. Thirdly, motivating young students by aligning teaching with their areas of interest should be encouraged, considering their significant habitat preferences. Lastly, interactive methodologies that stimulate students, such as immediate evaluation questionnaires, animations, and interactive exercises, should be prioritized, particularly for students residing in densely populated areas.

Keywords

E-learning; Online education; Digital learning; Youths; Adolescents; Students; Digital skills; Teaching methodologies; Teaching formats; Education system; Digital divide; Habitat; Topics of interest; Young people .

1. Introduction

The COVID-19 pandemic took its toll on many facets of society, one of the most notable being education. Secondary schools (compulsory secondary education, upper secondary education, and vocational education and training[1]) and universities were forced to move their classes online almost overnight. In Spain, schools were closed during the lockdown (from March to July 2020). In the following academic year (2020-2021), face-to-face instruction resumed, depending on the epidemiological conditions of each school. The initial move online during the lockdown was extremely sudden, and although it allowed students to continue learning in the midst of school closures, it also presented significant challenges. Many studies have been conducted in different countries on online learning experiences during lockdowns, but most have focused on university students (see, for example, the ten-country study by **Keržič** *et al.*, 2021; and in Spain, **Gil-Villa**, **Urchaga-Litago** & **Sánchez-Fernández**, 2020). The present study focuses on a different group: young people aged 16 to 18 in non-compulsory and pre-university education.

Interest in studying student satisfaction with e-learning is not new; it has existed since the first implementation of modern information and communication technologies in teaching-learning systems. Studies conducted before the pandemic highlighted the positive aspects of online education, such as increased motivation and interaction among students (**Belaya**, 2018; **Bignoux**; **Sund**, 2018). Indeed, the integration of technology in learning processes was already a growing trend (**López-Belmonte** *et al.*, 2020), which the pandemic has only accelerated (**Sáiz-Manzanares** *et al.*, 2022).

As stated by **Hodges** *et al.* (2020), many of the practices adopted by schools during the lockdown cannot be considered e-learning, but rather "emergency remote teaching" (p. 3), as they were not the result of a well-planned system underpinned by e-learning methodologies and theories. In this regard, it should be noted that

> "the shift from face-to-face to online activity should not only be about digitalizing content, but about rethinking subjects" (**Cifuentes-Faura**, 2020, p. 116).

Teachers, for their part, reported "overwork and additional stress" (**Gil-Villa**; **Urchaga-Litago**; **Sánchez-Fernández**, 2020, p. 103) during the lockdown. They were confronted with the challenge of technology and began to realize that the crux of the change was neither digital platforms nor IT resources, but rather the pedagogical approach and interaction that had to be created between teachers and students (**Bonilla-Guachamín**, 2020). The effort it took to teach remotely was a wake-up call for teachers, who did not see any improvement in the information available or the digital competence of their students (**Sales**; **Cuevas-Cerveró**; **Gómez-Hernández**, 2020). The advent of technologically advanced digital learning ecosystems has created an innovative educational paradigm that implies a new form of didactic interaction between teachers and students, as well as unprecedented ways of approaching content from a pedagogical theory perspective. The epistemic structure that has emerged as a result of the transmission, reception, and consumption of academic information in the digital age has curricular implications. Moreover, these new forms of digital structure, organization, and didactic design have a significant impact on the definition and conceptualization of learning objectives. This is because they affect the creation and development of educational activities and the implementation of state-of-the-art methods and resources in education. They are also used to assess and provide feedback to teachers and learners. This strategic renewal of educational institutions is a direct result of new learning ecosystems and new digital didactics, which are directly linked to the design and delivery of curricula tailored around new learning environments, and to the implementation of educational policies. In this context, teachers need to be trained in digital skills, techniques, and advanced methodologies (**González-Gutiérrez**; **Merchán-Sánchez-Jara**, 2022).

The educational policies initially introduced in Spain were inadequate and designed for the short term as a response to the health emergency, without considering the necessary strategy for a major digital transformation of higher education (**Area-Moreira** *et al.*, 2021; **Aznar-Sala**, 2020). According to authors such as **Chandasiri** (2020), the pandemic has forced stakeholders to rethink the education system. Blended learning, which combines face-to-face and online methods, may be more appropriate if courses are adapted accordingly.

The situation created by the pandemic has highlighted the need to improve students' digital access. Online learning in its current form, although positive in some respects and potentially supportive of the learning process, has also increased educational inequalities among students (**Cabrera-Rodríguez**, 2020; **Espinosa**, 2020; **Montenegro**; **Raya-Navaridas**,

2020). Access is a big part of the digital divide in education, but other factors such as parental education, teachers, and the learning environment also play a role (**Coleman**, 2021). Academic performance is directly related to access to technology, which in turn is directly related to family purchasing power (**Montenegro**; **Raya-Navaridas**, 2020). Previous studies (**Pérez**; **Bardales**, 2020) also show that parents need to be trained in ICT skills from the outset to ensure that their children perform well academically. A direct link has been found between the low educational and professional status of parents, especially mothers, and children's greater use of technology and smart screens, although without the required critical thinking and digital media education (**Jiménez-Morales**; **Montaña-Blasco**; **Medina-Bravo**, 2020).

Few studies have analyzed learners' digital skills in formal education settings, and even fewer in informal settings. There is therefore a need for more knowledge about technology-enabled informal (or non-formal) learning (**Masanet**; **Pires**; **Gómez-Puertas**, 2021). Previous research also points to the need to develop young people's information literacy and critical skills, in addition to their proficiency with the perhaps more obvious technologies (**Porat**; **Blau**; **Barak**, 2018; **Martinovic** *et al.*, 2019; **Jackman** *et al.*, 2021; **Estanyol** *et al.*, 2023).

As noted by **Sáiz-Manzanares** *et al.* (2022), it is necessary to

> "systematically assess student and teacher satisfaction with the teaching-learning process in virtual environments in order to make the necessary improvements" (p. 43)

and thus contribute to future educational policies. Students' motivation increases when they take responsibility for their coursework and become more involved (**García-Valcárcel-Muñoz-Repiso**; **Basilotta-Gómez-Pablos**; **López-García**, 2014). Therefore, it is essential that educational projects are learner-centered and suited to learners' needs and interests, and arouse their curiosity and intrinsic motivation (**García-Valcárcel-Muñoz-Repiso**; **Basilotta-Gómez-Pablos**, 2017). This motivation is arguably the most important aspect of learning (**Filgona** *et al.*, 2020; **Seifert**; **Sutton**, 2009).

2. Young people, depopulation, and large urban areas

In Spain, rural areas[2] and small and medium-sized cities have been depopulated in favor of demographic growth in large metropolitan areas, a trend that has accelerated since 2008 (**Escudero-Gómez**; **Martínez-Navarro**; **García-González**, 2022). According to these authors, this shrinkage is not unique to Spain (p. 46), but is rather universal, resulting in a

> "loss of economic activity, competitiveness, functionality, infrastructure, and, ultimately, a continuous loss of opportunities, leading to ever greater territorial imbalance" (p. 47).

Although most studies have focused on the loss of population in rural areas, these and other authors argue that the processes of urban decline resulting from population loss in small and medium-sized cities deserve more attention. In this respect, **González-Leonardo** (2021) highlights the demographic decline and ageing of the population in 15 Spanish provincial capitals, with young people migrating to large cities. Small urban areas are those with less than 50,000 inhabitants, while large urban areas are those with 50,000 inhabitants or more (*Government of Spain*, 2021c). As large cities grow as a consequence of economic globalization, they

> "concentrate financial and technological activities, advanced services, and information and communication networks, acting as centers of power in the world economy" (**Sassen**, 2001, in **González-Leonardo**, 2021, p. 170).

Goerlich and **Mollá** (2021) identify the main migratory trends among the Spanish population as a concentration of people along the coast and a shift from mountainous areas to valleys and from the countryside to cities. According to these authors,

> "provincial capitals have acted as poles of attraction for the population in their respective local markets, largely due to their role as administrative and service centers" (p. 42).

Moreover, it is in the large urban centers that the income per household is higher than the national average.

One of the consequences of the depopulation of rural areas and small cities is an ageing population, with young people concentrating in large metropolitan areas. In this context, **Ruiz-Valdepeñas** and **García-Cuesta** (2008) stress the need to promote innovation development policies in small and medium-sized urban centers. In the same vein, **Gutiérrez**, **Moral-Benito** and **Ramos** (2022) identify the accessibility of physical and digital services as an important factor in attracting new waves of people to rural municipalities, and point to possible new demographic dynamics in the future as a result of technological advances, new ways of working, and the ecological transition.

Currently in Spain,

> "rural areas have greater difficulties than predominantly urban areas in accessing the provision of both local and regional services" (**Alloza** *et al.*, 2021, p. 15)

in terms of healthcare and other public services such as libraries. There is also a significant rural-urban divide in access to digital services. Indeed, the highest levels of internet connectivity and speed are found in large urban areas (**Álvarez-Álvarez**; **García-Prieto**, 2021).

The higher concentration of young people in large urban areas (50,000 inhabitants or more), where faster internet speeds are also available, is a relevant factor that warrants research into whether it influences students' perceptions of online learning.

3. Digital competence

> "Digital competence involves the creative, critical, and safe use of information and communication technologies for purposes adapted to today's society" (**Moreno-Guerrero**; **Fuentes-Cabrera**; **López-Belmonte**, 2019, p. 9).

It is not only students who must acquire this competence, but also teachers. Integrating information and communication technologies (ICT) into the teaching-learning process means rethinking teaching methodologies, although for this to happen it is essential that schools and students have equal access to technological resources (mobile devices, PCs, etc.) and an internet connection.

Spain's economic development in recent decades has brought to light significant disparities in the income and well-being of its population, with the greatest levels of wealth and well-being concentrated in urban centers, to the detriment of impoverished rural areas. The greatest deficiencies in educational infrastructure in rural areas are found in secondary education, where only 50% of the population has access to a secondary school within their municipality of residence. Previous studies have stressed the need to use the 2030 Agenda as a valuable opportunity to make major changes that have been overdue for decades and to promote development in rural areas (**Silva-Quiroz; Lázaro-Cantabrana**, 2020).

This would highlight the enormous potential of these areas in the

> "search for a new model of land stewardship that will enable us to face the climate challenge and the forced transition towards a more sustainable society, which is undoubtedly one of the main strengths of abandoned Spain" (**Domínguez-Álvarez**, 2020, p. 15).

Today, the geographical divide is joined by the digital divide in some (but not all) of the country's most rural areas. Indeed, even rural schools are not on an equal footing, with the COVID-19 pandemic exacerbating educational inequality (**Cabrera**, 2020). Previous studies have shown that the differentiating variable is the relationship of each individual teacher with technology. For this reason, the digital divide is still present in some Spanish regions and their schools, despite various efforts and equipment upgrades. Therefore, the most important improvements will depend not so much on the technical equipment, but on the teachers themselves, who will have to take responsibility for bridging the digital divide in these environments in favor of inclusive education and social justice (**Morales-Romo**, 2017).

Recent studies have shown a lack of digital competence in the delivery of online education among VET (**Moreno-Guerrero** *et al.*, 2021) and university teachers (**Pattier**; **Ferreira**, 2023). For example, with regard to the use of augmented reality (AR) in their training activities, **López-Belmonte** *et al.* (2020) found that

> "VET teachers are not fully qualified to carry out teaching activities using AR, due to their mean level of digital competence and their limited complementary technopedagogical training" (p. 423).

4. Young people and online education

Previous studies have reported that the perception of online education among secondary school and university students largely depends on

> "their competence in using online tools, their technical ability to access online courses, and the way teachers conduct learning activities" (**Butnaru** *et al.*, 2021).

Students in more developed countries were found to be more satisfied with the online education they received during the COVID-19 pandemic due to their greater access to the internet, PCs, and other mobile devices, which also affects ICT literacy (**Keržič** *et al.*, 2021). Outside of Spain, **Reyes-Rodríguez** *et al.* (2023) gathered teachers' opinions to examine the online learning of teacher-mediated high school mathematics in Mexico, reporting that teachers felt that this subject was best learned in face-to-face environments. Meanwhile, research in Chile found reduced teacher-student interaction during the COVID-19 lockdown (**Sepúlveda-Escobar**; **Morrison**, 2020). **Nambiar** (2020) also found that teacher-student interaction decreased in India during the pandemic when the learning system moved online.

The future of digital content consumption (2023), a study conducted by the *Universitat Oberta de Catalunya* (UOC) and *Accenture*, found that not all generations of young people have the same preferences when it comes to online education. Generation Z (late 1990s-early 2000s), which includes the 16-18 age group covered by our research, prefers de-virtualization. According to the study, 78% of these young people see their teacher as very important for their learning and development, and 61.3% of teenagers who have had online lessons since the pandemic rate the experience as "not great or bad". Meanwhile, Millennials (Generation Y, early 1980s-late 1990s), who have been studying for years, seek the flexibility of self-directed and fully online formats. In terms of channels, 47% of Gen Zs enjoy learning with apps or interactive games, a figure that is slightly lower for Millennials (41%). Regarding the gamification of education, i.e. the inclusion of gaming elements in the learning environment, the study reports that 83% of young people who receive gamified education feel motivated, while 61% of those who receive non-gamified education feel bored and unproductive. A final key finding is that YouTube plays an essential role in learning for Generation Z, with 55% saying that this channel contributed to their education in 2022, compared to 40% of Millennials.

In order to improve online teaching, there is agreement on the need for better preparation among educational institutions, more specialized training for teachers (**Syauqi**; **Munadi**; **Triyono**, 2020), and

> "a different approach to capture students' attention in this new virtual system" (**Cifuentes-Faura**, 2020, p. 115).

5. Young people's interests

The topics that young people like to learn about are often determined by their interests, life experiences, identities, and expectations for the future. Previous research has shown that young people's voices are linked to learning and identity, suggesting that young people tend to participate in their communities and find a place in society where they can learn most effectively (**Zhu**, 2022; **Rahm**; **Lachaîne**; **Mathura**, 2014; **Serido**; **Borden**; **Perkins**, 2011). Given the compulsory nature of modern education, teachers cannot assume that students are motivated to learn and thus have a responsibility to ensure that they are. The learning process can be extremely frustrating for unmotivated students, who are likely to learn very little. Their interests, attitudes, and life goals should also be taken into account when considering their motivation. Students' personal and situational interests are also an influential factor (**Filgona** *et al.*, 2020; **Seifert**; **Sutton**, 2009). For all these reasons, it is important to engage students through educational projects that address their topics of interest. According to previous research, young Spaniards aged 15 to 30 are mainly interested in access to and quality of employment, housing, social injustice and inequality, and climate change (*Playground*, 2021).

Based on the above premises, this study has a threefold research and knowledge transfer objective for the education sector:

1. To assess the preferences of Spanish students between the ages of 16 and 18 with regard to the different modes of learning (face-to-face or online), analyzing whether there are significant differences between those who live in large urban areas and those who live in less populated municipalities.

2. To identify the topics of interest to these students in their self-learning and informal learning, in order to use them in their formal learning to improve motivation and engagement.

3. To find out which learning formats these students prefer in online education.

The research questions are:

[RQ1] How do students perceive online education and do they perceive it differently depending on where they live?

[RQ2] What topics are they most interested in and focused on in their self-learning and informal learning?

[RQ3] How do students perceive their level of participation according to the mode of learning: face-to-face *vs.* online?

[RQ4] Which mode of learning (face-to-face or online) do they prefer?

The hypotheses are:

[H1] Young Spaniards have a negative opinion of online education due to their experience with emergency remote teaching during the COVID-19 pandemic and feel that their teachers were poorly prepared.

[H2] There are differences in the topics of interest and preferences for online learning formats between young people living in large urban areas and those living in less populated areas.

[H3] Student participation is higher in online learning environments.

[H4] The most highly rated online learning formats are those that allow for greater interactivity.

This study makes a significant contribution to understanding the (in)satisfaction of 16-18-year-old students with the emergency remote teaching provided as a result of the COVID-19 lockdown, as well as identifying their topics of interest and preferred learning formats. The results have been broken down according to the students' area of residence and show significant differences.

This research can help the education sector to design more engaging and motivating online learning environments for this age group; enable schools to better cope with possible future emergency teaching situations through the use of online learning; and, most importantly, show institutions how to improve educational policies to accommodate different modes of learning.

6. Material and methods

6.1. Design

This research takes a quantitative and cross-sectional approach, using an online survey of 16-18-year-olds living in Spain. The participants were between 16 and 18 years old, with a mean age of 17.7 years (SD = 0.68); 51.1% lived in small and medium-sized municipalities and 48.9% in large cities (50,000 inhabitants or more). This age group was chosen because they are in the first years of non-compulsory education in Spain. The survey was self-administered and completed by respondents between September 23 and October 5, 2021, without the presence of an interviewer and with prior informed consent. The security and confidentiality of the data and participants were guaranteed in accordance with *UNE EN ISO/IEC 27001* standards and the favorable report issued by the Ethics Committee of the *Universitat Oberta de Catalunya* (*UOC*), file no. CE22-PR05.

6.2. Survey

The survey included a section of socio-demographic questions to obtain information about the respondents' municipality of residence. Eleven questions were then asked to assess their perceptions of ICT in both formal and informal learning.

The questions in the section on ICT in formal and informal learning asked about the topics that students most often look up on the internet, the most common things they do for self-learning, whether they have received specific training in digital technologies, how they would rate their participation and outcomes in online learning, how they would rate their teachers in the online lessons they have received, the type of online lessons (synchronous/asynchronous) they prefer, and the online practices and approaches most used by their schools.

The question about the topics that students most often look up on the internet was based on those identified by the *European Commission*'s *Eurobarometer* as being of most interest to young people (*European Commission*, 2019; 2022). The questions about how they would rate the online education they received during the pandemic and their level of participation in it were based on **Thomas**, **Thakkarn**, and **Ghanekar** (2021). The question about online learning practices and approaches was based on question 33a of the survey "Trends in the digital society during the COVID-19 pandemic" (*CIS*, 2021). The rest of the survey questions were created ad hoc.

Responses to the survey questions were measured using multiple choice and a 5-point Likert scale with the options "very little", "a little", "neither a little nor a lot", "quite a lot" and "a lot". The rating questions were also measured on a Likert scale from 1 to 5, with 5 being the best possible rating.

A principal component analysis (PCA) was performed on all questions to check their validity and Cronbach's alpha was used to measure their reliability. The analysis showed an acceptable structure for all items in the Kaiser-Meyer-Olkin (KMO) test, with a value of 0.910, indicating that the relationship between the variables is high, and Bartlett's test was significant ($p < 0.001$). The results of the PCA revealed a one-component structure explaining 70.1% of the variance. Reliability according to Cronbach's alpha coefficient was 0.79.

6.3. Sample

The company *ODEC* collected the data by sending a link to a representative sample of the Spanish population, taking into account age, gender, education and autonomous region of residence. Using simple random sampling, 600 young people completed the survey in an average time of 13 minutes. The response rate of the sample was 62.11% and the overall margin of error was 4%, with a confidence level of 95% (1.96 sigmas) and a maximum indeterminacy of P = Q = 50%. Once the data had been collected, a weighting process was carried out to adjust the weights of the respondents to the population data of the final study universe, using variables such as the size of the municipality of residence, gender and age from the last wave of the *Spanish General Media Study* (*EGM*) as a reference for the weighting coefficient.

7. Results

Most of the respondents said they had received specific training in digital technologies during their secondary or university education (73.5%). This was mostly in the form of talks about their use (safety, cyberbullying, etc.) (38.5%), occasional sessions at school (27.7%), and technology-oriented classes during one academic year (20.8%). However, it is noteworthy that 26.5% of the young people surveyed reported not having received any training in digital technologies (see Annex Table A1).

7.1. Results for *[RQ1] How do students perceive online education and do they perceive it differently depending on where they live?*

Regarding young people's perceptions of online education, based on their experience in the lessons they received during the pandemic, 61.7% said that it was worse than before. This figure is higher among young people living in large cities (63.3%) than among those living in municipalities with less than 50,000 inhabitants (59.9%) (see Table 1).

Table 1. Students' perceptions of the outcome of education during the pandemic (online) compared to before the pandemic

	Worse	**The same**	**Better**	**DK/NC**
Total	61.7%	17.7%	17.0%	3.7%
< 49,999 inhabitants	59.9%	18.3%	18.3%	3.5%
≥ 50,000 inhabitants	63.3%	17.0%	15.8%	3.9%

The results of the bivariate analysis show significant differences between young people living in cities of 50,000 inhabitants or more and those living in smaller residential areas in terms of their experiences and perceptions of formal and informal online education.

The proportion of young people who received no specific training in digital technologies during their secondary education was significantly higher in municipalities with less than 50,000 inhabitants ($\chi^2 = 4.523$; $p < 0.05$). However, the proportion of students who reported attending occasional sessions at school was lower in these municipalities than in those with 50,000 inhabitants or more ($\chi^2 = 6.001$; $p < 0.05$) (see Annex Table A1).

7.2. Results for *[RQ2] What topics are they most interested in and focused on in their self-learning and informal learning?*

"Education" and "Employment" are the two topics of most interest to young people in both types of municipality: 59.5% of young people in municipalities with up to 49,999 inhabitants say they are interested in education and 52.9% say they are interested in employment. These figures rise to 63.3% and 53.4% respectively for young people in municipalities with 50,000 inhabitants or more.

The topics that show the greatest differences according to municipality of residence are "Health and sexuality" (49.2% *vs.* 53.9%), "Poverty and inequalities" (32.2% *vs.* 23.05%), and "Feminism" (27.7% *vs.* 21.5%), with young people in large cities showing more interest (see Table 2).

The results of the bivariate analysis show that municipalities with a population of 50,000 or more have higher proportions of interested young people across all the topics analyzed. The topics "Health and sexuality" (χ^2 = 4.165; $p < 0.05$), "LGBTI" (χ^2 = 3.001; $p < 0.05$), "Poverty and inequalities" (χ^2 = 7.014; $p < 0.05$), and "Feminism" (χ^2 = 6.012; $p < 0.05$) show statistically significant differences according to the municipality of residence, with greater interest among young people living in large cities.

Table 2. Topics that students use the internet to find information about in their free time

	Total	< 49,999 inhabitants	≥ 50,000 inhabitants
Education	61.5%	59.5%	63.3%
Employment	53.2%	52.9%	53.4%
Health and sexuality	46.7%	43.9%	49.2%
Climate change	39.8%	38.4%	41.2%
LGBTI	30.0%	27.0%	32.8%
Poverty and inequalities	28.0%	23.5%	32.2%
Feminism	24.7%	21.5%	27.7%
Immigration	18.5%	17.3%	19.6%

When asked about their free time, 16-18-year-olds say they use the internet to acquire or improve skills. Specifically, 50.2% say they use it to learn about video games, 50.2% about sports, 47.5% about fashion and beauty (styling, make-up hacks, etc.), 47% about cooking, and 39.8% about music. It is in larger cities that the internet is most used for these purposes, with differences of three points, for example, in the use of the internet for skills related to video games and sports (see Annex Table A2).

For self-learning, young people most often watch online videos (63.3%), followed by browsing open resources on the internet (books, articles, etc.) (59.0%) and asking family, friends and acquaintances (51.2%). Although they follow the same trend, the strategies that young people use to learn on their own vary in percentage terms according to municipality type. Most notably, offline activities (asking relatives, friends and acquaintances; consulting books and magazines) are more common among young people from municipalities with less than 50,000 inhabitants (see Table 3).

Our results show that young people's use of self-learning strategies varies according to the size of the municipality in which they live. In particular, young people living in municipalities with less than 50,000 inhabitants tend to use more offline methods, such as asking family members, friends and acquaintances (χ^2 = 3.071; $p < 0.05$) and consulting books and magazines, and basic online actions (in terms of access and skill), such as reading or contributing to online chats (χ^2 = 4.032; $p < 0.05$).

Table 3. Students' top three self-learning strategies

	Total	< 49,999 inhabitants	≥ 50,000 inhabitants
Watching videos online	63.3%	60.2%	66.2%
Browsing open resources on the internet	59.0%	60.2%	57.9%
Asking family members, friends, acquaintances, etc.	51.2%	53.3%	49.2%
Checking websites, blogs, etc.	43.7%	42.6%	44.7%
Consulting books and magazines	26.7%	27.3%	26.0%
Doing nothing for self-learning	13.3%	12.1%	14.5%
Listening to podcasts	10.8%	8.7%	12.9%
Reading and/or contributing to online chats	6.8%	9.0%	4.8%
Taking open MOOC-type courses	4.2%	4.8%	3.5%

By far the most common online learning approach used by schools during the pandemic was emailing study materials with assignments and supporting instructions (67.25%), followed by setting up a system for online testing or assignment submission (40%) and using video or audio recorded by teachers with lesson content (33.5%). This shows that the most commonly used formats are asynchronous. In fact, direct video calls with students, working groups organized through meeting platforms and online lectures were only reported by 31.7%, 30.3% and 28.5% of respondents respectively.

Direct telephone calls between teachers and students were more common in municipalities with less than 50,000 inhabitants (20.1%) than in large urban areas (16.1%). The opposite was true for online lectures, which were used more by teachers in large urban areas (32.5%) than in smaller ones (24.2%) (see Table 4).

Table 4. Practices and approaches most commonly used by schools to carry out online activities

	Total	< 49,999 inhabitants	≥ 50,000 inhabitants
Emailing study materials with assignments and supporting instructions	67.2%	69.2%	65.3%
Setting up a system for online testing or assignment submission	40.0%	41.9%	38.3%
Using video or audio recorded by teachers with the content of cancelled lessons	33.5%	31.8%	35.0%
Making direct video calls to each student individually by computer or cellphone	31.7%	29.1%	34.1%
Organizing working groups or workshops with several students through online meeting platforms	30.3%	30.8%	29.9%
Holding lectures through online platforms	28.5%	24.2%	32.5%
Organizing working groups for educational and recreational activities	21.2%	19.4%	22.8%
Making direct telephone calls to each student individually	18.0%	20.1%	16.1%

The online teaching methods most highly rated by young people are online games (65% gave them a score of 4 or 5 out of 5), with no significant differences by municipality of residence; interactive exercises (59.3%), with a higher preference among young people living in municipalities with a population of 50,000 or more (64.3%) than in less populated areas (53.1%); self-grading quizzes (56%), also more highly rated in larger municipalities (59.5%) than in smaller ones (52.3%); animations (52.8%), with a higher preference in more urbanized areas (57.2%) than in areas with fewer inhabitants (48.1%); and finally, non-graded online forms (43.3%), with only half a point difference between the types of municipality.

Table 5. Students' ratings of online teaching methods (1 being the worst and 5 being the best)

	1	2	3	4	5	I have never tried this
Online forms (non-graded)						
Total	**6.3%**	**10.3%**	**26.3%**	**25.8%**	**17.5%**	**13.7%**
< 49,999 inhabitants	6.2%	11.1%	26.6%	23.2%	17.6%	15.2%
≥ 50,000 inhabitants	6.4%	9.6%	26.0%	28.3%	17.4%	12.2%
Self-grading quizzes						
Total	**6.0%**	**7.0%**	**20.0%**	**29.7%**	**26.3%**	**11.0%**
< 49,999 inhabitants	8.0%	9.0%	18.3%	27.0%	25.3%	12.5%
≥ 50,000 inhabitants	4.2%	5.1%	21.5%	32.2%	27.3%	9.6%
Interactive exercises						
Total	**4.2%**	**7.0%**	**21.0%**	**29.5%**	**29.8%**	**8.5%**
< 49,999 inhabitants	4.8%	8.7%	21.8%	31.1%	22.8%	10.7%
≥ 50,000 inhabitants	3.5%	5.5%	20.3%	28.0%	36.3%	6.4%
Animations						
Total	**3.8%**	**7.5%**	**20.5%**	**25.8%**	**27.0%**	**15.3%**
< 49,999 inhabitants	5.2%	6.2%	23.2%	25.6%	22.5%	17.3%
≥ 50,000 inhabitants	2.6%	8.7%	18.0%	26.0%	31.2%	13.5%
Online games						
Total	**4.3%**	**7.0%**	**14.0%**	**23.3%**	**41.7%**	**9.7%**
< 49,999 inhabitants	5.2%	7.6%	12.1%	24.6%	39.4%	11.1%
≥ 50,000 inhabitants	3.5%	6.4%	15.8%	22.2%	43.7%	8.4%

Municipalities with a population of less than 50,000 differ significantly from their larger counterparts, with more direct teacher-student telephone calls being used ($\chi^2 = 4.071$; $p < 0.05$). In contrast, online lectures are used more by teachers in large urban areas than in smaller ones ($\chi^2 = 5.502$; $p < 0.05$).

It should be noted that young people living in municipalities with less than 50,000 inhabitants have tried less e-learning methods overall, with differences of more than 3 points for all items (see Table 5).

Young people living in municipalities with 50,000 inhabitants or more have a higher preference for interactive exercises ($\chi^2 = 4.153$; $p < 0.05$). The same trend is observed for self-grading quizzes ($\chi^2 = 3.211$; $p < 0.05$) and animations ($\chi^2 = 2.985$; $p < 0.05$).

7.3. Results for *[RQ3] How do students perceive their level of participation according to the mode of learning: face-to-face vs. online?*

Young people perceive themselves as more involved in learning in face-to-face environments than in online environments, but there are differences according to the size of the municipality. Specifically, 58.2% of young people living in cities of 50,000 inhabitants or more said that they participate quite a lot or a lot in face-to-face lessons, compared to 33.5% in online lessons. Among young people living in residential areas with fewer inhabitants, 53.6% said that they participate quite a lot or a lot in face-to-face lessons. Although this figure falls to 37.1% for online lessons, their online participation is still higher than that of young people living in larger cities (33.5%) (see Table 6).

Table 6. Students' perceptions of how much they participate in online and face-to-face learning

	Very little	A little	Neither a little nor a lot	Quite a lot	A lot
Online learning					
Total	**18.7%**	**15.2%**	**31.0%**	**23.7%**	**11.5%**
< 49,999 inhabitants	19.7%	12.1%	31.1%	25.3%	11.8%
≥ 50,000 inhabitants	17.7%	18.0%	30.9%	22.2%	11.3%
Face-to-face learning					
Total	**6.0%**	**10.8%**	**27.2%**	**29.5%**	**26.5%**
< 49,999 inhabitants	5.5%	11.8%	29.1%	31.1%	22.5%
≥ 50,000 inhabitants	6.4%	10.0%	25.4%	28.0%	30.2%

7.4. Results for *[RQ4] Which mode of learning (face-to-face or online) do they prefer?*

When asked about their online education experiences, only 24% of respondents said that their teachers had stimulated their interest during online lessons, with an even lower proportion in larger municipalities (22.1%) than in smaller ones (26%). Only 30% felt that their teachers were well prepared and organized for this type of teaching, with no significant differences by type of municipality. Finally, only 32.8% said that they preferred asynchronous to synchronous lessons (see Annex Table A3).

8. Discussion and conclusions

This study has assessed the preferences of Spanish students between the ages of 16 and 18 with regard to the different models of education (face-to-face or online), identifying some significant differences between those living in large urban areas (50,000 inhabitants or more) and those living in less populated cities. The study focuses on the experiences of these young people following the effects of the COVID-19 pandemic, which made face-to-face classes impossible and led to the sudden adoption of remote learning systems, mostly online.

Although it is often assumed that young people are highly digitally literate, more than a quarter of the respondents in this study said that they had received no training in digital technologies during their secondary education, with this percentage being significantly higher in municipalities with fewer than 50,000 inhabitants. This lack of training should be addressed by schools, even if it is somewhat compensated by the digital skills acquired by students in early childhood and primary school, or through informal and/or self-learning. Particular attention should be paid to less populated areas, bearing in mind that previous studies have identified shortcomings in digital literacy and critical thinking in young people (**Estanyol** *et al.*, 2023; **Fernandes**; **Pinto-da-Mota-Matos**; **Festas**, 2022).

In response to [RQ1] (*How do students perceive online education and do they perceive it differently depending on where they live?*), the young people in our study felt that their teachers did little to stimulate their interest in, and were poorly prepared and organized for, the emergency remote teaching they did during the lockdown, with no significant differences observed by area of residence, confirming [H1]. This contrasts with the findings of **Thomas**, **Thakkar** and **Ghanekar** (2021), whose student respondents felt that their teachers were well prepared and engaged them in their online

lessons. However, like us, they also found that students preferred face-to-face learning in a traditional classroom. Other previous studies have highlighted the need for different teaching approaches and skills in online education compared to face-to-face education (**Stone**; **Springer**, 2019; **Pattier**; **Ferreira**, 2023). These shortcomings became apparent during the pandemic, when

> "the abrupt introduction of digital technologies caused great suffering among teachers due to the lack of training provided to them, the absence of minimum working conditions, the emergence of new professional and psychological burdens, and generational differences in their relationship with technology" (**Moura-Viera**; **Luderitz-Hoefel**; **Réal-Collado**, 2021, p. 1).

In this sense, **Hernández-Ortega** and **Álvarez-Herrero** (2021) has noted that

> "the evaluation of training plans in digital skills and the response of the educational administration to the transformation of the educational system do not satisfy teachers as a whole" (p. 130).

This requires particular attention from public administrations, as teachers are demanding training to improve their digital teaching skills, to strengthen their teaching strategies in fully online or blended learning environments, and to become more proficient in active methodologies or student assessment, feedback and monitoring practices that go beyond academic performance. **Chopra** *et al.* (2019) and **Keržič** *et al.* (2021) have also pointed out that one of the keys to successful online learning is regular, high-quality feedback from teachers on student exercises. There are also advocates of the need to create networks of teachers (within and between schools) to share experiences and practices. Many teachers talk about thoroughly revising the curriculum, a veritable overhaul, in order to agree on the core objectives and content to be targeted (**Trujillo-Sáez** *et al.*, 2020).

Motivation is crucial for a successful and positive learning experience. However, as authors such as **Saykili** (2018, as cited by **Niemi** and **Kousa**, 2020) point out,

> "even highly motivated students can find distance learning difficult, lonely and discouraging" (p. 367).

For this reason, it is important to identify topics that may be of interest to students and consider whether they can be linked to course content. There is currently little information available on the topics that interest and concern young people, especially those on the younger side. Our study confirms [H2] by identifying differences in the topics of interest and the preference for online learning formats among young people living in large urban areas compared to those living in less populated municipalities. We believe that it is necessary to adapt school projects and exercises to the topics of interest in each area of residence. The results of [RQ2] (*What topics are they most interested in and focused on in their self-learning and informal learning?*) confirm that there are significant differences in young people's preferences depending on where they live. We believe that further research on young people's interests could help educators to engage them in educational projects and thus avoid the risk of possible school dropout. Participants' level of interest in a given topic determines their level of commitment, which is necessary for any learning process (**Pereira** *et al.*, 2022). This motivation in the choice of topics has previously been highlighted as a key factor for student success (**Moreira**; **Mesquita**; **Van-Hattum-Janssen**, 2011). It is important to note that in Spain, 19.9% of young people aged between 18 and 24 are not in education, employment or training (NEETs). This figure is much higher than the average for the countries of the *Organisation for Economic Cooperation and Development* (*OECD*) (15.1%) and the 22 countries of the European Union (EU22) (13.3%). This is a matter of great concern, given the high level of vulnerability to which this population group is exposed (*Government of Spain*, 2021b). Although the multiple causes of early school leaving (financial, family, social, etc.) need to be studied in greater depth, the ability to link young people's interests to the content of their education may increase their motivation to learn and make a key difference in ensuring their success.

In response to [RQ3] (*How do students perceive their level of participation according to the mode of learning: face-to-face vs. online?*), despite previous studies indicating that online learning increases interaction (**Belaya**, 2018; **Bignoux**; **Sund**, 2018), our data show that young Spaniards participate less in online learning than in face-to-face learning, which refutes [H3] and is consistent with the findings of previous research by **Thomas**, **Thakkar** and **Ghanekar** (2021). Another previous study, focusing on online secondary education in Finland during COVID-19, also concluded that

> "the main challenges for teachers included non-authentic interaction and a lack of the spontaneity that in-person teaching provides" (**Niemi**; **Kousa**, 2020, p. 352),

and that students missed not only interacting with teachers but also with each other. Other authors, such as **Ozkara** and **Cakir** (2018), have also found higher levels of motivation when communication is face-to-face. **Yates** *et al.* (2021) identified three main characteristics that influence the online learning experience: personalization, authenticity, and collaboration. Encouraging participation and engagement is therefore an element that still needs to be improved in many online learning environments. However, it should be borne in mind that one of the reasons for this perceived lack of interaction is that the online system implemented during the pandemic –and the one most recently experienced by the young people who participated in this study– was emergency remote teaching, which was not the result of a planned strategy and did not harness all the potential for interaction that current online education platforms offer (**Area-Moreira** *et al.*, 2021; **Aznar-Sala**, 2020).

With regard to [RQ4] (*Which mode of learning [face-to-face or online] do they prefer?*), the young people surveyed in our study show a clear preference for face-to-face learning. However, it should be noted that their answers may have been influenced by their views on education in the midst of the pandemic, which was not only short-lived in Spain, but in many schools did not involve a strict e-learning or distance learning model, but rather emergency remote teaching. The fact that the online teaching methods most highly rated by young people are online games, interactive exercises, self-grading quizzes and animations –with a greater preference for all these online methods in municipalities with 50,000 inhabitants or more and less opportunity to try them in smaller towns– confirms [H4]. However, the most common online learning approach used by schools during the pandemic was emailing study materials with assignments and supporting instructions, followed by setting up a system for online testing or assignment submission and using video or audio recorded by teachers with lesson content, all of which are very non-interactive. These data are consistent with the findings of the *CIS* survey (2021, question 33a MT) and highlight that the potential of online learning in terms of promoting interactivity with students and gamifying the educational experience has not been fully exploited. As noted by **Duvall**, **Matranga** and **Silverman** (2020), student interaction with learning content is a strategy that enhances e-learning. It is therefore our recommendation that more interactive approaches continue to be encouraged. The most common practices and approaches used by schools to carry out online activities vary by area. For example, there are more telephone calls between teachers and students in municipalities with a smaller population, while online lectures are more common in large urban areas. In general, young people report a strong preference for synchronous rather than asynchronous lessons, which may be due to the fact that they have been exposed to this format since childhood, with asynchronous lessons being more common in higher education.

The results of our research are relevant because they invite us to reflect on the need to improve online education –with a focus on secondary education (both VET and compulsory/upper secondary education)– in order to break down spatial and temporal barriers between teachers and students, to understand the differences between areas of residence (large cities *vs.* municipalities with less than 50,000 inhabitants), and to increase students' motivation in the learning process. Our findings can be used to enhance online education and ensure that the education system is better prepared for future challenges that may require the use of online learning (new pandemics, more intense and frequent heat waves due to climate change, etc.). Based on this study, we offer the following recommendations for online education: Firstly, there is a need for teachers to acquire enhanced digital skills in order to adapt learning resources and methodologies to the new online environment. Secondly, it is important not to assume that young people have innate digital skills because of their age; instead, we must emphasize the acquisition of critical digital skills during their education. Thirdly, student motivation should be encouraged by linking what they need to learn to their areas of interest, while also considering the significant differences in their preferences according to where they live. Lastly, interactive methodologies that motivate students, such as self-grading quizzes, animations, and interactive exercises, should be prioritized, particularly for young people living in densely populated areas.

This research provides valuable insight into how young Spaniards perceive online education. However, it has certain limitations that may have influenced the opinions of the participants. One of these, as mentioned above, is their recent experience of emergency remote teaching during the lockdown, which cannot be considered as e-learning per se and may have biased their perceptions of online education. For future research, it would be beneficial to assess students' perceptions of online learning in settings further removed from such exceptional situations. Another challenge would be to explore new topics of interest to students in order to better motivate them and enrich their educational journey. These additional lines of research will provide a more complete and nuanced understanding of the challenges and benefits of online education.

9. Notes

1. In Spain, compulsory secondary education (ESO for short) lasts until the age of 16. Students between the ages of 16 and 18 therefore study on a voluntary basis, whether they are repeating a year of ESO, attending upper secondary school, taking part in an intermediate or advanced vocational education and training (VET) course, or entering their first year of university. In VET courses, students are taught to "perform the job functions of each vocational qualification" (**Moreno-Guerrero**; **Fuentes-Cabrera**; **López-Belmonte**, 2019, p. 13). In this type of course, considered more technical and job-oriented, online learning is relatively new in Spain (**Pérez-López**; **Vázquez-Atochero**; **Cabrero-Rivero**, 2021). **Suárez-Guerrero**, **Ros-Garrido** and **Lizandra** (2021) stress the need for digital training for teachers in order to promote online options in vocational training as well.

2. The rural population in Spain consists of people living in municipalities with up to 30,000 inhabitants and a population density of no more than 100 inhabitants per square kilometer. Non-urban areas comprise 7,046 municipalities, which account for 86.7% of all Spanish municipalities, 17.3% of the country's population, and 79.3% of the national territory (*Government of Spain*, 2021a).

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11. Anexes

Annex Table A1. Specific training in digital technologies received during secondary or university education

	Total	< 49,999 inhabitants	≥ 50,000 inhabitants
I have attended talks about their use (security, cyberbullying, etc.).	38.5%	37.4%	39.5%
I have attended occasional sessions at my school.	27.7%	26.0%	29.3%
I have not received any training.	26.5%	28.7%	24.4%
I have taken technology-oriented classes for one academic year.	20.8%	18.3%	23.2%
I have taken technology-oriented classes for more than one academic year.	18.3%	18.3%	18.3%

Annex Table A2. Internet use to acquire or improve skills

	Total	< 49,999 inhabitants	≥ 50,000 inhabitants
Videojuegos	50.2%	48.1%	52.1%
Deporte	50.2%	48.8%	51.4%
Moda y belleza	47.5%	46.7%	48.2%
Cocinar	47.0%	46.0%	47.9%
Música	39.8%	40.8%	38.9%

Annex Table A3. Assessment of teachers in the online environment and lesson type

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
My teachers stimulated my interest during online lessons					
Total	**15.3%**	**25.5%**	**35.2%**	**18.8%**	**5.2%**
< 49,999 inhabitants	14.2%	24.2%	35.6%	20.8%	5.2%
≥ 50,000 inhabitants	16.4%	26.7%	34.7%	17.0%	5.1%
My teachers were well prepared and organized for each online lesson					
Total	**16.0%**	**21.3%**	**32.7%**	**22.3%**	**7.7%**
< 49,999 inhabitants	13.1%	21.5%	33.6%	23.9%	8.0%
≥ 50,000 inhabitants	18.6%	21.2%	31.8%	20.9%	7.4%
I prefer synchronous online lessons to asynchronous online lessons					
Total	**18.5%**	**14.3%**	**29.3%**	**20.2%**	**17.7%**
< 49,999 inhabitants	19.4%	11.4%	34.3%	20.1%	14.9%
≥ 50,000 inhabitants	17.7%	17.0%	24.8%	20.3%	20.3%

Specific survey: Assessment of ICT in formal and informal learning

Question 1. In my free time, I use the **internet** to find information about the following **topics**:

- Climate change
- Education
- Poverty and inequalities
- Employment
- Feminism
- LGBTI
- Immigration
- Health and sexuality
- Other [please specify]

Question 2. In my free time, I use the **internet** to acquire or improve my **skills** in the following areas:

- Video games (finding out how to clear levels, etc.)
- Cooking
- Sport
- Music (playing an instrument)
- Fashion and beauty (styling, make-up hacks, etc.)
- Other [please specify]

Question 3. Tick your top three **self-learning** strategies:

- I do not do anything for self-learning.
- I ask family members, friends, acquaintances, etc.
- I consult books and magazines.
- I browse open resources on the internet (books, articles, etc.).
- I check websites, blogs, etc.
- I watch videos online (on social media, etc.).
- I listen to podcasts.
- I read and/or contribute to online chats.
- I take open MOOC-type courses.
- Other [please specify]

Question 4. Have you received any **specific training in digital technologies** during your secondary or university education?

- I have not received any training.
- I have attended talks about their use (security, cyberbullying, etc.).
- I have attended occasional sessions at my school.
- I have taken technology-oriented classes for one academic year.
- I have taken technology-oriented classes for more than one academic year.

Question 5. How much do you participate in **online** learning?

      1 Very little   2 A little   3 Neither a little nor a lot   4 Quite a lot   5 A lot

Question 6. How much do you participate in **face-to-face** learning?

      1 Very little   2 A little   3 Neither a little nor a lot   4 Quite a lot   5 A lot

Question 7. When your **school** carries out **online learning activities**, which practices or approaches does it use most?

- It emails study materials with assignments and supporting instructions.
- It makes direct telephone calls to each student individually.
- It makes direct video calls to each student individually by computer or smartphone.
- It uses video or audio recorded by teachers with the content of cancelled lessons.
- It organizes working groups or workshops with several students through online meeting platforms.
- It holds lectures through online platforms
- It sets up a system for online testing or assignment submission.
- It organizes working groups for educational and recreational activities.
- Other [please specify]

Question 8. Rate the following **online teaching methods** from 1 to 5 (1 being the worst and 5 being the best):
- Online forms (non-graded)

      1 2 3 4 5 8 (I have never tried this)
- Self-grading quizzes

      1 2 3 4 5 8 (I have never tried this)
- Interactive exercises

      1 2 3 4 5 8 (I have never tried this)
- Animations

      1 2 3 4 5 8 (I have never tried this)
- Online games

      1 2 3 4 5 8 (I have never tried this)
- Other [please specify]

      1 2 3 4 5 8 (I have never tried this)

Question 9. Indicate your level of agreement with the following statements:
- My **teachers stimulate/stimulated** my interest during **online** lessons

      1 Strongly disagree   2 Disagree   3 Neither agree nor disagree   4 Agree   5 Strongly agree
- My **teachers are/were well prepared and organized** for each **online** lesson

      1 Strongly disagree   2 Disagree   3 Neither agree nor disagree   4 Agree   5 Strongly agree

Question 10. **I prefer synchronous online lessons** (all participants connected at the same time) **to asynchronous online lessons** (via videos, materials, or educational resources provided by the teacher in advance).

      1 Strongly disagree   2 Disagree   3 Neither agree nor disagree   4 Agree   5 Strongly agree

Question 11. Do you think the outcome of **education during the pandemic** (**online**) was/is the same or worse than before?

      worse   the same   beter   DK/NC