

Digital Transformation of Universities: The Influence of COVID-19 and Students' Perception

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Abstract

On account of the disruptive nature of the COVID-19 disease, the present paper aims to analyze the main repercussions of the pandemic for the field of education. The objective is twofold: (1) To describe the process of digitalization and digital transformation of educational institutions, (2) To analyze students' insights regarding the implementation of hybrid methodologies of learning and identify potential differences in perception across university degrees. A structured literature review on the resonance of the COVID-19 pandemic for education is performed. From this, the concept of the Digital Divide has risen to prominence, as education digitalization has managed to broaden global social inequalities. In this context, the prevailing E-learning methodologies are detailed, outlining the differences between asynchronous and synchronous format. The topic of Blended Learning is put forward, detailing the diverse hybrid education models present in the actual paradigm of education.

In order to analyze and measure the perception of students regarding education digitalization, a survey based on validated scales is conducted among 305 university students in Spain. A statistical analysis reveals that the most frequently implemented teaching model within the COVID-19 scenario is the mixture of in-person and synchronous remote lessons. In addition to this, overall satisfaction, perception of workload and confidence in the professional future differs across branches of study. Finally, several implications for educational framework are presented.

Keywords: Digital Divide; COVID-19; Education; Perception; Blended Learning

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1. Introduction

The rapid spread of the SARS-CoV-2 virus resulted in severe global health, economic and social repercussions across all sectors of the economy, on top of accelerating the digitalization process (Crawford, 2021). As a result of the restrictions imposed by governments to counteract the coronavirus, educational institutions remained closed for almost the whole of 2020 (World Bank Group, 2020), and hence were pushed to rapidly adapt to remote learning pedagogies. The different educational settings which have emerged in this context have been described and conceptualized, but the effectiveness of the new learning environments requires an ex-post evaluation of the experience in the course year 2020-21 (Nuñez-Canal & de Obesso, 2021).

This motivates us to analyze, from a student's perspective, the degree to which the COVID-19 pandemic has affected and transformed the field of education and identify possible differences across branches of study.

The COVID-19 pandemic resulted in not only an economic crisis, but moreover, a severe health crisis. This resonated through the field of education by accentuating the *Digital Divide*, which makes reference to how technological expansion can induce different opportunities of development depending on the social context of each individual (OECD, 2001).

In this framework, we analyze the evolution of E-Learning over time, which reflects the increasing integration of technology into the learning process with the objective to enhance the learning progress in the light of the industrial revolution 4.0 (Halili & Sulaiman, 2021). Since the arrival of the COVID-19 pandemic, the term *Blended Methodologies* has become the protagonist within the context of education digitalization, making reference to the mixture of both in-person and remote lectures (Cronje, 2020).

The objective behind education digitalization has always been to universalize access to education. From this idea, the notion of Open Educational Resources is conceived, making reference to released learning materials, mostly in digital format, that are open access at zero cost (UNESCO, 2020). Massive Online Open Resources originated from this stream of thought, allowing the expansion of the traditional borders of education towards new unexplored territories (Downes & Siemens, 2013).

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As a way to analyze the perception of education digitalization amongst university students in Spain, a self-elaborated online survey was conducted based on validated Likert scales. To analyze the results obtained, a two-sample t-test was performed in order to identify potential differences in students' perception across university degrees. Results reveal that the most frequently implemented teaching model within the COVID-19 scenario is the mixture of in-person and synchronous remote lessons, and that satisfaction, perception of workload and confidence in the professional future differ across branches of study.

2. Literature Review

2.1. Background on the impact of crises on education

2.1.1. *The Socioeconomic Divide*

Traditionally, crises tend to highlight issues such as the Social Divide, a term used to describe the existing breach between low-income and high-income countries as well as within each nation (García, 2004). We are currently engaged in an unpredictable health crisis. With social distancing being the key prevention method against the spread of the virus, the world has had to restrict overall social contact (Cambridge, 2020). This situation has highlighted social inequalities and accentuated the Digital Divide, defined as inequality regarding access to digital devices and the Internet (UNESCO, 2020). In terms of how crises traditionally impact the educational outcomes of students, according to the investigation on education and crises developed by the University of Indiana (Shafiq, 2010), these are the main factors that affect educational outcome:

Negative impact:

1. A cut in household income may lead to a reduction in the budget dedicated to pay for education.
2. A reduction in adult salaries may lead to an increase in child labor rates.
3. Reductions in hourly wages tend to make people work longer hours, leading to parents having less time to help children with school activities.

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4. If a crisis leads to a labor market that does not reward educational preparedness, people would be less interested in investing in education.

Positive impact:

1. A reduction in labor force salaries may make child labor less attractive, for which people would rather invest the time in educating themselves.
2. During any crisis, people with higher education tend to suffer less than those without it, which can lead to more people enrolling in school.

2.1.2. The COVID-19 pandemic

The main consequence induced by the COVID-19 pandemic in the field of education has been the closure of all educational institutions. School closures will not only exacerbate negative educational outcomes, but also a worldwide economic crisis, which is very likely to continue to impact at a global level even when schools start to reopen. This double impact will become a threat to the quality of learning over time. If countries do not take immediate actions to respond, these impacts will imply long-term costs in terms of human capital and well-being (World Bank Group, 2020).

In order to discuss the long-term effects of the COVID-19 pandemic, we must consider its repercussion over the main macroeconomic indicators, as these will allow us to understand the current global economic situation, in addition to offering information on the future recovery. One of the key repercussions of the current economic situation for education is the impact on demand, with an average decrease of economic growth in the Euro Area of 6.8% in 2020 (OECD, 2021). As a consequence of this, the global increase in unemployment and the general loss of income will test the ability of thousands of households to pay for school enrollment fees. Even for students who do not drop out of school, households will be less likely to pay for educational supplies and materials until the economy recovers (OCU, 2020). Due to this, reenrollment campaigns and financial incentives, such as scholarships, will be key to motivate students to apply for tertiary education degrees. These incentives should be focused towards those students that suffer from vulnerable

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positions, who will be mostly found at public institutions. When facing a situation of economic crisis, countries must take advantage of the circumstances in order to create intrinsic reforms that will help improve the overall performance of education and, moreover, build resilience to face future situations (World Bank Group, 2020).

The COVID-19 pandemic affected 90% of students globally through the closure of educational institutions (Statista, 2020). As stated by UNICEF (2020), the school experience goes far beyond the acquisition of knowledge, as it helps conciliate family and work time, develop social relationships and compensate for overall social inequalities.

According to a study on the effects of lockdown on children's health, one out of every four minors between the ages of 3 and 12 have spent over 6 hours daily in screen time since being confined at home, which entails a greater exposure to risks associated with the prolonged use of the Internet (Universidad del País Vasco, 2020). Regarding the availability of digital tools and an Internet connection, 89% of the children living within the OECD countries have access to a computer and the Internet. It should be noted that in many homes technological devices are shared between family members, which complicates things even further (UNICEF, 2020).

With schools closing down, children's education becomes more reliant on family members and the household environment (Escuela Andaluza de Salud Pública, 2020). The OECD forecasts that the educational gap generated during this time will have long-term effects and will end up excluding students who have not been able to keep up with digitalization requirements (OECD, 2020).

Faced with the closure of schools, children from disadvantaged household units may find their learning process affected due to a lack of resources to adapt to these new learning methodologies (García, 2004). The OECD calculates that in a normal school year the gap between children belonging to different income levels can reach up to a month of delay in learning. During the pandemic, this effect is estimated to have increased up to six months (OECD, 2020).

Several international organizations that protect the application of Human Rights (UNICEF, OECD and Save the Children) proposed the following guidelines, summarized below, which had to be present in future education plans in order to guarantee the right to education for every child:

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1. Digitalization: Educational administrations should be the ones in charge of developing a centralized, digital teaching platform to guarantee homogeneity, accessibility and protection of personal data. The State should provide support to teachers as a way to train them on the new digital tools available (UNICEF, 2020).
2. Families' role: Ensure there is an open and fluent line of communication between schools and households, in order to provide support to those families that suffer from a vulnerable position (Save the Children, 2020).
3. Equity: Provide support and learning resources to students at risk of exclusion. Distribute digital devices to families who cannot afford them, or do not have access to the Internet (Save the Children, 2020).

2.1.3. *The Digital Divide*

For a long time, the only “weapon” available to counteract the spread of the coronavirus was social distancing (Dr. Ali, 2020). As previously mentioned, this situation induced the closure of all educational facilities in over 190 countries, affecting over 1.2 billion students worldwide (UNESCO, 2020). As digitalization of education gains relevance, we should not forget that there are over four billion people around the world that do not have access to the Internet (World Economic Forum, 2018).

Within this context the concept of the *Digital Divide* gains awareness. We understand by this term the existing socio-economic gap between individuals, households, and overall geographic regions, regarding their access to ICTs (OECD, 2001).

If we choose to completely digitalize the field of education, what will be of those who do not have the means to access technological devices? Based on Article 26 of the UN's Universal Declaration of Human Rights, the purpose of education has always been to become a universally accessible service. Therefore, education digitalization might go against the fundamental pillar on which this concept is based.

The *Digital Divide* is a worrying issue at a global level. In Spain, according to the Spanish National Institute of Statistics, 99% of the population between the ages of 16 and 24 have regular access to the Internet (INE, 2020). Meanwhile, in Africa, according to the World Bank, only 22% of higher-income households have access to the Internet (World Bank, n.d.). This exposes a wider set of problems such as nations' digital infrastructure and the need for each country to develop a specific social-distancing education plan accordingly to the resources accessible and available to their population.

2.2. Digitalization of the educational field

Though it might seem like the idea of distance education is quite recent, it has actually been a topic present in the education debate ever since society reached a certain level of alphabetization. In fact, we can talk about four main stages of remote learning.

First, by the end of the 19th century, mailing education appeared. At the beginning this method consisted of teachers mailing books to their students, and students mailing back doubts and homework. This method evolved throughout the 20th century, becoming a one-way mailing system by which the student received the necessary resources to be his/her own teacher (García, 2002).

Second, during the 1970s, television and radio allowed for educational institutions to make the educational process more dynamic, as audiocassettes and videocassettes became the new learning methodologies (Bernal, 2012).

Third, the invention of the personal computer marked the beginning of digital learning as we know it today. Since this time, computer education consisted of multimedia materials for the student to interact with, which allowed efficiency and flexibility (García, 2002).

Fourth, with the spread of the Internet over the last 10–15 years, new online learning materials and platforms started to arise. These tools, like for instance digital learning platforms, have been used as substitute or complementary tools to traditional classroom teaching with the objective to provide a more efficient learning environment for both, students and teachers (Erdmann & Torres-Marín, 2019). Yet, it was not until the COVID-19 pandemic that the world found in online learning the only resource available to keep education going. In fact, due to the pandemic, digital

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transformation has speed up making six years of progress (Clifford, 2020). However, “emergency remote teaching” that has emerged in the anomalous context of the pandemic is different from what is known as E-Learning (Nuñez-Canal & de Obesso, 2021).

2.2.1. *E-Learning and blended methodologies*

Developing from the previously mentioned traditional remote education techniques, the term “E-Learning”, which refers to the process of teaching through the use of the Internet (Downes, 2005) has become very familiar. Two different types of E-Learning methodologies can be distinguished (Hrastinski, 2008):

(I) *Asynchronous Learning* makes reference to deferred online education; the content is posted online, but without live lessons.

- Advantages: Flexibility is key, as it allows students to adapt their studies to their own personal commitments. Student contributions are considered more thoughtful, as they spend more time concentrating on their own development (Hrastinski, 2008).
- Disadvantages: Some students face difficulties to follow through in the absence of in-person educational guidance from an instructor (Hughes, 2014).

(II) *Synchronous Learning* refers to online lessons in real time.

- Advantages: Students are able to interact instantaneously (Hrastinski, 2008).
- Disadvantages: Set time schedules that could be incompatible with students lifestyles (Hughes, 2014).

Within this paradigm, the concept of *Blended Learning* becomes more prominent, making reference to the combination of both online and in-person education (Cronje, 2020). There are four models of *Blended Learning* within the actual paradigm of education:

- Rotation Model: Based on a fixed schedule, students rotate between different learning methodologies, one of these always being online learning (Hrastinski, 2019).

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- Flex Model: Content is mostly delivered through online platforms, and the instructor only provides face-to-face support on specific tutoring matters (Staker & Horn, 2013).
- Self-Blend Model: Online courses that students voluntarily take part in to provide additional support for their face-to-face courses. (Staker & Horn, 2013).
- Enriched-Virtual Model: Mixture of in-person and online lessons (Hrastinski, 2019).

2.2.2. *Open and universal access to education*

One of the main objectives behind education digitalization is the promotion of universal access to education, as it enhances the development of a more inclusive and cultured society (Fielding, 2016).

Within this framework, we encounter the term Open Education, which encompasses the set of practices that pursue the promotion of open access to high-quality education, with the main objective of making learning available for all (Decuyper, 2019). From this idea, the concept of *Open Educational Resources* (OER) is born. As reported by the UNESCO (2020), OERs are “*teaching and learning materials in any medium – digital or otherwise – that have been released under an open license with no-cost access*”. OERs facilitated an organic and quick transition from traditional to remote education during 2020 (Tang, 2020). Though traditional physical textbooks have always been considered the key learning tool for any student, it has been proven that OERs can be a substitute for them, at zero cost, and in fact, in some cases OERs have managed to improve students' academic results (Hilton & Laman, 2012).

By introducing the concept of Open Education into the digital field, we encounter the term of Massive Open Online Courses (MOOCs). These are free online courses that offer open access through the Internet, with an unlimited number of student participations (Nobre et al., 2018). Two types of MOOCs can be distinguished (Downes & Siemens, 2013):

- (i) *cMOOCs*: Seek to build the bases of knowledge among all members of the learning community. Each student chooses what they want to learn as there is no syllabus to follow (Downes & Siemens, 2013).

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- (ii) *xMOOCs*: Online courses offered through commercial platforms. There is a syllabus, set duration and certain tasks must be completed. A certificate is issued after its completion (Peco & Mora, 2014).

MOOCs have the potential to promote the universalization of education, since they offer access to those with the least resources. On top of this, they guarantee a reduction in education costs without loss of quality (Peco & Mora, 2014)

3. Evidence from Students' Perception

3.1. Methodology

As a way to comprehend students' perception of the digitalization of learning environments, a self-elaborated online survey was conducted and subsequently a descriptive analysis and hypothesis tests on differences across study branches were carried out.

The questionnaire was performed on Microsoft Forms, consisting of ten qualitative questions that tackle three main issues: the impact of education digitization, the adaptability to this new education reality and students' perception over their professional future. Six out of the ten total questions developed for this survey were adapted from existing literature, based on validated seven-point Likert scales, as detailed in Table 1.

The questionnaire was shared through the main social networks and communication channels most frequently used by university students: Instagram and WhatsApp. A total of 305 valid responses were gathered.

Table 1 Measurement scales

AUTHOR	CONSTRUCT	ADAPTED QUESTION	ANSWERS
Self-elaborated		Branch of study you are currently studying:	1. Arts and Humanities 2. Sciences (mathematics, physics...) 3. Health and Veterinary Sciences 4. Social and Legal Sciences 5. Engineering and Architecture.
Self-elaborated		What educational regime does your university use?	1. Face-to-face learning in its entirety 2. Online synchronous learning in its entirety 3. Asynchronous learning online in its entirety 4. Face-to-face and synchronous learning 5. Presential and asynchronous learning 6. Synchronous and asynchronous learning
Self-elaborated		Do you have the appropriate technical means (computers, internet connection, etc.) to participate in the online sessions?	Yes / No
Self-elaborated		Before the COVID-19 pandemic, did you have any experience with distance education?	Yes / No
Crosby, L. A., & Stephens, N. (1987)	Satisfaction with the Recovery Process. (p. 527 SMH)	I am satisfied with the methodology currently used by my university in terms of online learning.	(1 – 7) Not satisfied / Satisfied
Chae B., & Li, X., & Zhu, R. (2013)	Product Effectiveness (Performance). (p. 467 SMH)	How much do you believe that your university workload has increased since the implementation of a hybrid learning system?	(1 – 7) Not at all / Very much
Chae B., & Li, X., & Zhu, R. (2013)	Product Effectiveness (Performance). (p. 467 SMH)	How much do you believe that your academic results have improved since the implementation of the hybrid learning system?	(1 – 7) Not at all / Very much
Bracken, C. C. (2005)	Telepresence (Negative Physiological Response). (p. 603 SMH)	To what degree did you experience a worsening of your mental health since the pandemic started?	(1 – 7) No worsening / A lot
White, A., Breazeale, M. and Collier, J. E. (2012)	Word-Of-Mouth Likelihood (Negative). (p. 662 SMH)	Based on my experience, I would not recommend keeping the hybrid education model in my degree.	(1 – 7) Disagree / Agree
Crosby, L. A. & Stephens, N. (1987)	Satisfaction with the Recovery Process. (p. 527 SMH)	I feel favorably about my professional future.	(1 – 7) Disagree / Agree

SMH: Bruner, G. C. (2015). Marketing Scales Handbook.

Source: Self-elaborated.

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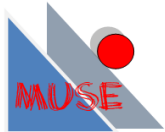


Table 2 Descriptive analysis based on averages

CRITERIA/QUESTION	TOTAL AVERAGE	AVERAGE BY STUDY BRANCH				
		Science	Health & Veterinary	Engineering & Architecture	Economics & Law	Arts & Humanities
Branch of study	100%	6%	39%	15%	33%	7%
Educational regime your university uses	-	-	-	-	-	-
Synchronous Online	12%	26%	7%	17%	15%	0%
Asynchronous Online	2%	5%	1%	2%	1%	10%
Face-to-face	8%	11%	8%	9%	7%	5%
Face-to-face & Synchronous Online	68%	53%	67%	65%	70%	80%
Face-to-face & Asynchronous Online	4%	0%	5%	2%	5%	5%
Synchronous & Asynchronous Online	6%	5%	12%	4%	2%	0%
Technological means to participate in the online sessions	-	-	-	-	-	-
Yes	88.20%	89%	88%	96%	83%	95%
No	0.33%	0%	1%	0%	0%	0%
Provided	1.31%	11%	0%	0%	2%	0%
Shared	10.16%	0%	11%	4%	14%	5%
Remote learning experience before COVID-19	-	-	-	-	-	-
Yes	10%	26%	4%	17%	8%	15%
No	90%	74%	96%	83%	91%	85%
University online methodology satisfaction (1-7)	3.83	3.42	4.02	4.24	3.45	4.10
Workload increase since hybrid learning (1-7)	4.92	3.76	4.83	4.63	5.42	4.75
Academic results improvement since hybrid learning (1-7)	3.44	4.05	3.45	3.57	3.28	3.35
Mental health worsening since the pandemic started (1-7)	5.07	4.53	5.06	4.87	5.23	5.30
Would not recommend hybrid education model (1-7)	5.01	5.32	4.94	4.78	5.16	4.85
Professional future (1-7)	3.88	4.00	4.01	4.46	3.47	3.70

Source: Self-elaborated.

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Table 3 Statistical two-sample t-test analysis

AVERAGE	Economics & Law	Science	Health & Veterinary	Engineering & Architecture	Arts & Humanities
Online methodology satisfaction (1-7)	3.45	3.42	4.02	4.24	4.10
p-value	-	0.9551	0.0127	0.008	0.1167
result	-	Insignificant	Significant difference	Significant difference	Insignificant
Workload increase since hybrid learning (1-7)	5.42	3.79	4.83	4.63	4.75
p-value	-	0.0002	0.0114	0.0067	0.1041
result	-	Significant difference	Significant difference	Significant difference	Insignificant
Academic results improvement since hybrid learning (1-7)	3.28	4.05	3.45	3.57	3.35
p-value	-	0.0586	0.4204	0.3148	0.8548
result	-	Insignificant	Insignificant	Insignificant	Insignificant
Mental health worsening (1-7)	5.23	4.53	5.06	4.87	5.30
p-value	-	0.1400	0.4799	0.2766	0.9587
result	-	Insignificant	Insignificant	Insignificant	Insignificant
Would not recommend hybrid education (1-7)	5.16	5.32	4.94	4.78	4.85
p-value	-	0.9017	0.4363	0.2864	0.5290
result	-	Insignificant	Insignificant	Insignificant	Insignificant
Professional future (1-7)	3.47	4.00	4.01	4.46	3.70
p-value	-	0.2612	0.0316	0.0034	0.6079
result	-	Insignificant	Significant difference	Significant difference	Insignificant

Source: Self-elaborated.

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3.2. Descriptive and statistical analysis

Table 2 provides a descriptive analysis of the average evaluations from the survey, differentiated by study branch.

In order to perform an accurate statistical analysis of the results obtained in the survey performed between university students in Spain, we have executed a two-sample t-test which allows us to comprehend whether there exists a significant or insignificant difference between the results of two variables. Setting up pairwise comparisons, Economics & Law has been chosen as the reference category for the benchmark analysis.

The results of the two-sample t-test are provided in Table 3, reporting the two-sided p-value. For a significance level of 5%, if p-value returns an amount below 0.05, the hypothesis that states that both means are equal will be rejected, as this would indicate that there is a significant difference in perception between the students of each study branch.

3.3. Results

We identify a significant difference in perception for those students of Health & Veterinary and Engineering & Architecture majors ($p\text{-value}_{HV}=0.0122$, $p\text{-value}_{EA}=0.008$), which suggests that students of these two study branches are much more satisfied with the educational methodology adopted by their universities. This could be due to these areas of study being less focused on social interaction. Likewise, students of these degrees could be more familiar with the use of technology, making it easier for them to adapt to these new methodologies.

Furthermore, Economics & Law students are found to perceive a large increase in work volume since remote learning methodologies were implemented, while students that belong to Science, Health & Veterinary and Engineering & Architecture do not perceive such change in their workload ($p\text{-value}_S=0.0002$, $p\text{-value}_{HV}=0.0114$, $p\text{-value}_{EA}=0.0067$). Our conjecture is that this may be due to the fact that many teachers, who suddenly had to adapt to remote learning during the pandemic, believed that the easiest way to rank students' evolution was through projects and essays.

Regarding academic results, we cannot reject the hypothesis on equal perception across degrees (p -values > 0.05 for all), as the overall response from our survey points out that the majority of students feel their academic results have neither improved nor worsened since the implementation of hybrid methodologies of learning.

The same holds for mental health worsening (p -value > 0.05 for all). The magnitude of the scores suggests that most students perceive a clear worsening in their mental health since the start of the pandemic. We believe that this could be a direct consequence of the large amount of hours that students have spent locked at home without being able to develop social relationships, which is of great importance for this particular age bracket.

There were also no significant differences across study branches regarding the recommendation of implementing hybrid learning environments (p -value > 0.05 for all). The high score obtained across all degrees implies rejection of the online environment under normal circumstances. This represents how, regardless of their individual branch of study, most university students in Spain seem not to recommend these hybrid methodologies of learning to be implemented long-term.

Considering students' confidence regarding their professional future, the hypothesis on equal perception as the reference group is rejected for Health & Veterinary and Engineering & Architecture students. That is, Economics & Law, Science and Arts & Humanities students do not feel confident regarding their professional future. This can be due to employment rates of these three study branches being deeply affected by the pandemic, as a large percentage of graduates will dedicate their professional future to the private sector, which is usually severely harmed after economic crises. On the contrary, Health & Veterinary, and Engineering & Architecture students remain positive about their professional future. In the case of Health students, this could be due to the COVID-19 pandemic leading to an increase in the demand for graduates in health-related degrees.

3.4. Discussion of results

Results suggest that, on average, students tend not to recommend remote methodologies of learning to be implemented in the long-term. As previously mentioned, restrictions imposed by governments affected 90% of the world's students through the closure of all educational institutions

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(Statista, 2020). For this, students might feel negative regarding hybrid learning due to the large amount of time spent isolated at home. They might not recommend these approaches to be implemented in the long-term, not because of the methodology as such, but because they would prefer to spend more time attending in-person classes in order to develop social relationships.

Though youth unemployment in Spain has severely increased during 2020 (OECD, 2021), survey results indicate an overall positive feeling from students when asked about their professional future. Based on the Bank of Spain forecast of Spain's future economic situation (Bank of Spain, n.d.), a slow but steady recovery is predicted by 2023. This could be the reason why current university students, who will graduate in the next few years, feel hopeful about their future job situation.

Lastly, the aforementioned study performed by the Universidad del País Vasco (2020) relates the increase in the use of digital devices to potential mental and psychological risks, which aligns with the survey's results as most students feel their mental health has worsened since the start of the pandemic.

3.5. Implications for the education framework

We find that the most frequently implemented methodology is the mixture of both in-person and synchronous online lessons. Based on the survey data, students seem to be content overall with the implemented methodology within their institutions. Due to this, in order for educational centers to successfully transition to remote learning, it should be recommended to alter between in-person lessons and online live sessions. This would ensure that students remain satisfied with the implemented methodology, as it allows them to maintain active communication with their fellow partners and teachers (Keengwe & Kidd, 2010).

Moreover, we have identified significant differences in the workload perceived, which suggests that the digital transformation of teaching should be career specific, as opposed to a uniform solution. Alternatively, it may be a result of differences in the initial digital endowment, both for professors and students. In any case, this confirms the existing challenge for teachers to find the best combination of learning possibilities (Nuñez-Canal & de Obesso, 2021) and provides insights on which aspects the differentiation of the teaching approach across study branches should focus.

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One of the most striking results from our survey is the global affirmative response from students when asked about their perception of having experienced a worsening in their mental health since the start of the pandemic. Educational institutions should be aware of the challenges students are facing nowadays regarding this matter in order to implement measures that will help them cope with their learning evolution. For this, it is of increasing importance for institutions to take proactive actions in order to support the mental well-being of their students, such as providing counselors to give professional help (Sahu, 2020).

As a response to the issues emerging from the rapid digitalization of education, UNESCO (2020) proposes a set of key recommendations that focus on protecting the social aspect of education. This assessment goes hand-in-hand with the statement above regarding university students' mental health. For this, we believe that protecting the social environment of education is key for students to be able to maintain good self-esteem and mental stability. To this we add the fact that most students would prefer not to maintain hybrid methodologies of learning within their institutions. Therefore, once the situation allows, we believe that returning to in-person lessons should be the long-term goal for education.

4. Conclusion

In order to comprehend the degree to which the spread of the COVID-19 disease has impacted the field of education, a thorough research study was performed. After analyzing the general framework of education and the repercussions suffered during the pandemic, we came to the conclusion that this crisis has highlighted two key concepts: The Digital Divide and the Social Divide. These two notions have become the center of debate when it comes to handling the COVID-19 crisis and the digitalization of education.

At the beginning of the pandemic, social distancing became the only prevention against the spread of the virus. With students attending remote lessons, social differences between children became greater than ever. Based on the aforementioned literature, children belonging to household units with limited access to digital devices or an Internet connection have suffered a greater loss in their educational outcome for the academic year.

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Since the Internet became a commodity service in most regions around the globe, the idea of digitalizing education gained awareness as it provides the perfect vehicle to universalize access to education. As the process of education digitalization requires a tremendous investment in time, money, and infrastructure, it was always perceived as a long-term objective. Still, on account of the spread of the coronavirus, nations realized that remote learning was the safest solution to provide students with access to education.

Still, students' perception regarding the new learning environment differs across branches of study. In particular, students of Health & Veterinary or Engineering & Architecture are significantly more satisfied with the hybrid teaching framework than Economics & Law students. At the same time, Economics & Law students perceive a higher increase in workload, and are found to be less optimistic regarding their professional future. However, academic results and mental health seem to be uniformly affected by the new teaching environment.

Overall, we conclude that the COVID-19 pandemic has taken education digitalization from a question of "if..." to a question of "how...", forcing countries to act without having time to plan a strategy. Remote education, though a very good solution for an emergency situation such as the one imposed by the COVID-19 pandemic, is not the long-term option desired by university students. Digital education is here to stay, but in-person education provides a level of social satisfaction yet to be replicated by online learning.

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