Article

Higher Education Response in the Time of Coronavirus: Perceptions of Teachers and Students, and Open Innovation

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Abstract: The COVID-19 pandemic has transformed training processes. The transition from face-to-face to virtuality has affected the entire educational process favoring one of the open innovation key features in the higher education institutions: the ability to manage knowledge flow. Open innovation in this crisis situation will encourage universities to deal with difficulties and embrace opportunities to enhance knowledge production. In this regard, the main objective of this work is to analyze how universities have managed knowledge flow during lockdown situation. The research presents a comparative study between three countries highly impacted by the coronavirus (Spain, Italy and Ecuador) based on perceptions from teachers and students on a convenience sample of 573 individuals. The study, of a descriptive and exploratory nature, applied surveys between March and April 2020 to students and teachers of Journalism, Communication. The survey had 2956 responses, collecting 65,032 pieces of evidence from students and 6468 from teachers. Teachers and students show their preference for being present, but they recognize the justification for the change of scenery and identify positive elements in virtuality. According to the findings obtained, the absence of presence has not generated an increase in the meetings between teachers and students. In addition, the tutorials have been shorter and sporadic. Added to this is a scant commitment to the variety of resources and options offered by the Internet. The predominance of textual material collides with the demand from students for a mixture of training resources, a greater role for the podcast and, especially, a typology of assessment tests that pass the traditional exams.

Keywords: COVID-19; education; university; resources; evaluation; open innovation

1. Introduction

Innovation is a matter of common interest in all fields of knowledge since in the context of the Knowledge Society, learning is maximized for the good of individuals [1] which requires the existence of a technological scenario, pedagogically designed, for learning throughout life [2]. In this sense, innovation, linked to the use of ICTs, responds to the emerging perspectives of restructuring and reculturation of the educational system [3] so that it is consistent with today's society, in all dimensions of its work [4]. In this regard, universities are closely related to open innovation in their specific role as entrepreneurial agents, as stated by Huggins, Prokop and Thomson [5] who are particularity concerned with their capacity for knowledge transfer and commercialization capabilities.

In the current scenario, the use of Information and Communication Technologies represents an important step towards innovation [6] since ICTs bring us closer to new possibilities of knowledge distribution and acquisition of skills and new competences, and can also favor constructivist and collaborative learning [7]. The issue of digitization of higher education has opened a broad academic and professional debate [8–10] to detect

where the forces of change and educational innovation goals should be directed [11,12] under the principle of improvement based on evidence and systematization of experiences which promote active citizenship and contribute to the development of the learner [13]. In this sense, the open innovation perspective highlight universities as capable agents driving innovation and fostering economic development providing knowledge flow [5].

Virtual environments are used for online teaching, offering access to the documentation necessary for the construction of pedagogically significant learning [14] capable of generating quality educational processes in our students as well as being a valid resource for student tutoring tasks [2,15]. Online education has been developed since the beginning of the century, improving, evolving and consolidating as a teaching methodology of its own, different from the face-to-face methodology [16–18] as a key issue for open innovation. In this sense, previous literature works show this evolution that implies consolidation of the model [7,19,20], specific competences for teaching staff [8], adequate materials and resources, more flexible and open methodologies [21] and specific evaluation systems focused on tutorials and formative evaluations [22,23]. This is how the Technological Pedagogical Content Knowledge (TPCK) approach was born, which indicates that a quality e-learning education is achieved when the teacher integrates the knowledge of the specific content of the subject with the knowledge of the pedagogical strategies for its teaching and the knowledge of the use of ICT [24]. Developing digital skills has been an international concerning since the beginning of the century from UNESCO, Media and Information Literacy Curriculum for Teachers [25], the European Union, DigComp [26] and even from international assessments such as the IEA (International Association for the Evaluation of Educational Achievement), the International Computer and Information Literacy Study [27].

The COVID-19 pandemic has introduced urgent and disruptive transformations in higher education systems, which have been rapidly implemented [9,28]. On the one hand, lockdown measures have forced higher education systems worldwide to exploit the possibilities of technology for training as unique teaching scenarios. On the other, this "forced situation" also served to identify problems, weaknesses and spaces for reflection, especially regarding digital literacy, and innovation in education, assessment and evaluation processes [29]. Universities have understood the importance of redefining their training processes, transforming them from face to face to virtual, and have had to prove their ability to adapt to future scenarios of home confinement.

This unprecedent context has provoked a never-seen situation in which all lessons have been redirected online. This framework introduces the perspective of open innovation, considering universities as a type of open innovator because of the significant levels of relational involvement through interactions that promote knowledge exchange [5]. Based on the above, this research presents a descriptive study that describes, compares and analyzes the reflections of university students and teachers during this unprecedented situation due to the pandemic on the classes and lessons, the study materials used, and the assessment applied throughout confinement as main issues for the knowledge exchange for innovation. The study aims to answer the following research questions in order to describe universities' open innovation capacity and capability during lockdown:

How do students and teachers value the synchronous encounters held during confinement?

What types of materials have played a major role in the quarantine stage?

What types of study materials do you consider most suitable for future phases of confinement?

What platforms do you consider most appropriate for education in times of confinement?

How important are the exams in these kinds of contexts?

What types of evaluation tests do you consider most appropriate?

2. Theoretical Framework

2.1. Education and Open Innovation

The discourse around changes in educational systems arose in the beginning of the century, concerning new competencies and new increasingly connected learning scenarios [25,27]. The education issue has evolved differently in each country from the traditional perspective to open innovation perspectives embracing the Internet and all the changes involved and shaping distributed innovation networks. Since the European Higher Education Area (EHEA) was endorsed by 46 countries in 2009 [30], dynamics for change and transformation have come from learning and teaching practices, matching educational necessities with open innovation issues. As acknowledged in the Bologna Process, their success and sustainability depend on the support given and established from educational institutions [31].

It could be said and widely accepted that learning, understood as the process of acquiring knowledge or skills, has been dramatically changed with the emergence of digital environments that have given rise to new learning paradigms such as: e-learning, ubiquitous learning and social-learning [21,32]. This emergence has been tightly linked to digital media, emergent technologies and wireless communications with continuous connectivity [27,33]. In this regard, it is generally accepted that nowadays learning occurs with different approaches depending on the mediation and use of digital platforms, methodologies and sources: e-learning, blended learning, m-learning and face-to-face learning. These learning methodologies have implied systemic changes in the way learning was traditionally accepted, integrating specific dynamics, sources, tools and teachers' training. Three decades have passed since the first eLearning was implemented. Learning provided by the Internet has developed specific issues, times, rewards, workload, administrative support, cost, course quality, student contact, and equipment, demonstrating that online teaching practices are certainly different from face-to-face practices.

Since COVID-19 appeared and as obliged educational institutions globally to lock down, the Internet has offered a viable alternative for universities in the global situation, but the main question is whether all lessons provided in face-to-face education have suddenly been provided online, which seems to be an emergence alternative but not efficient, keeping in mind that online learning is not the same as distance learning. Accordingly, Moore et al. [34] state the different types of learning environments depend on "the learning objective, target audience, access (physical, virtual and/or both), and type of content. It is important to know how the learning environment is used, and the influences of the tools and techniques that distinguish the differences in learning outcomes as the technology evolves" (p. 129). The volume of literature describing and analyzing specific features on online teaching is huge, providing interesting theoretical works which offer a better understanding of the nature of teaching and learning in distance learning [5,17,19,21].

Moreover, it is important to note that although this perspective is necessary, it is not enough to show a proper understanding of the situation. Defining open innovation as "a paradigm that dictates that internal and external resources and pathways are needed to create new innovative products and services" ([35] p. 2), universities should find a great deal with the pandemic situation with which to innovate and add significant value in social transformation.

2.2. Assessment in the 21st Century

Evaluation has a large literature on innovation processes in order to guide the new curriculum and the changes associated with it. In this regard, a cultural change is suggested that leads to moving from the assessment of learning to assessment for learning [36]. Evaluation is therefore considered a necessary resource for the development of competencies, essential to ensure educational success and proper integration in a digital world [27]. Various approaches recognize the determining influence of evaluation, its techniques, its strategies, its agents and its elements on student learning [37]. According to Butler and Crawford [38], if we want better graduates in a highly competitive environment, we need

to better evaluate our students. However, in university classrooms, evaluation is still linked to the passing of an exam. In this way, there is a gap between the knowledge and skills that students acquire and those that are really necessary to be successful in the 21st century [26,27].

The evaluation is singular, local and contextualized and, therefore, it must make sense according to the setting in which it takes place [28]. Therefore, evaluation cannot be understood without knowledge of learning, teaching and other curricular discourses in their context. As the authors of [10] state, improvements in assessment depend on the decisions and actions of individual teachers. At this point, it should be noted that teachers highly value evaluation and consider themselves quite competent in it, although they think that they put it into practice to a lesser extent.

Previous research on educational assessment has focused more on students and less on the role of teachers as innovators [22,39]. Among the studies that highlight the responsibility of teachers in the evaluation, there are the works that analyze the link between factors related to the thinking of teachers and the barriers to implement a specific model of evaluation: the conceptions of teachers, their thoughts and beliefs about evaluation [13,40].

To be considered an optimizing learning element [11], the evaluation must refer to significant tasks in themselves, focus on real-life problems and be contextualized in situations linked to specific disciplines. In addition, these tasks must involve students in a deep approach to learning [41]. Likewise, we must ensure the participation of the student. At this point, students have to be able to make judgments about the quality of a work and develop a process of reflection using a set of pre-established criteria; that is, they have to critically assess their tasks, and provide comments and suggestions for improvement in order to be trained as autonomous and efficient learners [42].

On the subject of educational evaluation, it is always important to assess the perception of utility that students have of it [6,18,19], since it is the necessary protagonist, as well as the ultimate goal, of the organizational effort that the teacher makes in order to teach. Thus, the works of Carter et al. [43] and Chiecher et al. [16] study the perception of students about the methodologies and e-learning experiences for which small virtual instances have been introduced, creating alternative contexts that students value positively for their possibilities of flexibility, the use of mixed methodologies and the opportunities to learn new ways of accessing knowledge.

COVID-19 has come to show the profound transformation that traditional educational systems need. In addition, the fact is that the global eruption of this virus is showing what a pandemic demands of institutions: quick actions and collaboration in a determined and audacious way. From the basis that teaching is an essential element of education for most students, it is generally accepted that the global pandemic has affected teaching; the main objective of this study is describe and analyze how much this process has been affected, with the specific purpose of giving to higher education the expected perspective of open innovation dynamics frequently claimed over last decade from different authors since online teaching burst into the educational system.

3. Materials and Methods

This descriptive, exploratory and explanatory research was carried out through a comparative study between Spain, Italy and Ecuador on the virtual teaching imposed during the coronavirus crisis. The methodological proposal was designed from an exploratory perspective [44] and applied surveys and content analysis. On the one hand, the study was based on two surveys (one carried out on Journalism and Communication and Education students from the three selected countries and the other on university teachers). It is worth noting that all the participants reached were students and teachers from presential and traditional learning courses; none of them were from online or blended learning. The first survey had 2956 responses from 376 students and the second one reached 197 teachers. In total, the study collected 65,032 pieces of evidence from users and 6468 from teachers. The surveys were conducted between March and April 2020.

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The invited sample, conceived as the set of elements of the population that are asked to participate in the research, corresponds to students and teachers, establishing a single-stage sample. The study considered an online survey as the optimal methodological mechanism to collect information, and it was directed to students of different age groups (between 18 and 29 years old), represented by age and gender as shown in Table 1. The percentage analyzed does not show statistical significance and, in this sense, the sample does not allow the inference of general results but descriptive ones. In Spain, the participation was 71.6% women and 28.3% men, whose ages range from 18 to 29 years. In Italy, the participation was 91.2% women and 8.8% men, whose ages range between 16 and 30 years, concentrating mainly on ages between 19 and 27 years. In the case of Ecuador, 64.1% women and 35.8% men participated, aged between 18 and 28 years. Regarding the professors consulted, the survey was directed to 196 university professors. In total, the study collected 6,468 pieces of evidence from teachers (61.2% men and 38.8% women). The training of the teachers consulted was: 23% doctors, 50.5% with a master's degree, 13% graduated and 13.5% with other types of studies.

Table 1. Description of the sample according to age, gender and country.

Students		Spain N = 159 (42.3%)	Italy N = 1 25 (33.2%)	Ecuador N = 92 (24.5%)	Total N = 376 (100%)
Gender	Male	45 (28.3%)	11 (8.8%)	33 (35.86%)	89 (23.7%)
	Female	114 (71.69%)	114 (91.2%)	59 (64.13%)	287 (76.3%)
Age	18–22	141 (88.6%)	95 (76%)	60 (65.21%)	296 (78.72%)
	23–29	18 (11.32%)	30 (24%)	32 (34.78%)	80 (21.27%)
Teachers		Spain N = 71 (36.04%)	Italy N = 66 (33.5%)	Ecuador N = 60 (30.45%)	Total N = 197 (100%)
Gender	Male	47 (66.1%)	41 (62.1%)	33 (55%)	121 (61.42%)
	Female	24 (33.8%)	25 (37.8%)	27 (45%)	76 (38.57%)
Age	26–47	39 (54.9%)	40 (60.6%)	32 (53.3%)	111 (56.3%)
	48–60	32 (45%)	26 (39.3%)	28 (46.6%)	86 (43.6%)

The research was based on a discretionary sampling or intentional sampling in the selection of the three participating universities. In this type of sampling, the subjects subjected to analysis and study are chosen by the researcher to be part of the sample with a specific objective as they are considered adequate or suitable for the investigation.

Concretely, acknowledging that comparative knowledge provides the key to understanding, explaining and interpreting, and aware of the limitations of our sample, which represent only the first step toward a global knowledge, three universities were selected.

The selection responds to a per genus et differentiam choice, according to the following criteria: (1) countries amongst the most affected (in terms of contagion and losses) by the COVID-19 pandemic, (2) countries that present different levels of digital readiness, (3) countries that present geographical, demographical and social diversity, (4) recognized public universities, (5) universities that base their teaching methods on presence courses and (6) courses that include at least one subject related to communication media literacy.

Acknowledging that our sample might be considered statistically not generalizable, we believe that by choosing different universities (by geographical location, economic situation and digital readiness), but similar profile courses, not only we can contribute to the understanding of how Journalism and Media Literacy students and teachers have faced the crisis, but, assuming that students and teachers involved in Communication and Media Literacy courses should show more awareness of the critical use of technology [12], we can offer a fruitful input for a more generalized overview.

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Accordingly, the universities that make up the study are the following:

The Autonomous University of Barcelona (UAB) is based in Catalonia, one of the richest regions of Spain. Spain ranks eighth among EU countries on readiness for digital learning. It is scores above the European average on all indicators [45].

Spain is currently the European country with the third highest number of losses due to COVID-19 and amongst the first for the strictness of the lockdown measures.

UAB is a top ranked university (in research and teaching), according to the majority of European university academic directories. On 26 November 2009, the UAB was recognized as a Campus of International Excellence. It has 37,166 students and 3262 teachers. The UAB offers 77 undergraduate degrees, 328 postgraduate programs and 90 doctoral programs. The study has had the participation of students on the degree of Journalism.

Italy, despite being world's seven industrial power and member of the G7, scores very poorly, ranking 26th out of the EU-27, when it comes to digital readiness. Concretely, its worst performance is in institutions and policies for digital learning and availability of digital learning [45]. The country was the first country hit by COVID-19 in Europe, the first to impose total lockdown in March 2020 and the most affected in terms of number of losses.

The University of Torino, founded in 1404, is among the oldest public universities in Europe. The study has had the participation of students on the degree of Education, since they learn media literacy.

Ecuador is a developing country. It was described in April as emerging as the "epicentre" of the pandemic in Latin America and the government struggled to manage the crisis due to lack of resources. Although the Internet penetration was 69%, in 2018, approximately 9.7 percent of the Ecuadorian population was living on less than 3.20 U.S. dollars per day [45]. The Technical University of Machala is located in the province of El Oro, in the south of the country. Despite being in an area of border vulnerability, it has been accredited in category B as a university of excellence. It has five faculties and about 13,000 students are enrolled in its academic courses, both undergraduate and graduate. The study has had the participation of students on the degree of Journalism.

The study adopted a hybrid work methodology based on a matrix survey made up of quantitative questions and open questions to also enable qualitative work. The survey was designed with closed questions of exclusive nominal scales and was based on a non-probability sample or convenience sample in a single-stage sampling procedure. Due to the lockdown situation, researchers accessed teachers and students close to them. The statistical analysis used on the survey was descriptive analysis based on frequencies and percentages. The total responses of each country, different in each case, were equated in percentages with a comparative intention that allowed a final crossover between the three selected countries. In addition, the methodological proposal includes closed dichotomous questions for the most defined topics on the use, the evaluation of the platforms and the impact of social networks on daily and professional performance. Furthermore, it was considered pertinent to incorporate categorized questions (offering the respondent a series of lists of possible activities to develop in a social network or different names of on-line dialogic platforms) and, in this way, identification questions combined intention, information and opinion. The main variables of the questionnaires were: (a) balance of virtual teaching during the confinement stage; (b) assessment of the activities and content provided; and (c) analysis of the role of teachers.

The questionnaire was validated by a panel of experts (n = 6) in communication and education matters before being implemented. Subsequently, an electronic version of the survey was carried out and sent to three communication faculties, one for each country. Both the users and the participating trainers were informed of the study and their consent was requested to participate in it. With the surveys, an exploratory motivational analysis was drawn from different fields of work:

- For students: data on age, country and gender; balance of the virtual teaching period during the confinement and assessment of the content, work dynamics, skills of the teaching team and information received from the university.

- For teachers: knowledge of the characteristics of virtual teaching, mastery of dialogic platforms and the guidelines for creating content for cyberspace.

In both surveys, closed questions of exclusive nominal scales were used for data collection (mostly from the use of the Likert scale with a degree of response, where 1 means totally disagree and 4 totally agree) and also different open questions. Dichotomous closed questions were included for the more defined topics on the type of internet use and knowledge of aspects related to safe browsing. In addition, it was considered pertinent to incorporate categorized questions (offering the respondent a series of lists of possible options) and, in this way, identification, intention, information and opinion questions were combined.

The open responses, which made free writing possible, made it possible to know the degree of mastery of certain topics, as well as giving users and trainers the ability to explain them.

The statistical analysis used in the surveys was descriptive, based on frequencies and percentages, whose responses were matched in percentages with a comparative intention. The internal consistency of the test presented high reliability with a Cronbach's Alpha of 0.943, confirming the measurement of the construct of multiple intercorrelated factors. According to Vilches [44], when the Alpha coefficient is >0.90, we can say that the reliability of the instrument is excellent and if it is >0.80 we can say that it is good. The questionnaire was sent through the Google Forms application. The second research technique was content analysis which allowed the interrelation of user responses with a group of identified variables of interest. The categories of analysis were designed based on the proposals and previously applied in the works of Tejedor et al. [46].

4. Analysis

4.1. Classes and Lessons during Lockdown

Regarding synchronous encounters, which enable a meeting in real time, in the three countries analyzed, the students consider them positive (72% in Spain, 63.3% in Ecuador and 48.4% in Italy). For their part, 89.3% of teachers think the same. For students, the main strengths of this type of exchange are that they resemble the operation of a face-to-face class (this is pointed out by 66.7% of Spanish students, 62.3% of Ecuadorians and 50% of Italians). The possibility that synchronous meetings offer the student the opportunity to organize their time is another of the strengths most valued by the student body (with 31.5%, 37.7% and 44.3%, respectively). For their part, the main weaknesses attributed by the students differ according to the country studied. Spanish university students indicate that they do not adapt to virtual work (48.1%) and that they are forced to be aware of the connection at one hour and time of the day (32.7%). In the case of Ecuador, 51.2% point out as a negative element that this type of encounter forces them to connect at a specific time of the day and, secondly, 46.3% criticize that they do not adapt to virtual work. On the other hand, in Italy, 49.3% point out as the main weakness of the synchronic encounters that they establish the obligatory nature of the connection at a specific moment, while 33.3% refer to the fact that they do not adapt to the characteristics of virtual work. Finally, in a section on "other" weaknesses, the students allude to the fact that, in this type of exchange, there is not the same level of concentration, the interaction is poorer, the connectivity may fail or there is an increase in technical problems.

On the other hand, the students consulted from the three countries coincide in pointing out that the move to virtual training has led to an increase in the work they have to do (83.4% in Spain, 58.9% in Ecuador and 73.4% in Ecuador, 8% in Italy). To the above, it is added that, in relation to this increase, the students believe that it is a justified change (82.6% in Spain, 67.9% in Ecuador and 58.9% in Italy). A total of 37.8% of teachers believe that the change has benefited them; 35.7% think that it has harmed them and 26.5% are indifferent towards it. Among those who consider that it has harmed them, 38.7% indicate that the main problem has been the increase in work; while 32.3% consider that the situation is less stimulating.

Regarding the materials used by teachers, except in the case of Spain where 75.2% think that they have not been adequate, in Ecuador (with 61.1%) and Italy (66.7%) the majority of the students think that these have been appropriate. The weaknesses attributed to them are, in the three countries, a lack of adaptation to virtual education, first of all, and the fact that they were exactly the same as in the face-to-face stage. In addition, they point out that they were very long documents, disconnected from the subject matter and, in many cases, in English. For their part, 85.2% of the teachers indicate that the materials used have been correct. The 14.8% who think otherwise do so because they believe they were the same as in the face-to-face phase and because they are not adapted to virtual education.

The type of content that has predominated in the confinement stage has been textual and audiovisual (see Figure 1). The predominance of textual materials in the Spanish case is striking, as well as the general absence of the use of the podcast. The use of PowerPoint is not mentioned by the students either.
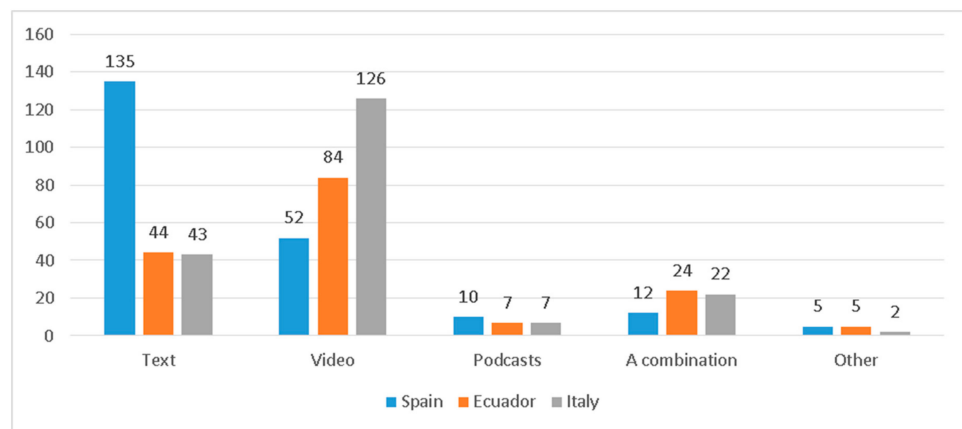

Figure 1. Types of predominant format during lockdown teaching.

Faced with the previous results, the students consider that the contents which should predominate in a virtual training stage such as the one generated by COVID-19 must be audiovisual (see Figure 2). To this is was added a commitment to the combination of materials of a different nature. In the Spanish case, an interest of the students is also detected in the sound content of the podcast. Along the same lines, the teachers pointed out that multimedia and audiovisual content are the ones that should predominate in a period of confinement. Textual material is of decisive importance to them. However, there is a minimal role for podcasts.
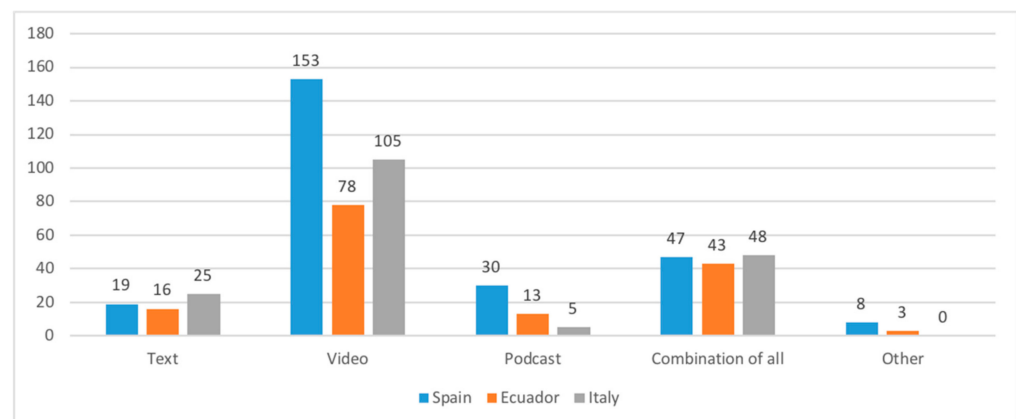

Figure 2. Formats that should prevail.

Zoom and Teams are the platforms that the students valued as most suitable for virtual teaching. Next is the virtual campus of the university and, in fourth position, is Skype

(see Figure 3). Teachers, for their part, value the Zoom platform first, followed by the virtual campus of their respective universities. Teams and Skype would be placed on a third level of importance for teachers. It is important to note that the unexpected situation force teachers to change their presential classes and give students a quick response, this is why most of teachers declared in the open question about "Would you like to add any comment about the experience?", that they were forced to use free web conference tools because their universities were not prepared for a virtual modality for all students neither they had they had enough training.
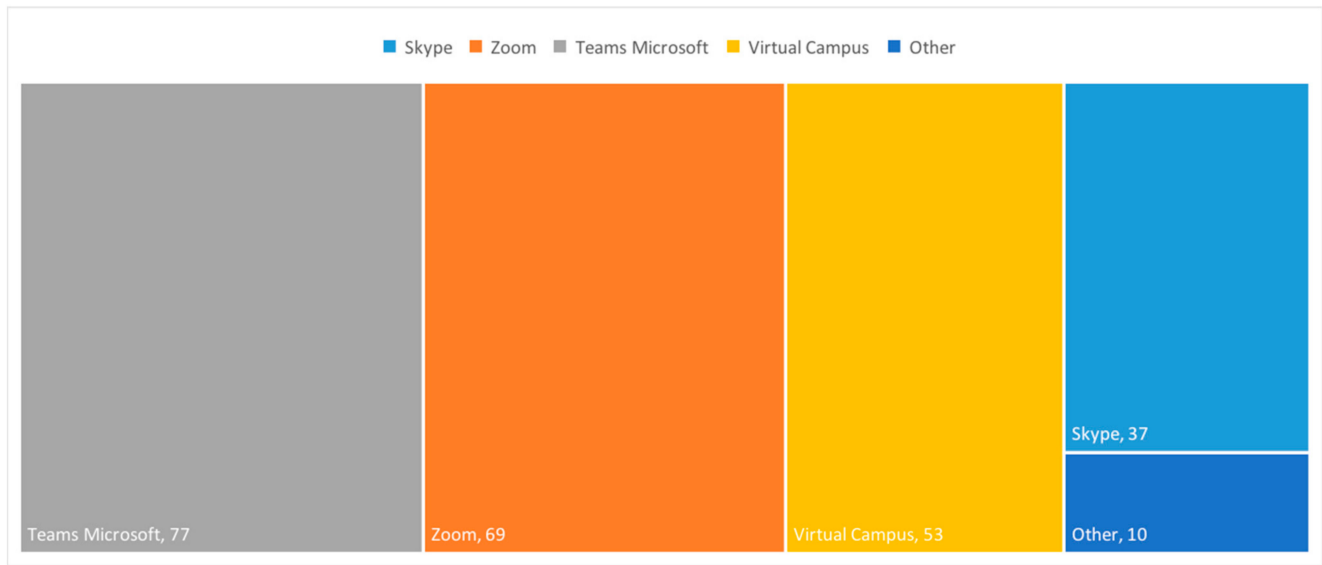

Figure 3. Platforms assessment.

Regarding gamification strategies, except in Ecuador (which has a percentage of 44.4%), both in Spain (with 23.6%) and, especially, in Italy (with 5.6%) the presence of this type of dynamics was very limited. This data invite reflection as the students of the three countries describe this type of proposal as motivating and useful, whose presence is, for the moment, very limited.

4.2. Assessment during Lockdown

Tutorials are a decisive element in the university learning process as part of the assessment since the European Higher Education Area (EHEA) endorsed by 48 countries follows the directives of the so-called Bologna Process, which established tutoring and tutorials as a necessary complement of master classes [30]. In this sense, confinement has raised the need to seek alternatives to face-to-face meetings between teachers and students. In relation to this, in the three countries analyzed, the preference of the students is that of being present: in Spain with 84.1%, in Ecuador with 83.3% and in Italy with 83.9%. Furthermore, the study makes it possible to point out that students have had a greater number of tutorials in the period prior to confinement than during it (see Figure 4). In the case of Spain and Italy, a considerable percentage affirm that the number was the same. Regarding the duration of these meetings, the majority of students (46.5% in Spain, 46.7% in Ecuador and 49.2% in Italy) assure that the tutorials lasted the same time as before the quarantine, although a high percentage of students can be observed in each country who affirmed that they were shorter (42.7% in Spain, 32.2% in Ecuador and 33.3% in Italy).
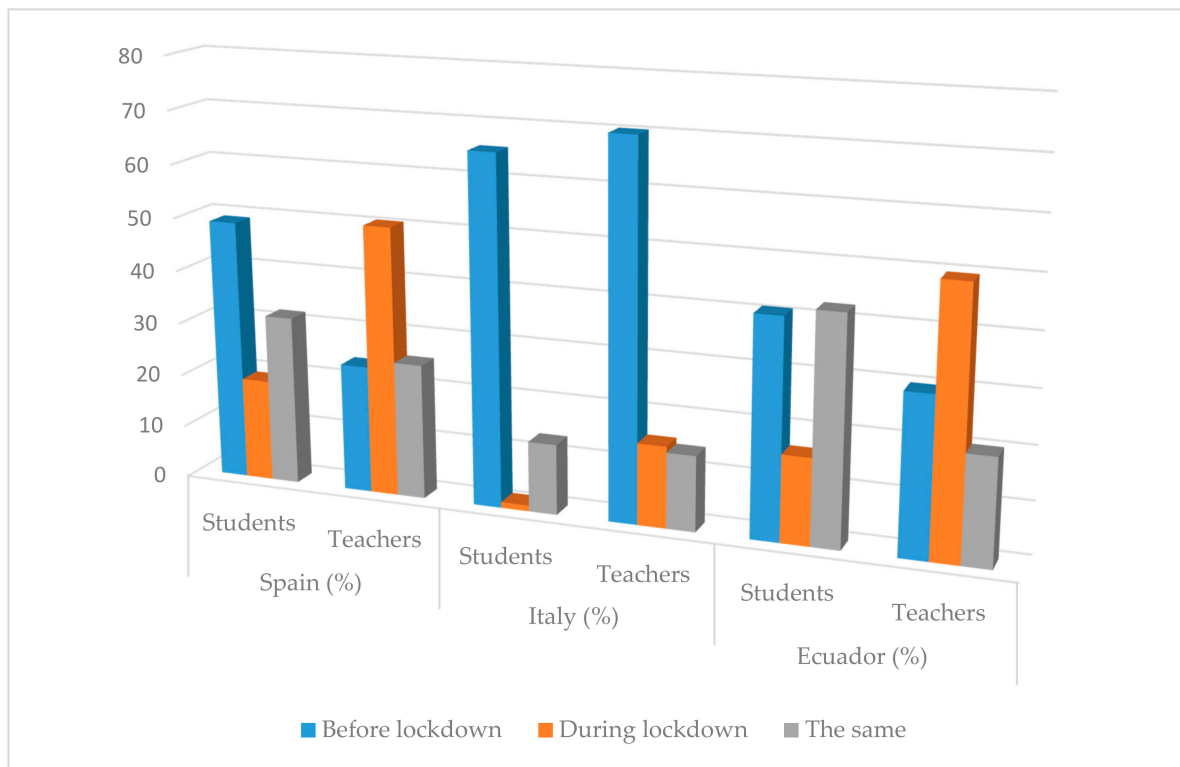
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Figure 4. In which period have you had more tutorials with your teachers?

On the other hand, 61.2% of the teaching staff are in favor of face-to-face tutoring compared to virtual ones. Coinciding with the results derived from the student survey, 38.8% of the teachers affirm that they had more tutorials with their students before the quarantine; 24.5% indicate that they had more during confinement and 36.7% think that the number was the same. Regarding the duration, the opinions of the teachers are divided, almost evenly, between 38.3% who say they were of the same duration, 31.6% indicated that they were shorter and 30.1% considered that they had been longer. The Results have a different perspective if we focus on each country and each sample as seen in Figure 1. Focusing on the data, as seen in Table 2, teachers had a very different perception from students. In Spain and Italy, teachers declare they had more tutorials, and these data are confirmed with the responses in the question "Did the situation imply more work for you?" in which the 84% of teachers from all the samples responded "Yes".

Table 2. Perceptions from teachers and students about the frequency of tutorials before and during lockdown.

In Which Period Have You Had More Tutorials?	Spain (%)		Ecuador (%)		Italy (%)	
	Students	Teachers	Students	Teachers	Students	Teachers
Before lockdown	49	24	65.6	70.3	41	30
During lockdown	19.1	50.6	1.1	15.4	16.4	49.7
The same	31.8	25.4	13.3	14.3	42.6	20.3

Exams have been another of the elements upon which much of the educational debates during the confinement period has been focused. In the Spanish case, 87.9% of the students believe that this type of test should be eliminated, while in Ecuador, the supporters of it stand at 57.8%. It is striking that, in the Italian case, 85.7% are in favor of maintaining them. In the event that they could not be eliminated, in the Spanish case, 49.7% and 59% in the Ecuadorian would prefer that they be in a group. In Italy, however, 73.4% consider individual exams more appropriate. In Spain and Ecuador, students would prefer

a multiple choice test, while in Italy the first preference would be question exams. It is striking that, in all three countries, students place developmental exams last. For their part, they consider group work, the creation of projects or the combination of various test typologies valuable. However, 90% of the students in the three countries analyzed consider that, due to the context introduced by COVID-19, the exams should be with notes or support materials.

For their part, 74% of the teachers consider that it should not be eliminated despite the peculiarities of the confinement period. A total of 77.8% of the teachers prefer individual tests, while 22.2% prefer group ones. Regarding the type of evaluation exercises, the teacher's order of preference is as follows: development tests, multiple choice tests, and short questions (57 points). Without reaching 90% of the results of the students, it is striking that 53.6% of the teachers think that the exams should be with notes or support materials.

Finally, it is especially worrying that in all three countries the student body believes that they have felt that they have lacked appropriated emotional support from their university during this stage. In the case of Spain, the figure reaches 80.3% of users, while in Ecuador it is 63.3% and in Italy it stands at 58.7% of the total. The professors, for their part, point out in 66.3% of the cases that they have not felt a lack of emotional support from the university during the confinement of COVID-19.

5. Discussion: Higher Education Response in the Time of Coronavirus and Open Innovation

The impact of the pandemic on Higher Education demands a clear restructuring of academic organization [47]. From a physical and architectural point of view, universities will have to rethink their workspaces in order to guarantee the social distance and, at the same time, the ergonomics necessary for the development of teaching and academic activities. However, this reformulation must be carried out from the possible perspective of a return to the previous scenario marked by presence. This aspect invites a redefinition and reconceptualization of teaching and study spaces as liquid areas rapidly adaptable to different work settings. Universities' open innovation capacity and capability during lockdown can be discussed from the following issues:

- Study materials and legal aspects: The new scenario demands an investment in content, especially audiovisual or multimedia content, which must also respond to the idiosyncrasy of each university, enhancing its digital branding and guaranteeing all legal aspects related to production, reproduction and distribution of content of this nature. For this reason, a scenario is foreseen that will demand a significant commitment by specialized legal offices in the subjects of intellectual property and copyright regarding the dissemination and use of the content, as well as the participation of the teachers in them. From an open innovation perspective, the lack of openness with regard to content access, this is knowledge generated, constrains the positioning of universities within networks of collaboration and innovation [5,48]
- Online content creation units: The virtual and hybrid models require study materials adapted to new interaction scenarios. This aspect, which forms one of the main complaints of the student body and constitutes an essential issue of social development and innovation, requires the passage to a scenario presided over by content adapted to the particularities of teaching and virtual study. Therefore, universities must ensure the usability and educational design of their study materials, an aspect that will affect the quality of teaching, but also the digital branding of the universities themselves.
- Virtual campus versus new platforms: The study determines that virtual campuses have not been able to respond, in many cases, to the needs of the new scenario. This aspect warns of the need to convert these platforms into virtual interaction spaces that are closer to the dialogical encounters that make platforms such as Teams or Zoom possible, considering the aspects of accessibility, permits, cost of licenses and teacher training in the advanced use of the same.

- Student and teacher care units: The pandemic has generated numerous cases of anxiety and stress that have affected teachers and, especially, students. For all these reasons, it is especially worrying that, in the three countries studied, students consider that they have lacked greater emotional support from their university during this stage. For this reason, there is a need to strengthen the creation of units that serve and monitor students and teachers, especially in periods of confinement that generate greater autonomous work and produce acute isolation. A study by the Complutense University of Madrid, based on 3500 surveys, concluded that people between 18 and 39 years of age present during these weeks of quarantine more anxiety, depression or feelings of loneliness than those over 60. The World Health Organization (WHO), has warned that a fifth of the world will suffer mental disorders, double that in normal circumstances [49]. The UNED has surveyed 500 people and has concluded that a third of the participants presented during these weeks a generalized anxiety disorder; the same proportion had severely altered sleep patterns, and a fifth required professional intervention for depression [50,51]. The Complutense University of Madrid inaugurated in 2017 a PsicAll, a call center for psychological care for its students, where 60% of the users are students and many prefer to do so by email.
- Decrease in student body and mobility: The pandemic has generated a worldwide effect of decreasing university students. In Spain, a decrease of up to 7% in degrees and up to 30% in master's degrees is calculated for the next year. Added to this are the mobility problems that affect students from their own country who had to travel to another city and the mobility programs as a whole, such as the ERASMUS program, which are in a highly compromised scenario. In Spain, for example, almost half of foreign students (46%) come from the European Union. For its part, Latin America is the second emitting region (23%). In master's degrees, in 2010 there were 18,384 foreign students and in 2019 that increased to 47,667, growing by 260%. Of them, the vast majority (62%) come from Latin America, followed by countries of the European Union, Asia and Oceania, which oscillate around 15% [52].

6. Conclusions

6.1. Implications

The results of the research invite reflection on the educational scene in order to redefine some processes whose fragility has evidenced the impact of COVID-19 in line with previous works [3,4]. The risk of new outbreaks and the perennial threat of new viruses or pandemics constitute a serious invitation to continue researching and monitoring the capacity of universities to face and adapt to these new challenges [28,29]. Moreover, this situation constitutes a great deal for universities as open innovators contributing to the social transformation and demonstrating their capabilities and capacities favoring knowledge openness and shaping distributed innovation networks.

Teachers and students understand the reasons for the change of scenery (face-to-face/virtual). However, the student body was harmed, while among teachers there are very different opinions. However, to the above, we add the preference of students and teachers for face-to-face processes in the educational field. This global inertia, shared by university students and teachers from different countries of the world, invites us to redefine the educational processes of virtuality, bringing them closer to the guidelines of face-to-face exchanges.

Regarding the meetings between teachers and students, COVID-19 has recorded a striking fact. Despite the confinement, the number of tutorials has not been increased. Furthermore, the exchanges carried out have generally been shorter than those held in the face-to-face stage. These data affect the need to define protocols for virtual meetings that are more stimulating for both students and teachers. It is not only a technological challenge but also the conceptualization of the planning, design and development dynamics of these exchanges. Regarding the platforms, Zoom and Teams have been the most valued by the students, while teachers have opted for Zoom and the virtual campus of their university.

The COVID-19 crisis has been, in this sense, an opportunity to evaluate the technological skills of teachers and students and, at the same time, it has served to test the solvency of the university's own tools (such as the virtual campus) that, in general, have been relegated to a second or third level of importance.

The materials used have been are one of the key elements in the whole process. Their lack of adaptation to virtual education, on the one hand, and the fact that they were exactly the same as in the face-to-face stage have been one of the main criticisms of the students and also one of the elements for discussion. It is striking, however, that the teachers consider that they are good materials. In this sense, a lack of innovation and approach to the idiosyncrasy of the multimedia scenario is detected. The type of content that has predominated in the confinement stage has been textual and audiovisual. The general absence of the use of the podcast and its low evaluation by teachers is a striking element. The great preference of students and teachers is for audiovisual content. However, students demand a more multimedia-based offer that combines resources of different types, while claiming a greater role for the podcast. Textual material has had an outstanding weight within the framework of a generation closely linked and familiar with the audiovisual.

Exams have been another of the most critical issues. COVID-19 affects the need to bet on new inquiry-based learning methodologies that allow students to evaluate their knowledge beyond conventional tests and take advantage of the wealth of resources in cyberspace. Students, who are in favor of substituting exams for other types of tests, clash with the majority of the teaching staff who continue to consider them essential.

6.2. Limitation and Future Research Topic

Finally, it is important to stress the limitations of the research presented, even despite its timely significance due the situation it provides limited empirical evidence in the context of three different universities. A wide pathway is open for future research in this area of study, having in mind universities are recognized as active actors in social environment transformation with social appropriation of knowledge. More specific studies are needed describing and analyzing universities' open innovation capacity and capability. In particular, both case studies, providing in depth knowledge about specific contexts and needs and comparative studies, allow the overcoming of what is country-specific, are encouraged. Moreover, research in this area should serve as a guide for governments supporting universities in the investment of knowledge transfer plans as key issues to develop social transformation and linking university and industry.

Institutional Review Board Statement: Ethical review and approval were waived for this study, due to the type of data gathered, only perceptions.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

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