Article

Digital Literacy and Higher Education during COVID-19 Lockdown: Spain, Italy, and Ecuador

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Abstract: Digital literacy constitutes the basis for citizenship in order to be effective and efficient in the 21st Century in professional and personal lives. The set of skills and competences integrating digital literacy are expected to be guaranteed in higher education. During the lockdown globally imposed for the COVID-19 pandemic, educational systems worldwide had to face many disruptive changes. The aim of this research is to present a comparative study of three countries' higher education institutions (Spain, Italy, and Ecuador), analyzing how they have faced the global lockdown situation, focusing on the development of digital literacy. The methodological approach followed in this study was quantitative with an exploratory-correlational scope using a questionnaire designed ad hoc and applied in a sample of 376 students. Results point the necessity of enhancing the main aspects such as the teacher's digital skills, sources for learning that may be adapted, communication between universities and students, and teaching methodologies that should be appropriate to the current context. Conclusions may suggest rethinking higher education learning and reinforcing main issues for this transformation, mainly: communication, teaching, and digital competences. Otherwise, digital literacy is not being guaranteed, which means higher education is not accomplishing one of its main objectives.

Keywords: digital literacy; COVID-19; generation Z; students; lockdown; higher education; communication

1. Introduction

The development of the "knowledge society" implies social transformation in which citizens need new skills and competencies. On the one hand, technological availability has motivated world-class universities to develop innovative programs and new ideas to accelerate and improve both teaching and learning [1]. On the other, as Jonas-Dwyer and Pospisil [2] (p. 195) observe, even if "the technological revolution has been a catalyst for change in universities", "research has shown that introducing new educational technologies alone does not improve teaching and learning outcomes" if they are not accompanied by specific training. Therefore, in a context of development and expansion of an increasingly digital society, training in competencies within the scope of digital literacy of higher education students should be essential, nonetheless, it is often viewed as something that "is often taken for granted" [3] (p. 95). In Poore's words, today, more than ever, we have the opportunity and the technologies to assist us in the human project of shaping, creating, authoring, and developing ourselves, however "we will not be able to achieve a liberating, collective intelligence until we can achieve a collective digital literacy" [4] (p. 34).

Aligning with Pérez-Tornero's holistic approach, understanding media literacy as a concept embracing all the fields and all the competences related to media, digital literacy is understood as the "acquisition of the technical competence for using information and communication technologies, understood in a broad sense, in addition to the acquisition of the basic practical and intellectual capacities for individuals to completely develop themselves in the Information Society" [5] (p. 29). Digital literacy may be understood as an inter-related set of skills or competencies necessary for success in the digital age [6], developed and evolved in different dimensions address in models acknowledge by countries and governments [7].

Within the context of the COVID-19 crisis, this has become even more evident [8]. The World Health Organization (WHO) declared COVID-19 as a global public health emergency of international concern on 30th January 2020 as well as a pandemic on 11th March 2020 [9]. As of 6th April 2020, UNESCO reported that there have been 1,576,021,818 affected learners out of 91.3% total enrolled learners in 188 countries in all levels of learning. Exactly as in many other aspects of everyday life, COVID-19 had a serious impact on students, instructors, and educational organizations around the globe [10]: the pandemic caused schools, colleges, and universities across the globe to shut down their campuses [11] and quickly move conventional education to distance and virtual learning [12]. Current educational circumstances are so unique that some authors accurately propose to define this new situation "crisis learning". Due to this uniqueness and exceptionality of past and current circumstances, many studies are emerging on the impact of COVID-19 restriction measures in different educational levels [10,13] and different contexts [11,14,15]. Most of these studies focus either on specific countries [13] or on specific aspects, such as technical aspects of e-learning [10] or psychological impact [14] or communicative perspectives [16].

The only—by the time—global study, developed by Crawford and colleagues [12], analyzing twenty countries educational responses, concludes that the educational sector needs to unite to postulate a future where students can be supported digitally, without compromising academic quality and standards of the curriculum. The aim of this research is to present a comparative study of three countries' higher education institutions (Autonomous University of Barcelona in Spain; University of Torino in Italy; and Technical University of Machala in Ecuador) analyzing how they have faced the global lockdown situation, focusing on the development of digital literacy.

2. Generation Z and the "Digital Native" Debate

Although there is no absolute consensus about the precise boundaries of Generation Z, most literature [17–19] considers that it is composed of individuals born between the years 1996 and 2010. Their most important characteristic is that they are the first generation that has never known a world without the Internet. Their lives are molded by the Internet, which has been converted in a natural part of their lives. Prensky [20] defines this cohort as "digital natives", implying that having been exposed to these digital technologies has endowed this generation with specific and even unique characteristics that make its members completely different from those growing up in previous generations.

Teräs, Myllyla, and Teräs [21] consider that, having grown up with highly sophisticated media, they are "naturally" more Internet savvy than their forbearers, displaying "natural skills of digital native learners" (p. 1). Veen and Vrakking [22], in the same line, propose to call this generation *homo zappiens*, considering that this cohort have developed all the metacognitive skills necessary for enquiry-based learning, discovery-based learning, networked learning, experiential learning, collaborative learning, active learning, self-organization and self-regulation, problem solving, by themselves. According to this vision, Generation Z students currently attending school or university are, therefore, considered experts in understanding technology, socially open through the use of technology, fast and impatient, and interactive and resilient multi-taskers [23]. Some research suggests that Generation Zers' brains are structurally different to those of previous generations [18,24]: surrounded by complex visual imagery, the part of their brain responsible for visual ability is more developed, making them more reactive to "visual learning", but with a shortened attention span.

Accordingly, there is a growing agreement that there is "a gap between higher education and 21st century skills" [21] and that educational institutions should adapt their methodologies [24]. Both the concept itself and the description of the so called "digital natives" have been criticized, lacking any empirical evidence or substantive characteristics. Kirschner and De Bruyckere [16], for example, harshly criticize this definition, comparing "digital natives" to Yeti-like creatures: a myth, someone that everyone talks about but that nobody has ever seen.

A study carried out by Romero, Guitert, Sangrá, and Bullen [25], comparing students of different ages, for example, found that older students (>30 years and thus born before 1984) who exhibited the characteristics attributed to digital natives more than their younger counterparts.

In their research, 58% of their students, older than 30 showed the characteristics of the so called "digital natives" more than their younger counterparts.

In terms of learning environment, a study from the University of Barcelona [26] concludes that the "digital native" label does not provide evidence of a better use of technology, rather that technology use is mainly influenced by the teaching model. Consequently, in a research on first-year undergraduate students at Hong Kong University, Kennedy and Fox [20] found that while students appear to use a large quantity and variety of technologies for "personal empowerment and entertainment", they do always appear digitally literate in using technology to support their learning. This is particularly evident when it comes to student use of technology as consumers of content rather than creators of content specifically for academic purposes" [27] (p. 76).

Adding to this, Shatto and Erwin [28] consider that Gen Z students' ability to obtain information from online sources seems impressive, but they lack the ability to critique the validity of the information and, are likely to get frustrated if answers are not clear immediately. Thus, keeping the attention of the student and developing higher order thinking skills are critical components of successful teaching. In other words, many students entering university today have a high level of exposure to digital technologies and media, but they do not seem prepared to cross the bridge between personal and academic use of technology. Therefore, as academic know-how is gained through formal education, so too must technological prowess be gained through structured learning experiences [28]. For this reason, it is vital that higher education institutions promote explicit and intentionally reasoned digital literacy strategies, that combine the optimization of the competencies that both students and teachers possess as users, with the generation of new competencies [29].

3. Digital Literacy

As previously mentioned, there is a growing agreement that there is "a gap between higher education and 21st century skills" [21] and that educational institutions should adapt their methodology [1], promoting explicit and intentionally reasoned digital literacy strategies, that combine the optimization of the competencies that both students and teachers possess as users, with the generation of new competencies [29].

Accordingly, even though digital literacy "has been one of those key concepts whose relevancy and weight as a key element for a digital citizenship have shifted from being recommended to essential" [7], the concept itself of digital literacy is not standardized, its scope is broad and has been researched from different fields. The most common approaches so far have been those of media studies, educational studies, computer science, information science, and librarianship [5].

Due to this, the understanding of this competence can be diverse. On the one hand, the different understanding of digital literacy responds to the interests and scope of each era of literacy [30]. Therefore, emerging at the end of the twentieth century with the spread of ICT (Information and Communications Technology), the term mainly referred to computer literacy, that is to say to technological skills, while with the growing of the "knowledge society", has highlighted that digital literacy should be understood as an "inter-related set of skills or competencies necessary for success in the digital age" [6]. In particular, the so-called critical approach has been growing, mainly with the spread of media literacy studies.

This approach highlights critical thinking as one of the fundamental aspects. Aligning with Pérez-Tornero's holistic approach, understanding media literacy as a concept embracing all the fields and all the competences related to media, we understand digital literacy as the "acquisition of the technical competence for using information and communication technologies, understood in a broad sense, in addition to the acquisition of the basic practical and intellectual capacities for individuals to completely develop themselves in the Information Society" [5] (p. 30).

Within this framework it is important to recognize that, since there is no unifying definition of digital literacy, many models and implementation are possible [7]. Accordingly, we will examine our result within the respective reference framework.

Digital Literacy Development Models

The development of digital literacy in Europe is based in both Spain and Italy on the DigCompEdu reference framework [31] in which six dimensions are established that teachers must promote for the development of adequate digital literacy with a series of sub-dimensions as shown below:

1. Dimension 1. Professional engagement, integrating organizational communication, professional collaboration, reflective practice and digital continuous professional development.
2. Dimension 2. Digital Sources resources, including the following subdimensions: selecting, creating and modifying and managing, protecting and sharing
3. Dimension 3. Teaching and learning, teaching, guidance, collaborative learning, self-regulated learning.
4. Dimension 4. Assessment within assessment strategies, analyzing evidence, and feedback and planning.
5. Dimension 5. Empowering learners, embracing accessibility and inclusion, differentiation and personalization, and actively engaging learners.
6. Dimension 6. Facilitating learners' digital competence which includes five subdimensions: information and media literacy, communication, content creation, responsible use, and problem solving.

In the context of Ecuador, Digital Agenda 2017–2021 [32] establishes 5 dimensions for the promotion of digital literacy:

1. Dimension 1. Hardware, which includes two subdimensions: connectivity and equipment.
2. Dimension 2. Digital learning, including the following subdimensions: curriculum; learning methodologies, content and digital sources.
3. Dimension 3. Teachers development, long life learning, pre-service teachers' education and professionalization, developing digital competences.
4. Dimension 4. Communication and promotion focusing on visualization, engaging and empowering, and web content.
5. Dimension 5. Innovation related with developing new skills and competences for teachers and learners.

The establishment of reference frameworks for the development of digital literacy in both contexts is very similar, as can be seen in their description, and they are the fruit of a collective awareness of the need to develop a new literacy according to the context of society of the information. In addition, its international recognition has implied an effort in recent years, from organizations, institutions, and governments so that this change was being put into practice. The objective of the work presented here is to carry out a specific temporal approximation (during the quarantine time for COVID-19, March–April 2020) with a study of the perception of university students to verify whether during this period of global confinement has sought the development of dimensions that guarantee the acquisition of digital literacy. To ensure greater significance of the results, the study was applied to three countries: Spain, Italy, and Ecuador, with a high incidence of COVID-19.

4. Materials and Methods

From the study of the reference frameworks for digital literacy in the three contexts studied (Spain, Italy, and Ecuador), the study dimensions associated with the variables that would later be included in the design of the questionnaire were designed, based on the DigCompEdu [31] and the Digital Agenda 2017–2020 [32]. Thus, the study dimensions were established as follows:

- Dimension 1 [D1]. Teacher's professional engagement and collaboration: it is related to professional engagement, the capability to integrate organizational communication, professional collaboration, and effective practice and development.
- Dimension 2 [D2]. Digital learning and sources: this dimension is meant to be a rethinking of conventional sources of learning, complementing the development of other dimensions. It includes the necessity for citizens to be aware of how to responsibly use, access, and manage digital content.
- Dimension 3 [D3]. Teaching and teachers guidance and skills: Learning strategies will definitely develop an appropriate digital literacy by designing, planning, and implanting in the different stages of learning digital tools and technologies.
- Dimension 4 [D4]. Supporting/empowering students: having in mind this is a dimension related to the development of digital literacy, it will ensure not only access to digital learning resources and activities but empowering learners and fostering their digital competences.

These dimensions conducted to the definition of several variables of study for the design of the questionnaire. The methodological approach followed in this study was quantitative with an exploratory-descriptive scope [33], using three independent socio demographical variables of study (gender, age, and country) and 20 dependent variables distributed for the analysis of each dimension as follows: [D1] Teacher's professional engagement and collaboration with four variables; [D2] Digital learning and sources including six variables; [D3] Teaching and teachers guidance and skills integrating five different variables; and [D4] Supporting/empowering students with five variables.

The dimensions and variables defined allow us to specify the purpose of the study, drawing the following research questions: [RQ1] During lockdown do teachers from the university show professional collaboration coordinating and addressing the situation? [RQ2] What kind of sources have teachers used during the lockdown? [RQ3] Did teachers use new learning methodologies to guarantee quality in teaching? [RQ4] What was the perception of students about their teacher's digital competences? [RQ5] Did students perceive negative aspects in the teaching lessons during lockdown? [RQ6] Did students feel their education was damaged because of this situation? [RQ7] Did students feel they had enough digital competence level to face the situation? In the findings of all research questions, the analysis and results will offer or not differences among countries.

Based on this research questions, the following objectives were addressed: (1) first, describe the situation in three countries studied, focusing on the four dimensions designed related to digital literacy, and, (2) secondly, find out if there were significant differences among the three groups studied.

In order to reach the second objective, the hypothesis established were as follows:

Null Hypothesis (H_0): There were no differences among countries in the research questions defined
Alternative Hypothesis (H_A): There were differences among countries in the research questions defined.

This descriptive research applied a comparative study between Spain, Italy, and Ecuador on the specific dimensions: consumption of devices and content during the global health crisis of COVID-19, during the months of March–May 2020. The methodological proposal was designed from an exploratory perspective and applied the survey instrument, which reached 2956 responses from 376 university students from Spain, Ecuador, and Italy. In total, the study collected 65,032 pieces of evidence from the three countries.

4.1. Sample

The invited sample, conceived as the set of elements of the population that are asked to participate in the investigation [17] corresponds to undergraduate students of Communication, Journalism, and Education. The study was composed of 376 students aged between 18 and 40 years old (M = 21.94; SD = 3.28). As shown in Table 1, the description of the sample was: in Spain, the participation represents 42.3% of the sample (N = 159), whose ages range from 18 to 29 years. The students from Italy were the 33.2% (N = 125), whose ages average between 18 and 24 years. In the case of Ecuador, 24.5% (N = 92), aged between 18 and 40 years.

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

		Spain N = 159 (42.3%)	Italy N = 125 (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%)

The research was based on 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 [17] as they are considered adequate or suitable for the investigation. Three universities from different socio-geographical settings were selected, which received a strong impact from COVID-19, generating significant numbers of affected and deceased in their territorial environment. In this regard, the institutions that made up the study were: Autonomous University of Barcelona (Spain) participating with students of the degree of Journalism; University of Torino (Italy), with the participation of students of the degree of Education, and Technical University of Machala (Ecuador) that participated in the study with students of the Communication degree.

4.2. Instrument and Procedure

The design of the instrument was carried out with the objective of describing the observed situation and exploratory analysis of the research questions raised in order to analyze the established dimensions and find if there were differences among the three groups studied (Spain, Italy, and Ecuador). In the first phase, the instrument was submitted to the judgment of experts, six in total, academics from the study area, two in each country, in order to establish clarity and relevance to the items. This first step discarded a total of 5 items for being redundant or imprecise and allowed six of them to be reformulated. For the analysis of the reliability of the instrument from the statistical point of view, Cronbach's Alpha was carried out for each dimension of the study, all values being above 0.70. The instrument was designed with Google Forms tool and, prior to its completion, each participant's permission was requested. It is important to note that before the data gathering, researchers assured the ethical issues in each university were addressed. None of the three universities involved required authorization from the ethics committee due the nature of the study, only the express participant's permission. The final instrument consisted of independent variables that collected sociodemographic information and of dependent variables, a total of thirty-one as can be read in Appendix A, Table A1. Dichotomous type questions were chosen because of the nature of information the researchers intended to gather. The dichotomous question format is used when the issue under consideration most likely is thought of in two possible values [18]. Statistical analysis of data was made with package SPSS, version 22, descriptive and inferential analysis was addressed. In order to check the equality of variances Levene's test was applied, which is proper for two or more groups, obtaining a p-value below 0.05 ($p < 0.05$). Results confirm there was no normality in the distribution of variables so non parametrical statistics were required in our study. The study was conducted in two steps in order to reach objectives designed in the four dimensions: firstly, with basic statistics (frequencies and chi-square test), and secondly,

to determine the strengths of associations after chi-square, we observed Cramer's *V*, (the suitable measurement in nominal variables) in order to reject or accept null hypothesis, showing which groups are different or where the groups differ. Accordingly, Norris et al. [33] and the interpretation for effect size (ES) in Social Science in Cramer's *V* should be considered as follows: ES ≤ 0.2 weak; 0.2 < ES ≤ 0.6 moderate and ES > 0.6 strong.

5. Results

In order to establish a clear explanation of results, they are presented as the following in the dimensions designed, responding in each case to the research questions involved.

5.1. Dimension 1. Teacher's Professional Engagement and Collaboration

Results for the first dimension [D1] were addressed in two steps as previously explained. Firstly, basic statics such as frequencies and chi-square for significance where analyzed in order to extract differences among countries, as can be seen in Table 2. In this regard, students where asked in four dichotomous nominal variables.

Table 2. Differences among countries for D1 and basic statistics (N = 376).

	Spain (%)		Italy (%)		Ecuador (%)			*p*	
	Yes	No	Yes	No	Yes	No	S-I	I-E	S-E
D1.1 Have teachers been well coordinated among them during the lockdown?	13.83	86.16	31.2	68.8	82.6	17.39	0.000	0.000	0.000
D1.2. Have you felt you were not supported enough?	80.5	19.49	50.4	48.8	63.04	36.95	0.000	0.139	0.002
D1.3. Have you felt you were properly informed about your lessons and proceedings?	44.02	55.97	52.8	47.2	60.86	39.13	0.142	0.236	0.010
D1.4. Have you received contradictory information anytime?	64.77	35.22	72.8	27.2	40.21	59.78	0.149	0.000	0.000

$p < 0.005$.

In this dimension, the results answer to RQ1: During lockdown, do teachers from the university show professional collaboration coordinating and addressing the situation? Descriptive statistics for the first dimension show significant differences among countries, for D1.1. *Have teachers been well coordinated among them during the lockdown?* So, null hypothesis is rejected. Results show statistically significant differences among all countries studied confirmed by Cramer's *V*: Spain–Italy (S-I) (χ^2 (1) = 12.51, $p < 0.005$), Cramer's V = 0.210 which is weak but statistically significant (ES ≤ 0.2); Italy–Ecuador (I-E) (χ^2 (1) = 56.22, $p < 0.005$), Cramer's V = 0.509 moderate (0.2 < ES ≤ 0.6); and Spain–Ecuador (χ^2 (1) = 14.25, $p < 0.005$), Cramer's V = 0.679 strong (ES > 0.6). D1.2., *Have you felt you were not supported enough?* This item only shows statistically significant differences between Spain–Italy (χ^2 (2) = 29.25, $p < 0.005$), Cramer's V = 0.321 moderate (0.2 < ES ≤ 0.6). D1.3., *Have you felt you were properly informed about your lessons and proceedings?* There were no significant differences among countries ($p > 0.005$), which means that in this item, null hypothesis is accepted. About last item D1.4., *Have you received contradictory information anytime?* Countries that differed most were Italy–Ecuador (χ^2 (1) = 23.25, $p < 0.005$), Cramer's V = 0.327 and Spain–Ecuador (χ^2 (1) = 14.25, $p < 0.005$), Cramer's V = 0.238 which is moderate in both cases (0.2 < ES ≤ 0.6).

Focusing on percentages, as seen in Table 2, bigger differences arise in the first and second items. While Spanish and Italian students consider teachers were not well coordinated among them during the lockdown, 86.16 and 68.8 percent respectively, in Ecuador students, a percentage of 82.6 consider the opposite about their teachers. About item D1.2., *Have you felt you were not supported enough?* The highest level is for Spain, 80.5 percentage of students have felt that during the lockdown they were not supported enough from their teachers.

Differences are evident once more when asking students about their perception about the learning situation. The Spanish ones declare in a high average that this learning context assumes them a higher workload, obligating them to be more autonomous and losing contact with classmates. Among Italian

students, these issues seem to be less relevant as confirmed in Figure 1, and Ecuadorian are like Spanish in this regard.
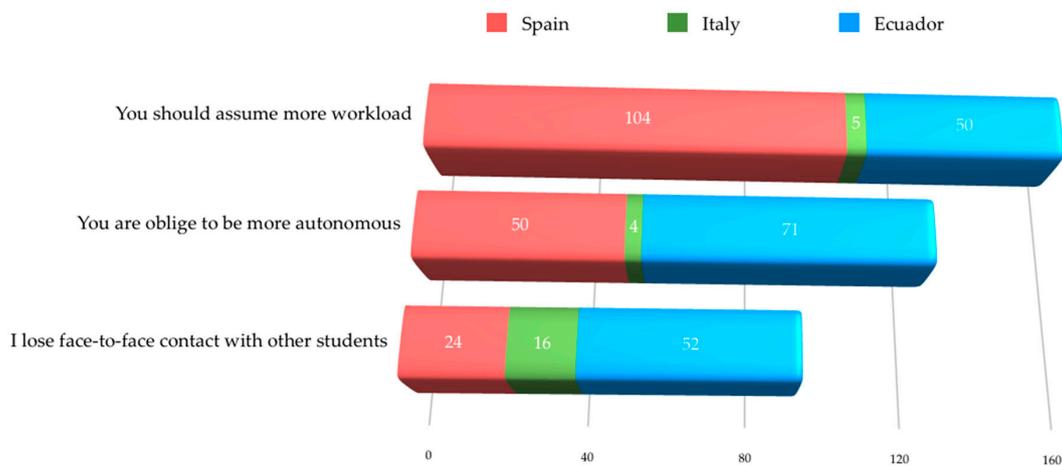

Figure 1. Student general perception about the learning situation during the lockdown among countries.

5.2. Dimension 2. Digital Learning and Sources

Regarding the second dimension, it is worth noting that students were asked ten items to check issues related to digital learning and sources during this period in which learning was mediated trough Internet. From D2.1 to D2.3. items (see Table 3), they were asked about what kind of sources did teachers use during the lockdown, and from D2.4. to D2.6. (see Table 3), what sources did they prefer for their lessons. As seen in Table 2, some items present differences statistically significant ($p < 0.005$) among countries, which means we could reject null hypothesis, it is worth noting that in the item D2.5., videos and audiovisuals as the preferred sources for learning from all students in all countries studied who seem to prefer videos and audiovisual sources for learning (>0.95%).

Table 3. Differences among countries for D2 and basic statistics (N = 376).

| | Spain | | Italy | | Ecuador | | | p | |
	f	%	f	%	f	%	S-I	I-E	S-E
D2.1. Papers and texts	145	91.19	59	47.2	67	72.82	0.000 *	0.000 *	0.000 *
D2.2. Videos and audiovisuals	54	33.96	118	94.4	78	84.78	0.000 *	0.018	0.000 *
D2.3. Podcast	19	11.94	26	20.8	28	30.43	0.043	0.105	0.001 *
D2.4. Papers and texts	65	40.88	64	51.2	58	63.04	0.083	0.082	0.001 *
D2.5. Videos and audiovisuals	152	95.59	121	96.8	89	96.73	0.602	0.980	0.750
D2.6. Podcast	72	45.28	48	38.4	55	59.78	0.244	0.002 *	0.036

$p < 0.005$. * differences statistically significant, null hypothesis is rejected in these cases.

These results give answer to [RQ2] about the kind of sources teachers have used during the lockdown. The situation in Spain shows that for 91.19 percent of students, teachers have used texts and that 95.59 percent of them will prefer video sources and audiovisual materials. Spanish students show significant differences from Italian (S-I in Table 3) (χ^2 (1) = 66.94, $p < 0.005$), Cramer's V = 0.486 results are statistically significant between both countries and are also moderately different (0.2 < ES ≤ 0.6). Spanish students from Ecuadorian (S-E in Table 3) (χ^2 (1) = 14.98, $p < 0.005$), Cramer's V = 0.244 show lower differences, which indicates to us that in both countries, papers and texts have been the most used sources. In Italy, the situation seems to be more consistent than in Spain, where 94.4 percent of students declare that teachers have used video sources and 96.8 percent confirm that they prefer this kind of materials for learning. Italian students show different perceptions from Spanish students in

item D2.1 (as explained above), and from Ecuadorian students as well (I-E in Table 3) (χ^2 (1) = 14.29, p < 0.005), Cramer's *V* = 0.257. A similar situation occurs in Ecuador with 84.78 percent declaring teachers used videos and audiovisuals and 96.73 consider these as the best materials for lessons. As an overview of these results, it is worth noting that 52.2 percent of all students in the sample declared that materials used for lessons during lockdown were not appropriate. From these responses, 62.3 percent of them argue that sources were not suitable for distance education, and 15.2 percent said that sources were boring for distance education.

Responding to research question [RQ4] about if teachers used new learning methodologies to guarantee quality in teaching, the 77.35, 94.4, and 55.43 percent from Spain, Italy, and Ecuador, respectively declare that their teachers did not used any of these methodologies.

It should also be noted, as seen in Figure 2, that teachers using new learning methodologies in this situation did not obtain all positive responses from students, 6.3 percent declare they were unusable and 15.3 said they were not well designed. We find only 18 percent of students from those who respond yes (22.34 percent from N = 372), finding this innovation "engaging" and 56.8 percent "engaging and useful".
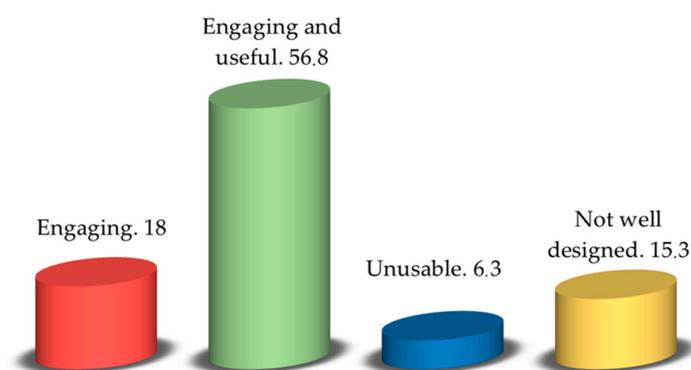

Figure 2. Student in percentage rating the use of active methodologies during the lockdown.

5.3. Dimension 3. Teaching and Teachers Guidance and Skills

The third dimension studied aspects related to teaching and teacher's guidance and their skills, in this regard, results show that students felt a positive perception about classes in this situation, 61.7 percent of the total sample declare they were positive and 38.3 felt they were negative. If we focus on each country, results are similar. As shown in Figure 3, in Spanish students, 72.32 percent perceive classes during this situation as positive, followed by Ecuadorian students at 63.04 percent, and Italian 47.2 at percent.
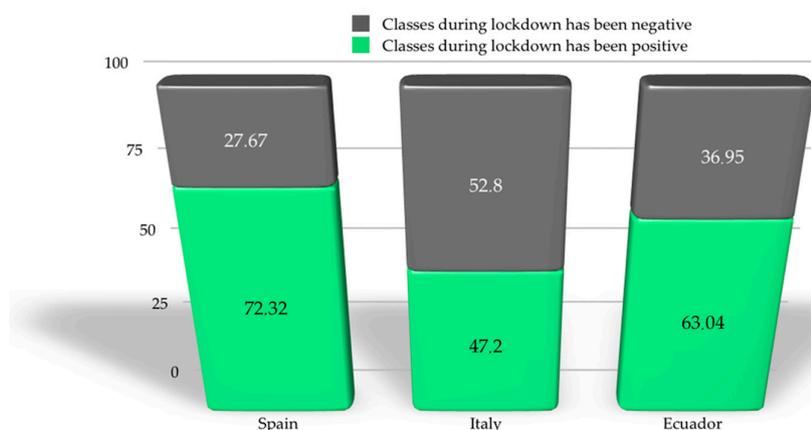

Figure 3. Student's perception about classes during the lockdown.

On the other hand, results of the third dimension give us a response to [RQ5]: Did students perceive negative aspects in the teaching lessons during lockdown? When asked about positive aspects, only 64.36 percent of students answered and only 43.08 percent responded about negative aspects. Keeping in mind these results, as could be seen in Table 4, Italian (46.26%) and Ecuadorian (37.09%) students felt time was better organized and almost half of Spanish students (48.42%) and Ecuadorian ones (42.39%) perceived lessons as similar to face-to-face classes. About negative aspects, it should be noted that there are barely no significant differences ($p > 0.005$), confirmed with the percentages: 3.26, 5.67, and 5.11 for Spain, Italy, and Ecuador, respectively, in the first negative aspect studied; and 40.07, 40.29, and 46.51 in the second unfavorable aspect analyzed. In this case, null hypothesis was not rejected, no differences were found in the perception of students in all countries ($p > 0.005$).

Table 4. Positive and negative aspects perceived by students among countries about teaching during lockdown.

Items		Spain		Italy		Ecuador		n	S-I	p I-E	S-E
		f	%	f	%	f	%				
D3.1. Positive issues	Time is better organized	36	31.85	31	46.26	23	37.09	90	0.053	0.291	0.507
	Similar to face-to-face classes	77	48.42	36	28.8	39	42.39	152			
D3.2. Negative issues	Force me to be aware any time	17	3.26	38	5.67	22	5.11	77	0.013	0.808	0.020
	Do not adapt to online learning	25	48.07	27	40.29	20	46.51	72			

Positive aspects N = 242; Negative aspects N = 162.

To conclude this dimension, students were asked about the fluency and skills of their teachers managing digital tools in this situation. As can be seen in Figure 4, differences among countries are clear, while only a percentage of 24.53 of students in Spain perceive their teachers have appropriate skills, in Italy and Ecuador, the percentage is triplicated with 74.4 and 76.08, respectively. These results are confirmed by chi-square test and Cramer's *V*, demonstrating which countries differ from each other: Italy–Spain (χ^2 (2) = 94.5, $p < 0.005$) and Cramer's *V* = 0.496 and Spanish and Ecuadorian students (χ^2 (1) = 63.05, $p < 0.005$) and Cramer's *V* = 0.501.
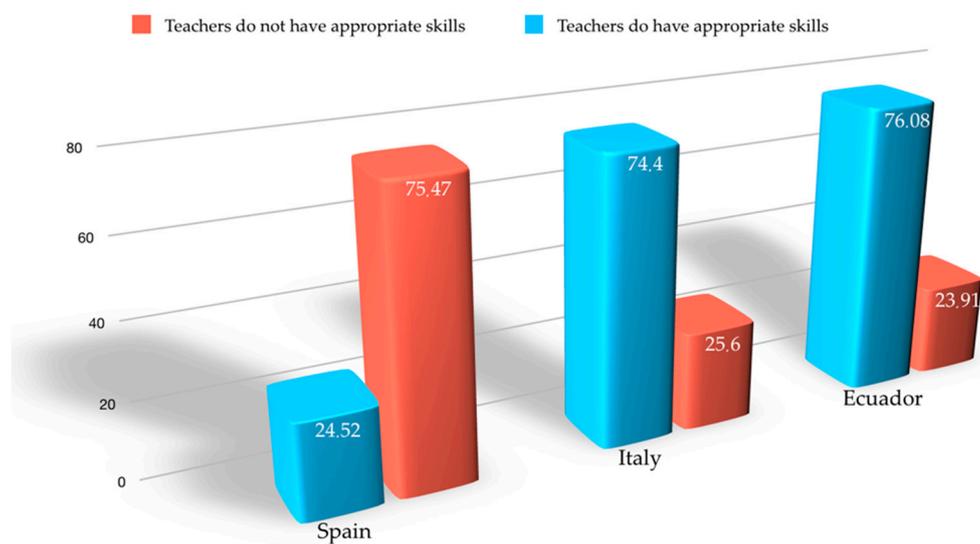

Figure 4. Students' perception about classes during the lockdown.

5.4. Dimension 4. Supporting–Empowering Students

Empowering students and supporting them is the fourth dimension defined, it is essential for an appropriate digital literacy. This dimension ensures the accessibility to learning sources, and the use of technologies to foster learners' active and creative engagement. In a global situation of lockdown, to guarantee this dimension implies offering the opportunity for students to follow personalized learning

pathways. The first data analyzed in this regard do not indicate students have felt confident about the situation. From the whole sample, results show that the 86.2 percent of students get the impression of their learning process being damaged because of the situation and the way it has been solved. Data from countries reveal similar results, being Spain the country in which students felt more damaged: Spain, 93.08%; Italy, 79.2%; and Ecuador, 83.7%.

Data collected in Table 5 give response to [RQ6]: Did students feel their education was damaged because of this situation? From the seven items studied, two main variables were analyzed: D.4.1. This situation has damaged your teaching (D4.1.1. to D4.1.4.) and D.4.2 Negative aspects in learning (D4.2.1 to D4.2.3). Differences among countries could be observed. In the first item, it is worth noting that 35.8% of Spanish students declared that the quality of teaching was the worst, and similar data for Ecuadorian students was found that in a percentage of 85.8 said that the learning process was at a lower level teaching. It also should be noted that half of Italian and Ecuadorian respondents (51.5 and 52.1, respectively) felt that learning was less stimulating, and all of them agreed that this situation lead to an increase in homework in their daily learning process.

Table 5. Positive and negative aspects perceived by students among countries about teaching during the lockdown.

		Spain		Italy		Ecuador		n	S-I	*p* I-E	S-E
		f	%	f	%	f	%				
	D4.1. 1 The quality of teaching is the worst	57	35.8	10	10.1	4	4.34	71			
D4.1	D4.1.2 More homework is demanded	46	28.9	30	30.3	4	4.34	80	0.000	0.000	0.000
	D4.1.3 Learning process has lower level	35	5.03	8	36.3	36	85.8	79			
	D4.1.4 Less stimulating	21	13.2	51	51.5	48	52.1	120			
	D4.2.1 Boring	25	15.7	1	0.81	40	43.4	66			
D4.2	D4.2.2 More demanding	23	14.4	6	4.87	19	20.6	48	0.000	0.000	0.000
	D4.2.3 Too much homework	88	55.3	79	64.2	22	23.9	190			

f = frequency.

In order to reject or not the null hypothesis (H_0) in variable *D.4.1. This situation has damaged your teaching* (D4.1.1. to D4.1.4), after chi-square significant differences for values $p < 0.005$, Cramer's *V* values were observed. For Spain–Italy (S-I in Table 5) ($\chi^2 (3) = 54.80$, $p < 0.005$) we reject null hypothesis, value for Cramer's $V = 0.461$ indicates that results are statistically significant and are moderately associated ($0.2 < ES \leq 0.6$). Spanish students felt more damaged than Italian students. Regarding Italy–Ecuador (I-E in Table 5), significant differences were also observed, $\chi^2 (3) = 40.16$, $p < 0.005$, value for Cramer's $V = 0.459$, showing that results are statistically significant and are also moderately associated ($0.2 < ES \leq 0.6$). Comparing Spain and Ecuador, significant differences are also appreciated $\chi^2 (3) = 79.70$, $p < 0.005$, value for Cramer's $V = 0.564$.

Regarding the variable *D.4.2 Negative aspects in learning* (D4.2.1 to D4.2.3), null hypothesis (H_0) is also rejected. After chi-square showing significant differences, Cramer's *V* explains the effect size. For Spain–Italy (S-I in Table 5) ($\chi^2 (4) = 43.27$, $p < 0.005$), Cramer's $V = 0.392$ indicates that results are statistically significant and are moderately associated ($0.2 < ES \leq 0.6$). In relation to Italy–Ecuador (I-E in Table 5) ($\chi^2 (4) = 90.05$, $p < 0.005$) value for Cramer's $V = 0.647$ show strong association ($ES > 0.6$), Italian and Ecuadorian students felt really different about this variable. Results in the case of Spanish and Ecuadorian students (S-E in Table 5) $\chi^2 (4) = 32.77$, $p < 0.005$, value for Cramer's $V = 0.361$ indicate moderate differences.

Keeping in mind students had not a very high feeling in the empowering dimension studied, the following data give more context about the situation, responding to [RQ7] about the students' perception about their own digital competence level to face the situation. It seems clear observing Figure 5 that all students participating (n = 376) were confident about their own digital competences.
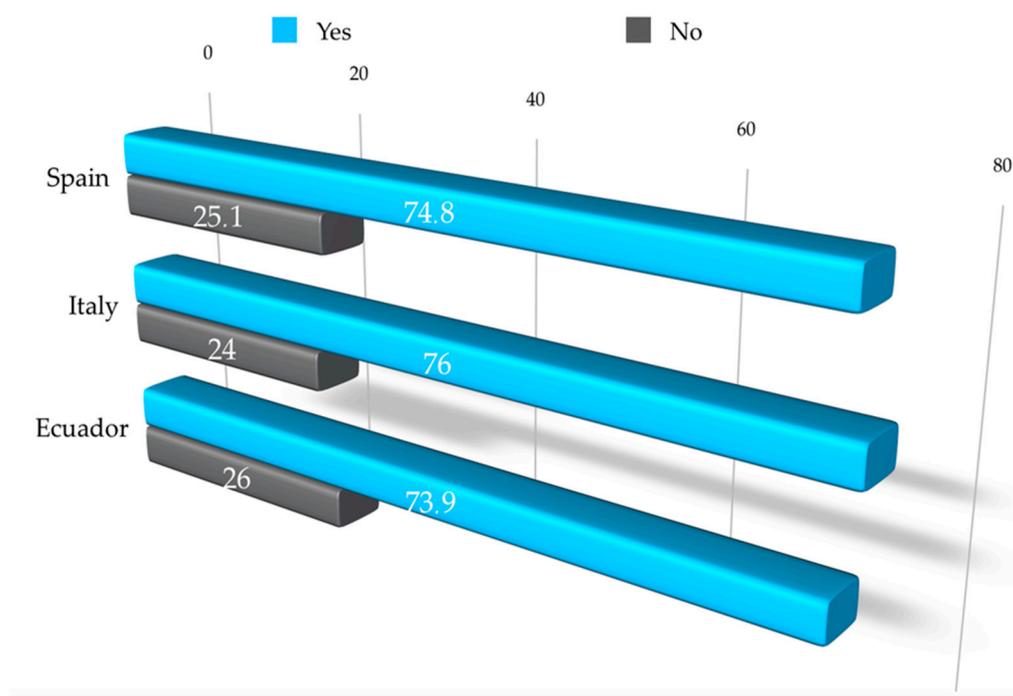
Figure 5. Students' confidence about their own digital competence and skills.

As can be observed in Figure 5, three quarters of all countries felt confident (74.8 percent in Spain; 76 in Italy, and 73.9 in Ecuador). These data are also supported by results in the last questions about fake news. To use technologies within a pedagogical purpose is essential for them to have the transversal skills needed for deep and critical thinking. In this regard, students in all countries declared receiving fake news during the lockdown but not almost sharing them as seen in Table 6.

Table 6. Students reception and sharing of fake news during lockdown.

| | Spain | | Italy | | Ecuador | | n | *p* | | |
	f	%	f	%	f	%		S-I	I-E	S-E
D4.9. Have you received fake news during lockdown?	145	91.1	106	84.8	89	96.7	376	0.135	0.006	0.119
D4.10. Have you shared fake news during lockdown?	20	16.3	10	8	12	13.04	376	0.047	0.259	0.585

f = frequency; $p < 0.005$.

It should be noted the high percentage of students in all countries studied received fake news: Spain 91.1, Italy 84.8, and Ecuador 96.7. There is no significant difference among countries ($p > 0.005$) as observed in Table 6, students mostly respond "Yes" to question D4.10, *Have you received fake news during lockdown?* (M = 1.1; SD = 1) and "no" in question D4.11, *Have you shared fake news during lockdown?* (M = 1; SD = 2).

6. Conclusions and Discussion

Since Glister defined digital literacy in 1997, the concept has been generally accepted and its development is inherently merged to educational development [34–36]. In this regard, since the beginning of this century, changes and challenges in the educational environment such as new competencies, new digital media, open digital sources, digital communication, and critical thinking have been related evolving all together in the multidimensional concept of digital literacy [7,37]. Already two decades since not only the international community strives to develop this digital literacy through education [38,39],

but also all countries and governments around the world [30–32], education should ensure digital literacy whatever modality it acquires.

The aim of this research was to present a comparative-descriptive study analyzing how high education in three different countries has faced the global lockdown situation in terms of ensuring the development of digital literacy. Having in mind the unusual situation caused by COVID-19 seems to be a disruption for education [39] that will obligate countries and governments to rethink educational systems, it really makes sense to analyze what has happed during the lockdown situation in order to face future decisions with empirical information [40]. In this regard, it could be said that one of the limitations of this study is that it only analyzed three countries, future pathways could amplify the research area in order to study the impact of this situation in a wider perspective.

In line with previous and recent research [29,41,42], this study presents an overview of the development of digital literacy in three different contexts: Spain, Italy, and Ecuador. The novelty in this case is that research is framed in the global lockdown caused by COVID-19, allowing us to make interesting conclusions for the near future in which the pandemic situation still affects education and global health. Dimensions defined and analyzed support findings and results in line with main frameworks defining digital literacy [30,31,39]. In this regard, we could highlight the following conclusions from results obtained:

In first place, and regarding dimension one studied, *Teacher's professional engagement and collaboration*, related to the capability to integrate organizational communication, professional collaboration, and effective practice and development, results make us conclude that significant differences exist among the three countries studied. For Spanish and Italian students, teachers have not been well coordinated in this situation, they felt they were not properly informed and declare receiving contradictory information. Nonetheless, all samples, Spanish, Italian, and Ecuadorian students, felt they were not supported enough with statistically significant differences between Spain and Italy, and Spain and Ecuador. Spanish students were the most disappointed in this regard. This evidence should be interpreted taking into account, that in March 2020, the Italian government [43] announced it would equip schools with digital platforms and tools for distance learning, lend digital devices to less well-off students, and train school staff in methodologies and techniques for distance learning. Significant differences are shown as well among countries in the case of receiving contradictory information, Spanish and Italian students declared 24 points and 32 points above Ecuadorian students.

About dimension two, *Digital learning and sources*, analyzed, it can be concluded that digital sources used during the lockdown by teachers, mainly texts and papers, were not the ones the students would prefer as digital sources for learning, which were videos and audiovisual materials. Differences among countries are interesting in this point, showing that Spain was the county in which teachers used papers and texts the most and videos and audiovisuals less. This may be one of the reasons for the high level of displeasure among students from all countries on the way teachers and universities have addressed the situation. These results are in line with the Organization for Economic Co-operation and Development Report [39] (p. 10) highlighting several universities have "struggled and lacked the experience and time they needed to conceive new ways to deliver instruction and assignments".

The third dimension analyzed, *Teaching and teacher's guidance and skills,* gives evidence that students perceive positively the issue following their classes in a distance learning modality, however they perceive too many negative aspects such as online lessons being too similar to face-to-face classes, not adapting properly to the online philosophy. In the case of Spain, these results are reinforced in the fact students felt teachers did not have appropriate skills to manage distance online teaching. Summarizing student's perceptions, the situation has given the worst quality of education, less stimulating and boring lessons, and more homework to do. It is worth noting that no differences were found among countries in this regard, so in future actions, this dimension should be reinforced and enhanced. Teachers' digital skills still continue being a key point in digital literacy development as previous research indicated [21,23].

All international frameworks and mostly nationals highlight dimension four as fundamental for a proper digital literacy enhancement, *Supporting-empowering students*. Existing literature also emphasizes

this area as essential [28,29]. This dimension gives them the engagement that ensures the accessibility to learning sources, and the use of technologies to foster their active and creative engagement [44,45]. Results in this dimension have no significant differences among countries studied: Spanish students felt the most that the quality of teaching was the worst, and Ecuadorian ones think the most learning process has lower level during the lockdown. About too much work being demanded, Spanish and Italian students were the most displeased groups. Students felt confident about their digital skills and competences to face online distance learning. They all show a mature behavior receiving and evaluating fake news; they mostly declared getting them but not sharing it at all.

The work presented is found in line with the last report by the OECD, *The Future of Education and Skills, The future we want* [38] that constitutes part of the OECD Learning Framework 2030, but focusing on new concerns related to the development of proper digital literacy during and after COVID-19. These conclusions give interesting insights from students to face future challenges that the crisis has brought to light: firstly, universities would need to rethink and reinvent learning environments, not only based on a digital platform, striving to give learning possibilities through digitalization that expands and complement students learning; secondly, digital skills and competences should be reinforced in teachers as a key point in new learning scenarios, and it may be teachers are not ready enough for digital learning opportunities, so efforts in technology investment are not enough to guarantee learning for the near future.

Appendix A

The appendix A provides important information in order to clarify dimensions established, items studied in each dimension and finally the coding scheme for each item. These data will help in the understanding of data analysis and results.

Table A1. Dimensions, items in each dimension and coding scheme used in the questionnaire.

Dimension	Items	Coding scheme	
		Type of Codification	**Values**
D1. Teacher's professional engagement and collaboration	D1.1 Have teachers been well coordinated among them during the lockdown?	Dichotomous	Yes = 1 No = 2
	D1.2. Have you felt you were not supported enough?		
	D1.3. Have you felt you were properly informed about your lessons and proceedings?		
	D1.4. Have you received contradictory information anytime?		
	D1.5. Worst aspect about online teaching during lockdown	Numerical coding, no scale	
D2. Digital learning and sources	D2.1. Papers and texts	Dichotomous	Yes = 1 No = 2
	D2.2. Videos and audiovisuals		
	D2.3. Podcast		
	D2.4. Papers and texts		
	D2.5. Videos and audiovisuals		
	D2.6. Podcast		
	D2.7. Were the materials used by teachers adequate?		
	D2.8. Were they appropriate for distance learning?		
	D2.9. Did teachers used new learning methodologies to guarantee quality in teaching?		
	D2.10. Can you value these methodologies if they have been used	Numerical coding, no scale	

Table A1. *Cont.*

Dimension	Items	Coding scheme	
		Type of Codification	**Values**
D3. Teaching and teachers guidance and skills	D3.1. Students perceptions on online lessons	Dichotomous	Positive = 1 Negative = 2 Yes = 1 No = 2
	D3.2 Did you feel time was better organized?		
	D3.3 Did you feel classes were similar to face-to-face classes?		
	D3.4 Did you feel they force me to be aware of a moment/hour of the day?		
	D3.5 Did you feel they do not adapt to the philosophy of online learning?		
	D3.6. Did you feel teachers have appropriate skills?		
D4. Supporting-empowering students	D4.1. Do you think the quality of teaching was worst?	Dichotomous	Yes = 1 No = 2
	D4.2. Do you think more homework was demanded?		
	D4.3. Do you think learning process had lower level?		
	D4.4. Do you think learning process was less stimulating?		
	D4.5. Do you think learning process was boring?		
	D4.6. Do you think learning process was more demanding?		
	D4.7. Do you think learning process had too much homework?		
	D4.8. Did you feel you have the proper digital skills?		
	D4.9. Have you received fake news during lockdown?		
	D4.10. Have you shared fake news during lockdown?		

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