

Connectivity Characteristics and Level of Acceptance Linked to Online Learning by Higher Education Students During the Confinement Generated by the Covid-19 Pandemic

Holman Montiel Ariza¹, Fredy H. Martínez Sarmiento² and Harvey Gómez Castillo³

Associates Professors, Facultad Tecnológica, Universidad Distrital Francisco José de Caldas, Bogotá D.C, Colombia.

¹ORCID: 0000-0002-6077-3510, ²ORCID: 0000-0002-7258-3909

³ORCID: 0000-0003-4474-3642

Abstract

Online education was the alternative used worldwide to provide continuity with training processes in higher education institutions during the confinement generated by the Covid-19 pandemic. The objective of this work is to analyze and identify the characteristics of connectivity and the level of acceptance linked to online learning by students of technological programs at the Universidad Distrital Francisco José de Caldas. For this purpose, 287 students from 3 different academic programs were surveyed, where it was possible to obtain information on Internet connectivity, positive and negative impressions associated with the digital tools they were using in their classes and finally the perception of the accompaniment of their teachers in the training processes.

Keywords: Online Learning, Digital Divide, Covid-19, Confinement, Technology Education.

1. INTRODUCTION

Thanks to new technologies and digital tools, both at a hardware level (smartphones, tablets, laptops, etc.) and at a software level (learning platforms, course management systems - CMS, repositories, massive open online courses - MOOCs, simulators, etc.) and connectivity that allows digital ubiquity, formal education institutions have begun to integrate concepts such as smart learning environments, smart e-learning or smart classroom into their training strategies (Ospina, & Galvis, 2017). These strategies, although in continuous evolution, have made it possible to shape what has been called the Smart University (SmU) (Tikhomirov, Dneprovskaya, & Yankovskaya, 2015). These ideas have become even more important today due to the restrictions on mobility and social interaction imposed worldwide by the spread of the COVID-19 virus (Connor et al., 2020; Huang, Liu, Tlili, Yang, & Wang, 2020).

These new social conditions have forced universities and institutes of higher education in a very short time to strengthen their distance training strategies, pushing teachers and students into new educational normality that abruptly breaks with the pre-confinement dynamic. In many cases, these online learning environments were only used by teachers as non-essential support tools, but now they have become the basic platforms of the training process (Mesiono, 2020; Winarso, Yuliana, Muniroh, Halin, & Tyas, 2020).

Remote learning environments have special characteristics that allow the creation of unique conditions and opportunities in the academic development of students and teachers, in aspects such as personalized learning, new learning, and teaching strategies, greater focus and motivation of students, more targeted interaction between students and teachers, design and development of interactive learning content on the Internet, development of multimedia material (mainly videos), and evaluation and immediate feedback, among others. Besides, they allow access to specific material in many ways, which is particularly important with students with low economic resources and/or technological difficulties (Mulenga & Marbán, 2020). Other positive impacts not related to the education process involve the safety of the academic community (in particular concerning COVID-19), environmental protection (related to digital management and reduced mobility), and simplification of some administrative processes (Favale, Soro, Trevisan, Drago, & Mellia, 2020).

A comprehensive training process must include elements such as critical thinking, awareness, logical reasoning, self-learning, adaptation, communication, and integrated work. Some of these elements are supported in remote environments, even better managed than in a classroom setting. However, the abrupt change from a face-to-face to a distance mode significantly affects students and teachers at a social and emotional level (Abuhassna, Zakaria, Yahya, Kosnin, & Al-Rahmi, 2020). In this context, teachers must promote aspects such as collaborative work, motivation to the learning process, identification and support of students with specific difficulties, and most importantly, to provide feedback to the student, which is essential to build confidence. Also, the new distance model assumes that both have technological capacity related to the availability of devices/connection and digital management skills, which from experience has been observed does not coincide with the reality (Garcia, Corell, Abella, & Grande, 2020).

One of the most important strengths of learning environments supported by online technology is their ability to empower students. Under this model the teacher ceases to be a totalitarian authority, giving the student the capacity to apply his learning strategy, at his own pace, and according to his time and resource conditions (Starr-Glass, 2020). The role of the teacher becomes that of a designer of the training strategies based on the objectives of the course, of a counselor in the process and application of the training strategies, of feedback and support

in the process of the students in coherence with their needs.

While it is true that online training strategies have a strong democratizing character of education by allowing a greater level of access and opportunity of study to a larger number of students, it is also true that this type of training presents many more challenges to the student and teacher (Aikina & Bolsunovskaya, 2020; Israfilov et al., 2020). The design of the material and other elements of the course cannot cover the wide range of learning schemes and processes present in the students, which is why it is necessary to provide a greater and different level of support from teachers (He, Zheng, Di, & Dong, 2019). It has been observed that students do not use critical self-regulated learning (SRL), an element that has been identified as fundamental in learning processes based on online environments (Wong et al., 2019). Research has pointed out that these difficulties by the student possibly explain the high rates of student dropout reported by the online models (Ejubović & Puška, 2019; Muljana & Luo, 2019).

Online learning environments tend to significantly reduce social interaction between students. However, this is a crucial element in the training process that should be encouraged (Hussin, Harun, & Shukor, 2019a, 2019b). Interaction between

students promotes critical thinking, involving participants even more in the learning activity, which in turn increases the levels of personal commitment to the course, peers, and teacher (Im & Kang, 2019). It is widely accepted that critical thinking in vocational training is fundamental to increasing the social impact of future professional (Azhari et al., 2020). This can be encouraged by proposing and supporting activities that involve higher order thinking in the solution of problems with a high social impact (Zalli, Nordin, & Hashim, 2020).

2. MATERIALS AND METHODS

The development of this research was carried out with a survey method whose primary objective was to identify the connectivity characteristics and level of acceptance associated with online education during the quarantine generated by the Covid-19 pandemic. A sample of 287 students belonging to 3 study programs (Technology in electronics, Technology in medium and low voltage electrical systems and Control Engineering) from the Universidad Distrital Francisco José de Caldas, Bogotá-Colombia was counted. See Table 1.

Table 1. Biographical data of students surveyed online

Classification of respondents	Category	Percentage	Number of respondents
Gender	Female	84,0%	241
	Male	16,0%	46
Socioeconomic	1	16,0%	46
	2	62,0%	178
	3	21,4%	61
	4	0,3%	1
	5	0,3%	1
Semester	1	34,5%	99
	2	13,2%	38
	3	11,5%	33
	4	10,1%	29
	5	10,5%	30
	6	11,1%	32
	7	3,5%	10
	8	1,4%	4
	9	3,1%	9
	10	1,1%	3
Ages	between 16 - 18 years old	35,5%	102
	between 19 - 21 years old	46,0%	132
	between 22 -25 years old	15,0%	43
	> 25 years old	3,5%	10

The survey consisted of 23 closed-ended questions that described: the characteristics of the equipment most used by the students to approach the online classes, the quality associated with the Internet connectivity in their homes, the positive and negative impressions associated with the digital tools they were using in their classes and finally the perception about the accompaniment of their teachers in the training processes.

3. RESULTS AND DISCUSSION

The first part of the instrument created for the survey focuses on collecting all the information associated with the devices used in the Teaching-Learning process; this part focused on analyzing the type of device used and the characteristics of the Internet connectivity of the respondents' households.

Fig. 1 shows that conventional computer equipment such as desktops and laptops are still the most widely used devices by students, overall, 63.6% of respondents use these devices. However, the next most used item is the smartphone with 31.9%, an indicator that shows us that this element becomes fundamental in the daily life of university students.

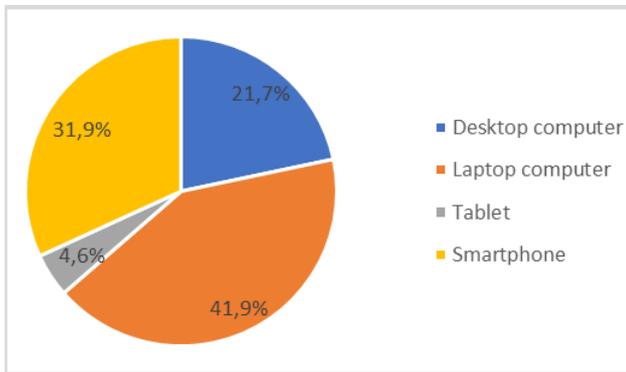


Fig. 1. Respondents' response to the question What type of device do you often use for classes?

Fig. 2 shows the analysis of the characteristics associated with the performance aspects of the devices used by the students; it should be taken into account that, for the most part, these are devices that the student already had in his or her possession and are being used to address the situation presented by the mandatory quarantine decreed by government entities and following the guidelines of the Colombian Ministry of Education.

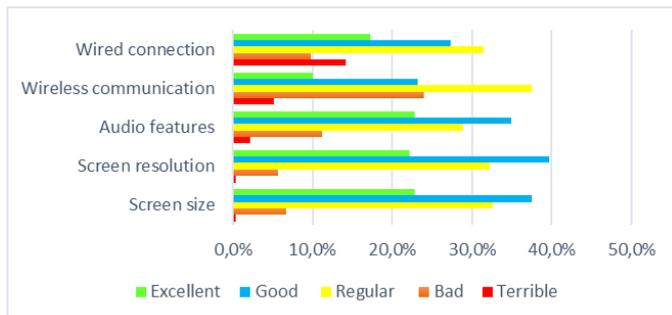


Fig. 2. Respondents' response on rating aspects of the device used during online learning.

Fig. 3 shows that many students do not have a broadband connection for Internet service, since according to the Communications Regulation Commission of the Republic of Colombia, broadband services must have a minimum speed of 25 Mbps downstream and 5 Mbps upstream.

In addition to the factor mentioned above, the quality of service provided by Internet Service Providers is not good, there is a 63.9% disagreement associated with the frequency of lost connectivity with this service, see Fig. 4 and 5.

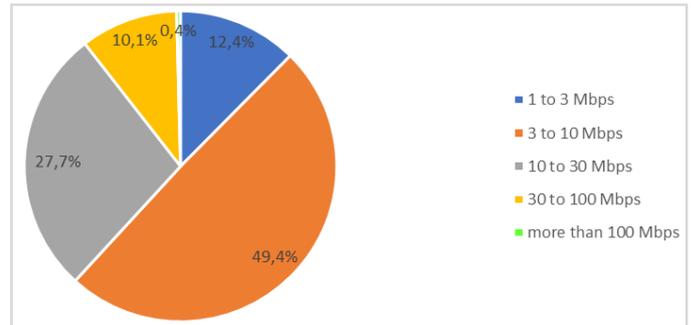


Fig. 3. Respondents' response to the question What is the bandwidth of their Internet connection?

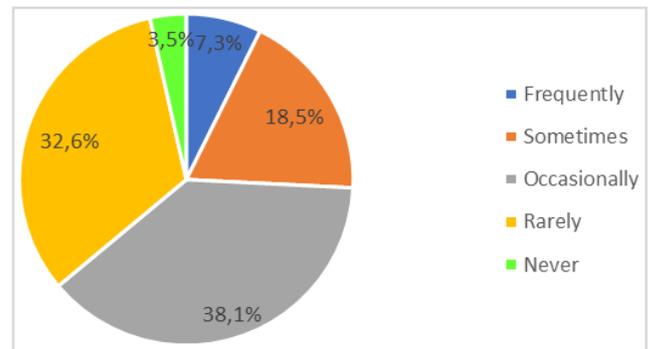


Fig. 4. Respondents' response to the question How often is connectivity lost?

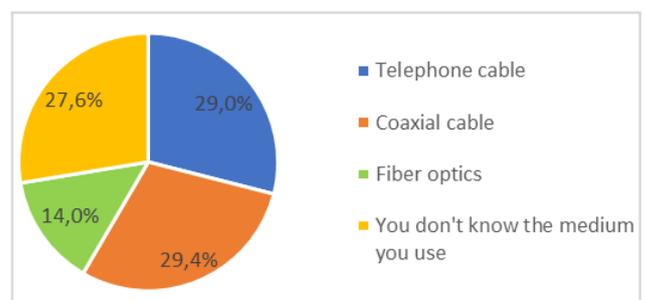


Fig. 5. Respondents' response to the question What type of connection media do you use to connect to the Internet? (Connection provided by the Internet Service Provider).

While it is true that many students are adapting to the process of remote learning, a key factor in assessing and analyzing the characteristics of connectivity would be the number of people

in the household who make use of the Internet connection. Table 2 shows that due to issues of compulsory quarantine and teleworking in some cases, the bandwidth would be seriously compromised according to the number of users with whom the connection is shared simultaneously.

Table 2. Number of people who are simultaneously connected in your home to study, work or develop another activity

Number of people	Percentage
0	1,1%
1	2,8%
2	12,8%
3	23,9%
4	25,6%
5	15,0%
6	8,9%
7	3,3%
8	4,4%
9	1,1%
10	1,1%
	100,0%

The second part of the survey focused on collecting all the information related to the aspects of favorability and acceptance towards the e-learning process. The digital tools they use in their training process and the students' perception of the teachers' accompaniment of this learning methodology were analyzed.

According to the diagrams in Fig. 6, 79.1% of the students present dissatisfaction with the tools of a single application or use, such as the case of Zoom; there is a high acceptance for the case of integrated services within the same environment, as is the case of the Google educational platform.

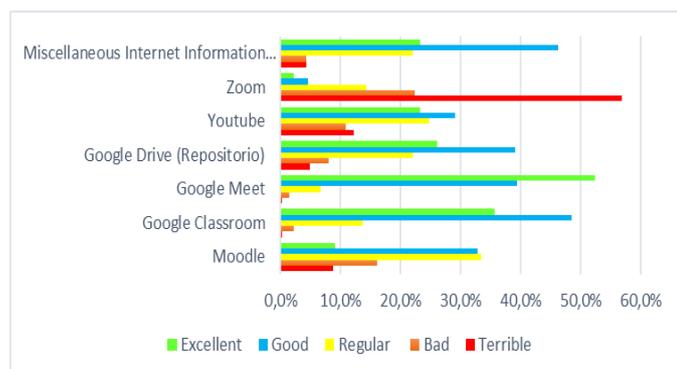


Fig. 6. Respondents' response on rating the digital tools they use in their Teaching-Learning process

The process of communication and interaction in the online learning environment is a fundamental factor to help students achieve better results, Fig. 7 shows with respect to communication with the teacher 49.1% favorability (35.5% Good, 13.6 % Excellent) and in the case of response times associated with the delivery of results of the evaluation processes of the subjects, 63.1% of favorability is presented (44.3% Good, 18.8% Excellent).

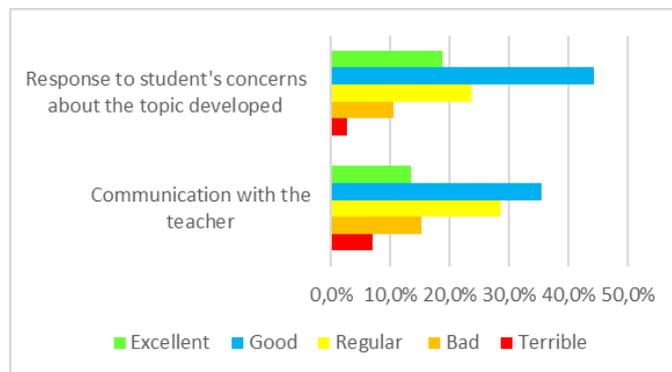


Fig. 7. Response of respondents on communication and accompaniment of teachers.

In general terms, although many higher education institutions in Colombia had virtual education programs, students within the framework of this emergency were not ready to assume the change of methodologies in their training processes. This is reflected in the fact that only 3% of the students prefer virtual education over face-to-face education, see Fig. 8.

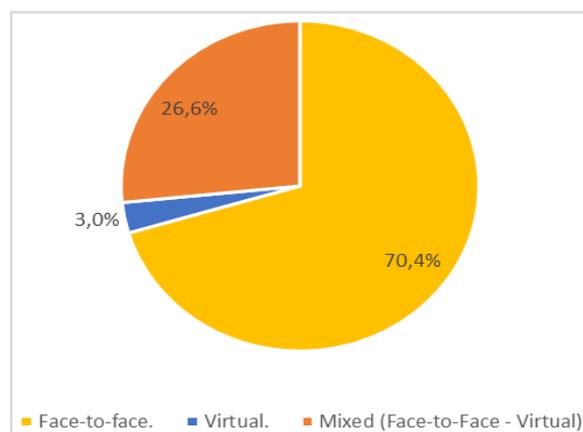


Fig. 8. Respondents' response to which mode of education they prefer.

4. CONCLUSIONS

The instrument applied made it possible to identify and contextualize the way in which higher education students from the Technology Faculty of the Universidad Distrital Francisco José de Caldas assumed the obligation of online classes during the quarantine established by the government authorities. It was possible to identify that a very high technological gap still exists with respect to access to an optimal broadband Internet

connection, with only 10.5% of those surveyed being able to access it. In addition to this, it should be noted that on average such internet access is shared with 3 or 5 people simultaneously, see Table 2, increasing the limitations for most students taking their classes online.

With respect to teachers, the tool identified that students generally perceive a good process of communication and interaction in the online learning environment. With respect to communication, there was only a negative perception of 15.3% Bad and 7% Terrible; compared to the response times of teachers, the negative perception was 10.5% Bad and 2.7% Terrible. These percentages are directly linked to those students who perceived that the process of communication and interaction between teachers was not optimal, either due to failures in the technological infrastructure (equipment and internet access) or due to the lack of knowledge and skills associated with the online applications that were used for the teaching-learning process. This leads to rethinking training processes in digital tools for both teachers and students, in order to improve and increase the performance of these teaching methodologies.

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