Higher Education during the health contingency COVID-19: Use of ICTs as learning tools. Case study: students of the Faculty of Accounting and Administration.

La Educación superior durante la contingencia sanitaria COVID-19: Uso de las TIC como herramientas de aprendizaje. Caso de estudio: alumnos de la Facultad de Contaduría y Administración.

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ABSTRACT
Information and communication technologies in the educational sector have important relevance in the teaching-learning process of students and the knowledge of life skills. The objective of the research was to analyze the use of ICT as learning tools in the face of the COVID-19 contingency in the students of the Faculty of Accounting and Administration of the Autonomous University of Chihuahua in Mexico. he nature of this research was quantitative and the type of research was applied, the scope was descriptive and the field research, the design was non-experimental descriptive transectional, the technique of gathering information was through a questionnaire. The main results showed a positive correlation towards information and communication technologies, which is shown in various aspects studied: learning style, mastery of the use of ICT, social networks, educational program, level of satisfaction with having technological resources appropriate; in all of

them a favorable predisposition is manifested. The advantages that students consider with the use of ICT are the availability of information and collaborative learning. Of the disadvantages that were identified were the failures in the Internet connection, they have access to many distractions during class and consider that they have less learning. One of the most important findings of this research was that students have a very good mastery of ICT to manage the technological tools used during the COVID-19 health contingency.

KEYWORDS: ICT; COVID-19; use; learning; distance education; students.

RESUMEN
Las Tecnologías de la información y la comunicación en el sector educativo tienen una relevancia importante en el proceso de enseñanza aprendizaje de los estudiantes y en el conocimiento de las competencias para la vida. El objetivo de la investigación fue analizar el uso de las TIC como herramientas de aprendizaje ante la contingencia COVID-19 en los alumnos de la Facultad de Contaduría y Administración de la Universidad Autónoma de Chihuahua en México. La naturaleza de esta investigación fue cuantitativa y el tipo de investigación fue de forma aplicada, el alcance fue descriptivo y la investigación de campo, el diseño fue no experimental transeccional descriptivo, la técnica de recolección de información fue mediante un cuestionario. Los resultados revelaron una correlación positiva hacia las tecnologías de información y comunicación, que se evidencia en diferentes aspectos examinados: estilo de aprendizaje, dominio en el uso de las TIC, redes sociales, programa educativo, nivel de satisfacción de contar con los recursos tecnológicos apropiados, entre otras; en todas ellas se manifiesta una predisposición favorable. Las ventajas que los estudiantes consideran con el uso de las TIC son la disponibilidad de información y aprendizaje colaborativo. De las desventajas que se identificaron fueron las fallas en la conexión de Internet, tienen acceso a muchas distracciones durante la clase y consideran que tienen un menor aprendizaje. Uno de los hallazgos más importantes de esta investigación fue que los estudiantes tienen muy buen dominio de las TIC para manejar las herramientas tecnológicas utilizadas durante la contingencia sanitaria del COVID-19.

PALABRAS CLAVE: TIC; COVID-19; uso; aprendizaje; educación a distancia; estudiantes.

CONTENT

Translation by **Paula González** (Universidad Católica Andrés Bello, Venezuela)

1. Introduction

Information and communication technologies (ICT) are a fundamental resource of unprecedented developments in today's world, generating great innovations in humanity, science, and government. Societies are what they are due to the increase in the importance of technology, however, it should not be forgotten that ICT will not solve all problems and that, in the educational field, they are instruments that allow the use of different paths and actions to be tested, where the main challenge is the development of abilities and skills that are apt to be computerized, such as creativity or social intelligence. (Cobo, 2016)

At present we are faced with the assumption of the inclusion of ICT in the educational field: if there is a lack of technical knowledge in the use and application of digital instruments, it will be complex

to incorporate them into the educational field. The deficiency that teachers have in the use of technological tools will make it difficult for them to use them effectively in the educational process with their students. (Fernández-Cruz and Fernández-Díaz, 2016)

In Mexico, in March 2020, the SARS-CoV2 disease epidemic (COVID-19) was published by the General Health Council as a health emergency due to force majeure (General Health Council, 2020).

Given the feasible transmission of the virus and the threatening exposure of the population to it, either through contact with infected people and / or by being exposed to contagious surfaces or objects; It was that the Ministry of Public Education (SEP by its acronym in Spanish), upon receiving the indications and information from the Ministry of Health, agreed to suspend classes in the institutions dependent on the SEP to protect the student community; Such agreement was published in the Official Gazette of the Federation (DOF by its acronym in Spanish) (Ministry of Public Education, 2020); Currently, the suspension continues and will continue until, according to the epidemiological traffic light, it goes from red to green, where the development of all activities, including school activities, will be allowed (Government of Mexico, 2020).

Institutions of Higher Education in their face-to-face modality face the fact of continuing with the development of educational programs in institutions, overcoming barriers such as lack of equipment, lack of training, resistance to adopting new technologies or methods, among others, situation derived from the crises caused by the COVID-19 pandemic, students must continue their learning from their homes through the use of Information and Communication Technologies (ICT). Students and professors are faced with the problem of adapting to these changes and having to learn new ways of transmitting knowledge. This transition stage will have a change in educational institutions because the teaching-learning process will be different from the traditional one with the use of ICTs, which have acquired great relevance in the educational environment with great challenges in unprecedented times, where education is facing a complete transformation.

In response to the Declaration of Health Emergency published in the Official Gazette of the Federation for the contingency of COVID-19, the Autonomous University of Chihuahua (UACH) made the Moodle Institutional Educational Platform available to the entire academic community, to give continuity to the academic activities of all the educational programs of the Technical, Undergraduate, and Postgraduate Levels, as well as the institutional online services such as Webex Videoconferences and the Google Suite to support academic activities.

The suspension caused great uncertainty in educational institutions at all levels. In this time of confinement within the university community, different problems were identified that students and professors had to overcome, such as: poor communication between professors and students, lack of computer equipment, training, and internet connections, besides having to handle new teaching-learning technologies to continue the distance learning period.

To continue with the semester under virtual education, it was necessary to use computer equipment; the one that they had access to at school was no longer available, the students had to look for alternatives to attend classes since some did not have one, or the technological tools they had were obsolete; others made use of their smartphone (with certain limitations). Some students, despite having a computer, share it with other family members, and this limits their use. The lack of internet was another difficulty for them, some did not have the service and were forced to look for different alternatives or to hire it, however, nowadays, not all of them have the economic capacity to invest in this service; coupled with the fact that the internet signal does not reach all their places of residence. Another problem was the lack of knowledge and skills to handle digital tools, basically, the students

use the internet, but a limited number use electronic databases for their research, the tools they use are those of the Office suite, and only a few had had access to platforms such as Moodle, Meet, or Zoom, among others.

Because of the above, the following research questions were raised: 1) what is the use of ICTs as learning tools in the face of the COVID-19 contingency in students of the Faculty of Accounting and Administration (FCA by its acronym in Spanish) of the Autonomous University of Chihuahua?; 2) what is the relationship of the use of ICTs with gender, mastery of ICT, learning style, characteristics of ICTs, and level of satisfaction?; 3) what is the correlation degree of the use of ICTs with educational programs regarding mastery, social networks, semester, tools used, the continuation of virtual classes, and place of connection?; 4) what are the advantages and disadvantages of ICTs as learning tools for students?

The general objective of the research was to analyze the use of ICT as learning tools in the face of the COVID-19 contingency in students of the Faculty of Accounting and Administration (FCA) of the Autonomous University of Chihuahua. The specific objectives were: 1) Identify the relationship of the use of ICT with gender, mastery of ICT, learning style, characteristics of ICTs, and level of satisfaction; 2) distinguish the correlation degree of educational programs with mastery of ICTs, social networks, semester, tools used, the continuation of virtual classes, and place of connection, and 3) determine the advantages and disadvantages of ICTs as learning tools for students.

2. Theoretical framework:

ICTs are a set of technologies that allow the acquisition, elaboration, storage, treatment, communication, recording, and presentation of information, in the form of voice, images, and data contained in acoustic, optical, or electromagnetic signals. ICTs include electronics as the base technology that supports the development of telecommunications, computing, and audiovisual, but also incorporates a whole series of innovative elements at the service of education and meaningful learning. (Cacheiro, 2014)

ICT from the educational point of view, as mentioned by Mendoza (2018), is one of the most significant innovations in the field of education, because they allow seizing an effective space in the educational context at the international level. The use of technology in education has been key to the development and creation of educational technologies in daily exercise in the classroom.

In the opinion of Astudillo et. ál. (2018), the primary role of ICT is to reinforce and transform educational practices. For this, it is necessary to appropriate the learning networks and see that all those involved must be considered as similar. Because the essential idea is to contribute, discuss, debate, and open an effective communication process with collaboration and the creation of knowledge. In this way, the learning processes are motivating and significant if a change can be made according to current needs. This work must take place between professors and students so that the proposed objectives are achieved.

Silva, García, Guzmán, and Chaparro (2016) mention that today the combination of Information and Communication Technologies (ICT) is a common resource in educational innovation environments that, increasingly, proposes to increase actions based on interaction and the joint creation of knowledge (Avello-Martínez and Duart, 2016). In this environment, it has been shown that Learning Management Systems (LMS) increase participation and cooperation among the actors of the teaching-learning process (Perkins and Pfaffman, 2006; Vázquez and Burrial, 2017; Yanacón-Atía and Menini, 2018). However, interaction and collaboration have become an important variable

(Smith and Xu, 2016) within the training context created from the European Higher Education Area (EHEA), which has implied the intensive implementation of online teaching-learning platforms such as Moodle (Learning Management System), to promote the creation of Virtual Learning Environments (VLE), collaborative learning, and blended-learning. (Vuopala, Hyvönen, and Järvelä, 2016; Coyago, Puente, and Jiménez, 2017)

In today's society, where education relies on technology, access to knowledge is based on two main elements: a) technological supports and b) communication, which have become the basic tools of knowledge management (Moreno, 2016). On the other hand, through the use of computers, the globalized society is related, so the sharing of information and knowledge is through physical devices and telecommunications, this means that even education uses computer equipment to guide us to virtualization in all areas of society.

As has already been pointed out, the development of ICT has brought about a revolution in the area of communications and is currently offering new forms of teaching. The Internet was, initially, a tool used to communicate between computers and departments, only available to people familiar with the command lines. Thanks to the development of the hyperlink on the Web, it transformed it into a friendly tool that allows a document to include elements that come from other documents, and that in turn leads us to others. (St-pierre and Kustcher, 2001)

The implementation of ICTs has considered that for educational institutions these are no longer an option, and the impulses of the countries and institutions are focused on the generation and implementation of proposals that involve the maximum use of technologies in the teaching processes. (Severin, 2010)

Cacheiro (2018) points out that for the use of ICT in the teaching-learning process to be indisputable, a different way of thinking about the role of teachers is necessary, from being a transmitter to a guide. Therefore, this fosters an evolution in the students, where they take active participation in this transformation.

The problem of the adoption of ICT in educational processes seems to be structural. There is interest on the part of professors, but in higher education institutions there is a lack of strategic planning for the adoption of technological tools, even though the institutions have the appropriate infrastructure; However, there is a lack of training for teachers, which leads to the demand for institutionalized and systematic pedagogical training, the objective of which is to promote new skills among teachers. (Vera et al., 2014)

Virtual education supports better learning because in different areas it is considered that education outside the traditional one is more conducive taking into account the knowledge revolution, this has generated that students develop learning autonomously, besides being considered digital natives for having access to information in the different devices at their fingertips, this leads us to think of a metacognitive strategy in the area of ICT. In the first place, they have transformed the cognitive process and, as it points out, a new type of intelligence has been generated, distributed intelligence that is defined as “intelligence is not a property attributed to the minds of individuals, but rather it is distributed between people, and between people and physical tools and symbolic systems” (Herrero and Brown, 2010), this has led to new paradigms and new ways of teaching and learning, such as connectivism, which tries to demonstrate it through learning networks, social networks, self-learning, and personal learning environments, besides the use of ICTs, students can generate their knowledge autonomously, transcending their construction of the virtual classroom and be evaluated by them and

their peers, simply leaving the teacher as a mediator of what has been learned. (Gallego Torres, 2017)

Secondly, it should be considered that, due to the use of computational environments, according to Karl Stephen (Sierra, Carrascal, and Buelvas, 2014) it can be divided into two types: Container system, which is how virtual learning environments are often called, are pre-established repositories of information focused on the environment, and the resources offered by the different platforms, also of the content system where users provide and share information and content, achieving an appropriation of the course by the students who participate in the process and not only as recipients of knowledge, but, as pro-consumers, that means that they consume and produce the necessary information to achieve the learning objective required by the course, this is achieved with the articulation of the content proposed by the students and with the activities, evaluations, and comments from teachers, using asynchronous tools such as forums, blogs, etc.

3. Methodology

The research work was developed at the Faculty of Accounting and Administration (FCA) of the Autonomous University of Chihuahua (UACH) from April to June 2020. The focus of this research was of an applied quantitative nature. The design was non-experimental as the variables were not manipulated. Transectional because the data were collected in a single time, and descriptive since it was intended to know the current situation and was oriented to measuring the variables.

The information collection instrument was a questionnaire in Google Forms (the questionnaire is annexed), specially designed to evaluate the variable Use of ICT. The questionnaire was made up of a total of 30 closed questions; in which, as a response, a degree of agreement or disagreement was requested, according to the Likert scale.

Table 1 shows, in detail, how the variable Use of ICT was systematized. As can be seen in Table 1, three dimensions were considered; general data, ICT management, and tools. The questionnaire was validated through a pilot test and the reliability of the instrument for each of its dimensions was calculated using Cronbach's coefficient of internal consistency, which reported acceptable results ($\alpha \geq 0.70$).

Table 1. *Systematization of the study variable*

Variable	Dimensions	Indicators	Items
Use of ICT	General data	– Educational program – Current semester – Online continuity – Internet access place – Gender – Age – Marital Status	1 – 2 – 3 – 4 – 5 – 6
	ICT management	– Student´s mastery of ICT – Learning style – Professor´s mastery of ICT – Internet connection – ICT use frequency	7 – 8 – 9 – 10 – 11 – 14 – 15 – 17 – 18 – 19 – 20 – 21 – 22 – 23 – 24 – 25

Tools	– Characteristics – Level of satisfaction – Social networks – Advantages – Disadvantages	12 – 13 – 16 – 26 – 27 28 – 29 -30

The type of sampling was non-probabilistic, all students enrolled in the January-June 2020 face-to-face semester were taken into account. The population of interest that was taken was 4,522 students from all the educational programs offered by the Faculty of Accounting and Administration: Bachelor of Business Administration (BBA), Public Accountant (PA), Bachelor of Financial Administration (BFA), Bachelor of Government Administration (BGA), and Bachelor of Information and Communication Technologies Administration (BICTA); the sample was calculated with a trust level of 95%. The application of this equation resulted in obtaining a total sample of 1,198 students, the population was divided into groups according to the degree in which they were enrolled because they shared similar characteristics, the students were selected voluntarily. The basic information was provided by the academic coordination of the face-to-face modality of the FCA, from where the sample was obtained.

After obtaining the results derived from the questionnaire, the information was processed in Excel and SPSS V.22, proceeding to make analysis tables of the obtained information, frequencies tables, and correlations between the questions that projected more representative discoveries regarding the use of the Information and Communication Technologies after having moved from traditional education to distance education due to the health contingency. Finally, a cross was made between the information obtained quantitatively. This research shows the results of the most relevant questions on the addressed topic.

4. Results

The results are presented according to the proposed methodology, as well as the analysis of the data collected through the questionnaire on the use of Information and Communication Technologies (ICT) in the face of the COVID-19 pandemic at the FCA of the UACH in the different educational programs it offers, as well as general data such as gender, age, and disability. Which are presented divided as follows:

Table 2. *Profile of the samples*

Educational Program	Gender	Age	Disability
P.A.	63.6% Women	40.7% > 17 < 19 years old	0% Hearing
		43.8% between 20 and 22 years old	0.3% Motor
	36.4% Men	9.9% between 23 and 25 years old	10.5% Visual
		5.6% over 25 years old	89.2% None
B.B.A.	67.8% Women	34.9% between 17 and 19 years old	0.8% Hearing
		50.4% between 20 and 22 years old	1.1% Motor
	32.2% Men	12.8% between 23 and 25 years old	8.2% Visual
		1.9% over 25 years old	89.9% None
B.F.A.	56.4% Women	37.5% between 17 and 19 years old	0.7% Hearing
		49.1% between 20 and 22 years old	0.3% Motor
	43.6% Men	12% between 23 and 25 years old	7.2% Visual
		1.4% over 25 years old	91.8% None
B.G.A.	60.2% Women	43.9% between 17 and 19 years old	1.6% Hearing
		38.2% between 20 and 22 years old	0.8% Motor
	39.8% Men	14.6% between 23 and 25 years old	8.9% Visual

		3.3% over 25 years old	88.6% None
B.I.C.T.A.	33.3% Women	33.3% between 17 and 19 years old	2.2% Hearing
		43% between 20 and 22 years old	1.1% Motor
	66.7% Men	18.3% between 23 and 25 years old	11.8% Visual
		5.4% over 25 years old	84.9% None
TOTAL	60.4% Women	37.9% between 17 and 19 years old	0.8% Hearing
		46.5% between 20 and 22 years old	0.7% Motor
	39.6% Men	12.4% between 23 and 25 years old	8.9% Visual
		3.2% over 25 years old	89.6% None

Source: Self-made (2020)

Table 2 allows knowing by educational program the percentage of gender, the age range, as well as the existence of some type of disability in the surveyed students. Where it can be observed that only in the BICTA educational program there is a higher percentage of men than women, in the same way only 3.2% are over 25 years old, and 89.6% do not have any disability. Most of the Faculty´s population are women.

Table 3. *Tools used to query information*

Educational program	Search engines	Databases	Social Networks	Blogs	None
P.A.	303	109	103	46	0
B.B.A.	344	122	129	72	4
B.I.C.T.A.	84	43	52	19	0
B.F.A.	279	98	105	64	0
B.G.A.	117	55	54	20	0

Source: Self-made (2020)

Table 3 shows that 94% of the respondents use search engines and it is the educational programs BBA, PA, and BFA that make the most use of them with 344, 303, and 279 students per career respectively. Regarding the used databases and social networks, they represent between 36 and 37% respectively. Finally, blogs represent only 18% as a tool used to consult information.

Table 4. *Tools they are using in the face of the COVID-19 contingency*

Tools	P.A.	B.B.A	B.I.C.T.A.	B.F.A.	B.G.A.
Moodle Platform	185	239	76	176	93
Google Classroom	137	146	25	130	39
Video conferences through the Meet platform	278	311	74	251	109
Video conferences through the Zoom platform	118	120	49	98	39
Email	101	131	22	84	39
Cloud computing (Google Drive)	64	69	29	53	25
Other	23	9	5	16	1

Source: Self-made (2020)

Table 4 shows the different tools that the surveyed students use for their distance classes due to the COVID-19 contingency, in the PA educational program 76% use one or more of these tools, while BBA has 86% of use in these tools. The programs corresponding to BICTA, BFA, and BGA make use of different tools in 23, 67, and 29% respectively. The most used tools being videoconferences through the Meet platform and the use of the Moodle platform.

Table 5. *Student´s mastery of ICT by Career and Gender*

Educational program	Gender	Bad	Fair	Good	Very Good	Excellent
P.A.	Man	9	9	34	40	26
	Woman	6	18	82	107	37
B.B.A.	Man	4	5	35	48	26
	Woman	7	13	74	77	35
B.I.C.T.A.	Man	9	1	12	14	27
	Woman	0	1	5	11	14
B.F.A.	Man	7	9	37	51	23
	Woman	5	8	55	67	29
B.G.A.	Man	1	2	18	21	7
	Woman	2	4	32	22	14

Source: Self-made (2020)

Table 5 shows the performance of students in terms of their mastery of ICT, leaving the PA educational program that represents 31% of students with 210 out of 368 with a level between good and excellent. For BBA 186 of 324 students belong to the good or excellent level, BICTA with 66 of the 94 students surveyed belong to the same rank, and, finally, BFA and BGA have performances between good and excellent of 170 of their 291 respondents, and 64 of 123 students, respectively. It can also be observed that, in terms of gender, only in the BICTA program is the performance of men higher, while in all the others the performance of women is higher.

Table 6. *Pearson´s correlations between gender, student and professor mastery, learning style, ICT characteristics, and level of satisfaction*

Correlations

		Gender	ICT used by the UACH mastery	Learning Style	Characteristics of ICTs used in distance classes because of COVID	Level of satisfaction with the use of UACH virtual platforms	Professor´s mastery assessment in online classes
Gender	Pearson's correlation	1	-.008	.026	-.018	-.081	-.020
	Significance		.770	.366	. 538	.005	.497
(bilateral)		1198	1198	1198	1198	1198	1196
	N						
ICT used by	Pearson's correlation	-.008	1	-.097	-.023	-.577	-.469
the UACH mastery	Significance	.770		.001	.433	.000	.000
(bilateral)		1198	1198	1198	1198	1198	1196
	N						
Learning style	Pearson's	-.026	-.097	1	-.036	-.064	-.038
correlation		.366	.001		.214	.026	.191
	Significance	1198	1198	1198	1198	1198	1196
(bilateral)							
	N						
Characteristics of	Pearson's	-.018	-.023	-.036	1	-.024	-.034
correlation		.538	.433	.214		.397	.238
ICTs used in distance	Significance	1198	1198	1198	1198	1198	1196
(bilateral)							
classes because of COVID	N						

Level of satisfaction with the use of UACH virtual platforms	Pearson's correlation	-.081	-.577	-.064	-.024	1	-.560
	Significance (bilateral)	.005	.000	.026	.397		.000
	N	1198	1198	1198	1198	1198	1196
Professor mastery assessment in online classes	Pearson's correlation	-.020	-.469	-.038	-.034	-.560	1
	Significance (bilateral)	.497	.000	.191	.238	.000	
	N	1196	1196	1196	1196	1196	1196

**The correlation is significant at the 0.01 level (2 queues)
* The correlation is significant at the 0.05 level (2 queues)

Source: Self-made (2020)

The most significant positive Pearson´s correlations between the indicators in the previous table show the following, 0.081, which shows a low relationship between gender and the level of satisfaction with the use of virtual platforms in the FCA of the UACH, a 0.026 also between the gender and learning style. With a 0.577 that shows a moderate relationship between the mastery of ICT and the use of the virtual platforms of the UACH, the 0.469 also moderate between the mastery of ICT and the professor's evaluation in online courses. Besides, the 0.023 showing a low relationship between the learning style and the characteristics of the ICTs used in distance classes because of COVID, likewise the 0.560 of a moderate relationship between the level of satisfaction with the use of the UACH virtual platforms and the evaluation of the mastery of the professor in online classes. While the most relevant negative correlation is between the learning style and the ICT used by the UACH mastery with a -0.097 showing a very low inverse relationship.

Table 7. *Pearson´s correlations of educational programs with mastery, social networks, semester, tools used, the continuation of virtual classes, and connection place*
Correlations

		Educational program to which they belong	ICT used by the UACH mastery	Social networks used for virtual class because of COVID	Current semester	Tools used for virtual class because of COVID	Would continue studies by virtual class after COVID	Place where you connect for virtual classes
Educational program to which they belong	Pearson's correlation	1	.050	-.076**	.015	.053	-.007	-.039
	Significance (bilateral)		.081	.008	.614	.068	.816	.182
	N	1198	1198	1198	1198	1198	1198	1198
ICT used by the UACH mastery	Pearson's correlation	.050	1	-.016	.103**	-.035	.066*	-.130**
	Significance (bilateral)	.081		.586	.000	.228	.023	.000
	N	1198	1198	1198	1198	1198	1198	1198
Social networks used for virtual class because of COVID	Pearson's correlation	-.076**	-.016	1	.025	-.041	.031	.006
	Significance (bilateral)	.008	.586		.388	.153	.282	.839
	N	1198	1198	1198	1198	1198	1198	1198
Current semester	Pearson's correlation	.015	.103**	.025	1	.052	-.056	-.008
	Significance (bilateral)	.614	.000	.388		.071	.051	.772
		1198	1198	1198	1198	1198	1198	1198

	N							
Tools used for virtual class because of COVID	Pearson's correlation Significance (bilateral) N	.53 .068 1198	-.035 .228 1198	-.041 .153 1198	.052 .071 1198	1 1198	-.013 .642 1198	-.020 .488 1198
Would continue studies by virtual class after COVID	Pearson's correlation Significance (bilateral) N	-.007 .816 1198	.066* .023 1198	.031 .282 1198	-.056 .051 1198	-.013 .642 1198	1 1198	-.075** .010 1198
Place where you connect for virtual classes	Pearson's correlation Significance (bilateral) N	-.039 .182 1198	-.130* .000 1198	.006 .839 1198	-.008 .772 1198	-.020 .488 1198	-.075* .010 1198	1 1198

** The correlation is significant at the 0.01 level (2 queues)

* The correlation is significant at the 0.05 level (2 queues)

Source: Self-made (2020)

The correlation table for the 7 mentioned indicators shows that there is a significant positive correlation of 0.05, a very low relationship between the educational program to which the student belongs and the tools used, as well as the mastery of ICT used by the educational institution. Regarding the ICT mastery, it has a significant positive correlation of 0.1, also a very low relationship with the semester in which it is currently enrolled, regarding the continuation of virtual classes even without the COVID-19 contingency, there is a significant positive correlation of 0.03 with a very low relationship with the use of social networks used for classes due to contingency. There is also a significant positive correlation of 0.6 of a moderate relationship between whether they would continue to use online classes and their mastery of ICT performance. Finally, there is a significant negative correlation of -0.13 between ICT mastery and the place where they have their internet connection, showing a very low inverse relationship.

Table 8. *Advantages offered by ICTs*

	P.A.	**B.B.A.**	**B.I.C.T.A.**	**B.F.A.**	**B.G.A.**
Information availability	265	313	87	246	105
Greater interaction with the professor	61	72	39	57	35
Greater interaction with peers	51	65	18	41	16
Greater learning of the subject	32	42	9	18	11
Collaborative learning	100	133	37	78	46
Greater communication (professor/students)	83	80	25	72	31

Source: Self-made (2020)

From the table above, it can be seen that 85% of students consider the availability of information as an advantage of online classes, 22% believe that there is greater interaction with the professor, and 16% with their peers. Only 9% think that they have better learning of the subject, while 33% consider an advantage in collaborative learning. Finally, 24% of those surveyed believe that there is greater communication between the professor and the students.

Table 9. *Disadvantages offered by ICTs*

	P.A.	B.B.A.	B.I.C.T.A.	B.F.A.	B.G.A.
Connection problems	288	301	82	231	107
Less communication (professor/students)	169	205	35	146	52
Access to many distractions	182	211	48	165	71
Less learning	187	209	30	172	62
Lack of interaction with peers	147	136	30	122	42
Difficulty handling them	97	98	25	63	36
Lack of technological tools (computer or internet)	88	82	38	57	38

Source: Self-made (2020)

Regarding the disadvantages, the table shows the following results: 84% of the respondents had connection problems, 51% of the students felt less communication with the professor, and 57% consider that they have access to many distractions. While 55% believe that they learn less and 40% that they lack interaction with their classmates, also 27% comment that they have difficulty handling them, and 25% do not have the technological tools for online classes, such as it is the computer equipment and the internet connection.

5. Discussion

The results of the research show that the university students of the institution show a positive correlation towards information and communication technologies, which is shown in several aspects studied: learning style, mastery in the use of ICT, tools, educational program, level of satisfaction of having the appropriate technological resources, among others. One of the most important findings of this research was that students have a very good command of ICT to handle the technological tools used during the health contingency, as well as a positive correlation between the mastery of ICT and the use of virtual platforms of the UACH, between the learning style and the characteristics of the ICT used in distance classes.

Mominó and Sigáles (2016) mention that in the educational context is where the set of technological-social transformations should become more evident because in this context is where individuals are produced and socialized. In today's world and the current situation of the COVID-19 pandemic, being able to access information and communications technologies (ICT) was a significant need to participate in a context increasingly dependent on technology. ICTs are a fundamental dynamic element in society and organizations of any kind. The Autonomous University of Chihuahua in Mexico went from traditional education to a distance education model through educational technological tools. Hernández et al. (2020) point out that, in this context, professors and students must acquire different abilities and take on different roles than those they have traditionally performed. Information and communication technologies in education allow several alternatives and at the same time represent a huge set of challenges, through them it is possible to produce broad and flexible knowledge, relating to the application, innovation, negotiation, directing, adopting, disseminating, establishing, increasing, in short; a series of concepts that are transposed to the non-linearity of learning that occurs from the use of these, starting the study of learning, correction, deconstruction, and so on. (Cobo, 2016)

ICTs promote the development of teaching and learning processes by making different alternatives available to students to easily achieve the learning objectives (Aguaded and Cabero, 2014). The reason why they are considered in this research as tools that provide many options for use both for

the student and the professor at the time of imparting knowledge and thus meet the objectives of the educational task.

ICTs, like other human activities, are becoming an increasingly necessary tool in educational institutions where they can perform various functions, to achieve collaborative work, and, most importantly, in today's education, to make learning meaningful. (Queiruga, Sáiz, and Montero, 2018)

In various studies, it seems to be a constant that there is awareness of the advantages of ICT, but its use does not end up being consolidated. According to Pelgrum (2001), even in favorable environments, most people dedicated to the education sector consider the lack of computer equipment as one of the biggest problems. Ottenbreit-Leftwich et al. (2010) point out that on some occasions it is said that professors with positive opinions towards technology adopt them in their professional practice. In this research, the greatest advantage was having the information available at all times and as the second indicated option was collaborative learning and the most mentioned disadvantage was the problems with the internet connection.

Campos and Ramírez (2018) in a study point out that age, attitude, familiarity, and knowledge related to ICT are not obstacles to overcome to integrate them into educational programs; the participants seemed to be significantly affected by the use of technology. In this study, age and academic profile were not the problems, the main barriers were lack of equipment, little training, resistance to adopting new technologies or methods, among others, a situation derived from the crisis caused by the COVID-19 pandemic. García (2014) points out that users use digital tools to a greater or lesser extent and are inserted more intensely in their management, not based on age, but on the context, motivations, and interests, in which the attitude factor influences more than experience. Students and teachers are faced with the problem of adapting to these changes and having to learn new ways of transmitting knowledge. This transition stage will have a change in educational institutions because the learning process will be different from the traditional one. After all, the use of ICT in the educational environment through distance education and the appropriate didactic use represents an unprecedented challenge.

6. Conclusions

Due to the confinement and social distancing measures, in the face of the COVID-19 contingency, technologies have become even more relevant, and for some, both professors and students, they have had to get involved in forced marches for the preparation of materials, use of web portals, and technological platforms used in the teaching-learning process.

Based on the results, it can be confirmed that the tools that students are using the most in distance classes are the Moodle platform where the teacher shares course materials, videoconference classes through Google Meet, and for the preparation of assignments they consult information through the different search engines. Students characterize ICT as accessible and flexible.

There is a direct correlation between the mastery of ICT and the use of the virtual platforms used in the UACH, and between the level of satisfaction with the use of the virtual UACH platforms and the evaluation of the mastery of the professor in online classes. This confirms that students master the ICTs used at UACH.

However, when analyzing the present relationship between whether they would continue taking online classes and the mastery they have in the performance of ICT, a moderate positive significant

relationship was found, this indicates that the more mastery students have in their performance with ICT, the more they are interested in continuing to take classes online.

Smartphones, email, and the WhatsApp social network were pointed out as part of the most used technological tools by students, which facilitated this transition from traditional education to distance education, thanks to these it was possible not to lose communication between professors and students, and reaching those students without a computer and internet access; not only because they come from places where this service does not exist, but also because of the family's economic situation in the face of the pandemic.

The availability of information and collaborative learning are the advantages that students consider of ICT as tools to carry out the interaction between the various participants in the teaching-learning process. One of the disadvantages that were identified was Internet connection problems and that they have access to many distractions during class, and they consider that they learn less.

7. Recommendations

Taking into account that this pandemic is a juncture to identify the skills that all students and professors require in the teaching-learning process, precisely in a crisis like this, where it was necessary to enter distance education through the use of technologies, it is recommended to continue with the training of teachers of the different subjects where they efficiently apply them in the teaching work, where they increase productivity in the use of the Internet and the necessary tools in distance education. So, in this way, teachers acquire the necessary skills to achieve effective communication with students through technologies.

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Annex.

Questionnaire

1. Sex: ☐ Woman ☐ Man

2. Age: ☐ Between 17 and 19 years old ☐ Between 20 and 22 years old

☐ Between 23 and 25 years old ☐ Over 25 years old

3. Marital status: ☐ Single ☐ Married

4. Select your Educational Program:
☐ Bachelor of Business Administration
☐ Public Accountant
☐ Bachelor of Financial Administration
☐ Bachelor of Government Administration
☐ Bachelor of Information and Communication Technologies Administration

5. Semester (in case of taking subjects from different semesters, please indicate the semester to which the subject with less progress belongs): _____

6. How much do you think you know about COVID-19?
☐ Nothing ☐ Fair ☐ A lot

7. Does your home or workplace have an Internet connection?
☐ Yes ☐ No

8. What is your predominant learning style?
☐ Auditory ☐ Visual ☐ Kinesthetic (By touch) ☐ I don´t know

9. 9. How do you consider your mastery in the use of ICT with the tools that the University is using in the face of the COVID-19 contingency?
☐ Excellent ☐ Very good ☐ Good ☐ Fair ☐ Bad

10. How difficult has it been for you to handle the technological tools for virtual classes?
☐ Very difficult ☐ Difficult ☐ Neutral ☐ Easy ☐ Very easy

11. Do the professors who teach the virtual classes master the technological tools used in their class?
☐ Not at all ☐ Fair ☐ A lot

12. What technological tools are you using in classes in the face of the COVID-19 contingency?
☐ Moodle platform
☐ Video conferences through the Meet platform
☐ Video conferences through the Zoom platform
☐ WhatsApp
☐ Facebook
☐ Cloud computing (Google Drive, box, One Drive, Dropbox)
☐ Other _____

13. How satisfied are you with the use of virtual platforms used at the University?

- ☐ Completely satisfied
- ☐ Quite satisfied
- ☐ Indifferent
- ☐ Quite dissatisfied
- ☐ Completely dissatisfied

14. How often do you use virtual platforms in your classes?
- ☐ Once a day
- ☐ Several times a day
- ☐ Once a week
- ☐ Everyday
- ☐ On weekends

15. What is the reason why you use virtual platforms?
- ☐ Review material
- ☐ Do an assignment
- ☐ Participate in a forum
- ☐ Chat
- ☐ Upload an assignment
- ☐ Watch videos
- ☐ Other _____

16. What characteristics best describe the information and communication technologies used in your virtual classes? (Select all that apply)
☐ Dynamic ☐ Accessible ☐ Simple ☐ Flexible ☐ Complicated

17. How often do you use videoconferencing in your classes with your professors?
- ☐ Once a day
- ☐ Several times a day
- ☐ Once a week
- ☐ Everyday
- ☐ On weekends

18. Do you consider that the professor establishes environments conducive to learning using Information and Communication Technologies (ICT)?
☐ Never ☐ Rarely ☐ Occasionally ☐ Almost everyday ☐ Everyday

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
19. Using ICT makes class learning easier.					
20. Using ICT makes it easier to do a job or assignment.					
21. The use of ICT is important within the subjects taught at the Faculty of Accounting and Administration					
22. Do you consider that the use of ICT promotes better communication between professor and student?					
23. Do you think classes will improve with the use					

of ICT?					

	Rare	Infrequent	Frequently	Fairly frequent	Very frequent
24. Have you established online communication with classmates to carry out an academic activity?					
25. How many times does the professor entrust you with works or assignments where you have to use ICT?					
26. Do you use the computer and/or other information technologies when you make presentations in class?					

27. Select the resources you use the most to connect to virtual classes
- ☐ Desktop computer - PC
- ☐ Laptop / notebook
- ☐ Tablet
- ☐ Cellphone (Android, Apple, BlackBerry)
- ☐ Other _____

28. Select the social network you use the most for the use of your classes in the COVID-19 contingency
- ☐ Facebook
- ☐ WhatsApp
- ☐ Instagram
- ☐ YouTube
- ☐ Twitter
- ☐ I don't use social networks

29. What advantages do Information and Communication Technologies (ICT) offer in your virtual classes in the face of the COVID-19 health contingency? (Select all that apply)
- ☐ Information availability
- ☐ Greater interaction with the professor
- ☐ Greater interaction with peers
- ☐ Greater learning of the subject
- ☐ Collaborative learning
- ☐ Greater communication (professor/students)

30. What disadvantages do Information and Communications Technologies (ICT) offer in your virtual classes in the face of the COVID-19 health contingency? (Select all that apply)
- ☐ Connection problems
- ☐ Less communication (professor/students)
- ☐ Access to many distractions
- ☐ Less learning
- ☐ Lack of interaction with peers
- ☐ Difficulty handling them