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Influence of Knowledge Area on the Use of Digital Tools during the COVID-19 Pandemic among Latin American Professors

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Abstract: In this paper, quantitative, descriptive, and correlational research is carried out on the impact that the process of digitalization of academic activities in higher education has had on the habits of use of information and communication technologies (ICT) among professors and the influence of the area of knowledge on this impact. For this purpose, responses from 716 professors from different Latin American universities to a survey designed by the authors were statistically analyzed. Following the UNESCO guide on the use of ICT in higher education, the survey distinguishes the following teaching activities to measure the use of ICT: lessons, tutorials, sharing materials, and evaluation. The results show that the use of ICT has increased in all teaching activities, but unevenly, being particularly intense in those in which the use of ICT was less frequent during the pandemic—specifically, tutorials and evaluation, whose frequency of use has increased by around 50%. As a result of this uneven increase, the use of ICTs in different teaching activities has become more homogeneous after the pandemic. This increase was significantly higher among engineering and social sciences professors than in other areas of knowledge, as well as in evaluation and tutorial tools than in other activities. In addition, the ICT tools most used during the pandemic were those with which the professors or students were most familiar before the pandemic. It is recommended that universities increase the specific training of professors in the pedagogical use of ICT and that they should address the specificities of each area of knowledge.

Keywords: digital resource; higher education; virtual learning environment; digital competence; COVID-19 pandemic; technical applications; training; online learning

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1. Introduction

The World Health Organization identified COVID-19 as responsible for a global health crisis, considering it to be a pandemic in March 2020 [1]. The rapid spread of the virus induced the world's governments to take extraordinary measures to control it, affecting the pillars of logistics, culture, and economy [2]. The field of education was also affected. As of 25 March 2020, 150 countries closed their educational institutions, moving their activities to virtual learning environments, which affected 80% of the world's student population [3]. The field of higher education was no exception to this reality, and many universities were forced to close their campuses and, therefore, all their face-to-face activities [4]. University faculty then faced the new challenges that the consequent migration to virtual environments imposed. Among others, professors had to rethink their teaching methods to accommodate a new role for information and communication technologies (ICT) in the development of different training activities. This gave continuity to the development of a digital teaching competence that, although already present before the pandemic [5,6], had to be intensified abruptly so that the pandemic restrictions would not affect the achievement of the learning objectives of different studies and university degrees [7].

The process of integrating ICT into teaching requires specific faculty training that should include at least three dimensions: (i) technological training; (ii) development of

a pedagogical approach to the use of technologies for learning; and (iii) acquisition of practical knowledge of different technologies through the sustained experience of use over time [8]. The sudden irruption of the pandemic meant that the migration to virtual environments of different academic activities had to be carried out abruptly by professors, regardless of the training stage they were at, their digital competence, and the technological capacity of their institutions. In addition to being sudden, this migration had to be complete, rather than progressive, i.e., it forced a wide variety of activities to be transferred to digital environments at the same time, including lessons, sharing contents and materials, tutorials, or evaluation of learning [9].

The measures taken by different universities to carry out this extraordinary digital adaptation have been disparate. Some universities have centralized decision-making about the use of digital tools in a methodologist, while others have given professors full responsibility for choosing resources, creating, and sharing materials, or designing telematic assessment tools [10]. The burden of this responsibility has been assumed in different ways by professors but has caused, in general, an increase in their nervousness and anxiety derived from the digitization process [11].

This migration of higher education to digital environments has come up against numerous conditioning factors, such as unequal access to the Internet, depending on the geographical region in question [12]; the requirements in terms of equipment and facilities that the incorporation of these technologies imposes on universities [13]; the digital competence of the teaching staff, which is positively influenced by their experience in the use of ICT, but which is usually insufficient or can be improved [14]; or inequalities in the access and use of digital technologies by professors, according to gender or age [15]. The literature has indicated that all these conditioning factors concur, in the form of limitations, in the digitization process in the Latin American and Caribbean region, which is precisely the region that is the subject of the present study, and significantly influence the impact of the pandemic on the ICT integration process in the universities of the zone [16]. However, an analysis of the influence that the pandemic has had on the habits of ICT use among professors in different areas of knowledge is not found in the literature. This aspect is, however, interesting given that it is reasonable to think that the measures that universities should take for correct and progressive integration of ICT should be different depending on the area. This perspective constitutes an element of originality of this article.

The different factors that have been described, all of them linked to the COVID-19 pandemic, are unprecedented in the recent history of higher education and mean that the digitalization process and the transformation that it has brought about in the habits of ICT use by professors is a new phenomenon. This paper, considering the relevance of evaluating the evolution of ICT use in the university context, focuses on analyzing the impact that the pandemic has had on the frequency of ICT use in different teaching activities in universities in Latin America and the Caribbean, assessing the progress made in the use of various ICT tools to improve teaching practice.

2. Literature Review

2.1. The Challenge of Digitization of Higher Education in the Context of COVID-19

The success of universities in their work of knowledge management and dissemination depends, in part, on the availability of resources appropriate to their changing needs to achieve their objectives [17]. Among these resources, the COVID-19 pandemic has given special prominence to ICT, which, in the field of higher education, include the Internet, learning platforms, mobile devices, apps, specific software for certain areas of knowledge, databases, and all the infrastructure and equipment required for their proper integration into training activities [18].

Among university students, the adoption of ICT has not been homogeneous, despite being a generation of digital natives—the so-called Net generation [19]. Moreover, ICT use among students is less frequent when applied to study activities than in any other context [20]. Typically, students use the same tools for learning that they use in different situations in their daily lives because, although they are familiar with the technologies, they are not sufficiently trained to use them effectively as learning resources [21,22]. Students communicate with each other via WhatsApp® or through social networks, such as Facebook®, and share information through platforms such as YouTube® or Instagram® [23]. The incorporation of the use of ICT into the activity of higher education professors, however, is not sufficiently adapted to the uses that young people make of networks, devices, and platforms; rather, professors make use of a reduced number of tools, such as Power Point® or Prezi®, cannons or digital whiteboards, and Moodle® or Blackboard® type platforms, without taking advantage of the formative potential that the previous resources, better known by young people, can offer. Indeed, the literature supports that the formative use of tools such as WhatsApp®, YouTube®, Twitter®, Facebook®, or TikTok® are more frequent in early childhood and primary education [24,25] and, in higher education, they are essentially relegated to the so-called self-regulated learning, according to Zimmerman's terminology [26], in which the student is the one who has the main responsibility for the design and development of learning situations [27].

As far as it has been possible to explore, there is no standardized classification of ICT for didactic use in higher education. The United Nations Educational, Scientific and Cultural Organization (UNESCO) gives a comprehensive guide on the use of ICT in higher education with a focus on teacher training [28]. In addition, it is based on the perspective that ICT should not be a mere teaching tool, but that it is committed to a true technification of learning. This implies that teacher training should not be limited to the occasional use of independent tools according to need, but rather to true interrelated integration of ICT within all the activities of the teaching and learning process and that ICT should not be used as a mere tool for professor use, but rather as a real technification of the learning activities. This perspective of faculty training for the technification of higher education is shared by some specialists and projects that advocate training professors to use ICT in the various activities that make up their teaching tasks without any activity being left behind in this process of ICT integration [29]. Although the UNESCO guide does not provide an exhaustive classification of ICT tools, it does, however, analyze the different areas of teaching work on which digital faculty training efforts should be focused. These areas include: (i) multimedia presentations, for supporting lessons in digital environments; (ii) telecomputing projects and CyberGuides, which involve both autonomous student work and the sharing of learning materials; (iii) tools for online communication, meetings, and discussion with students; (iv) tools for monitoring and evaluating learning—although this type of ICT tools is not explicitly addressed in the guide, the need to design appropriate activities for monitoring students, such as WebQuests, is raised.

It is also relevant to explore the classifications made of ICT tools for learning in works focused on students' self-regulated learning, because the use that this type of students make of ICT is very high, the scientific literature on the subject is extensive, and it can provide clues to deepen the technification of learning processes in higher education from the perspective of professors [28,29]. In fact, it can be observed that the rationale underlying the description of different ICT resources in this type of work is similar to the above classification obtained from the UNESCO guide. Thus, among the most exhaustive classifications of ICT resources used by students to conduct different learning activities in higher education is that of Yot-Domínguez and Marcelo [30,31] (Table 1). This classification groups the ICT didactic resources into four broad categories, according to the academic activity for which each of them is intended: (i) tools for meetings and tutorials with students; (ii) sharing content resources; (iii) evaluation tools; and (iv) tools used by students to search for and process information and manage their time. The classification of digital tools is made from the perspective of the phases of student activity and self-reflection, according

to the scheme of self-regulated learning [26,27,30,31]. If the aim is to redirect the analysis towards the perspective of the professor's teaching activity, which is the purpose of this work, and to classify ICT resources useful for their didactic work, it is necessary to add a new category to the original classification, referring to tools for presentations and resources to dynamize classes which various works in the preceding literature report, as shown in Table 1. For the sake of clarity, different families of teaching activities described in Table 1 stem from the UNESCO classification [28] and are essentially consistent with the taxonomy of Yot-Domínguez and Marcelo [30,31], except that this last classification does not consider support tools in class lessons. The specific tools indicated in the last column are not intended to establish an exhaustive list of specific resources, but rather a list of the tools worked on in the training session that was carried out as one of the initial stages of the research. These specific tools have been the object of treatment by the specialized scientific literature so they constitute resources that enjoy scientific endorsement. The last column of Table 1 shows references that support each of the tools indicated.

Table 1. Classification of the ICT didactic resources commonly used by university students and professors.

Number	Didactic Activity	Type of Resource	Technology
1	Meetings and tutorials	Communication	Skype®, Google Meet® [31] LifeSize®, Daily.co®, Blackboard® [32] Google Hangouts®, Zoom®, Microsoft Teams® [33]
2	Sharing content	Repository	SlideShare®, Instagram®, iVoox®, YouTube® [31]
		Social network	Twitter®, Facebook® [31] WhatsApp®, Twitch®, TikTok®, Telegram®, LinkedIn® [34]
		Cloud storage	Blogs, Dropbox® [31]
		Social bookmarking	Delicious®, Sage® [31]
		Multimedia resources	Webinars [31]
3	Evaluation	Evaluation	Google Forms®, Google Classroom®, Educaplay® [31] Quizlet®, Nearpod® [35] Socrative®, Kahoot®, Mentimeter®, Padlet®, Quizizz®, Plickers® [36,37] Pear Deck®, Poll Everywhere®, EDpuzzle® [38]
4	Lessons	Presentations and dynamization tools	Power Point®, Prezi®, Slidesgo®, Genially®, Zoo Show®, Visme®, Slidebean®, Powton®, Piktochart®, Intuiface®, Google Slides®, Canva® [39–42]

Some of the tools indicated in Table 1 are expressed in a generic way (specifically, blogs and webinars), while the rest of the tools are indicated in a specific way. This is due to the fact that, in the training session given by the authors as part of the present research, no specific tool of these types was developed in detail, but rather a generic presentation was made. Likewise, the list of tools in Table 1 is not intended to be exhaustive for each of the categories indicated, but only the tools used in the aforementioned training session have been included and each of them has been included in the category in which it was presented in that training session, although some tools may have several uses among those shown in Table 1.

The literature that studies the use of ICT by university professors before COVID-19 already coincides in pointing out the need to rethink the figure of the teaching staff to develop innovative paths in the use of technology and improve learning, knowledge, creativity, and the integration of the most avant-garde technologies [43]. In addition, the conception that professors adopt regarding the use of these tools determines the methodology, theory, and practice of their work [44]. Thus, the literature reveals that there is a tendency to use these tools only to replicate traditional teaching, focusing on the search, production, and processing of information, as well as communication and access to the virtual classroom [45–47].

The pandemic has driven initiatives to develop pedagogical proposals for the didactic use of ICT based on platforms from the field of communication, such as Minecraft Education, National Film Board Education, Educ'Arte, Scratch, and 7 de Cinema [48]. The so-called smart learning is beginning to be linked to innovation and the development of creativity in education [49] and virtual tutoring is gaining importance [50], contemplating a constructivist vision of learning based on the use of new technologies [51]. This shift in the conception of higher education is in line with a change in the profile of students, who show that they make assiduous use of these technologies in access to information and learning [52,53], although this aspect is not usually contemplated in curricula [54].

COVID-19 has transformed society, extolling the importance of different virtual learning environments in the educational field [55], changing the roles [56] and the perception of university faculty in relation to the use of virtual learning platforms, to move from the face-to-face model to emergency distance teaching [57,58]. Reality has shown high rates of stress in the faculty due to this digitalization [59–61] and generally, deficient training levels to cope with this situation [62–66]. Training deficiencies especially affect content creation, information expression, and problem-solving, although some studies show that university professors have adequate communication and digital content-sharing skills [67,68]. In this sense, blended learning, challenge-based learning (CBL), or the technological pedagogical content knowledge (TPACK) model [69–71], as well as the use of virtual reality and augmented reality technologies [72], including virtual laboratories for scientific and technical experimentation [73–76], are examples that prove the combination of non-presence, flexibility, and easy access to content. From the perspective of university students, the implementation of these tools has allowed them to develop greater skills in communication, through interactive presentations, videos, or images, and in collaborative work with online documents [77,78], although their attitudes and aspirations in making use of ICT to optimize results should not be forgotten [6,79]. For the future enhancement of these skills in students in the service of thinking, critical thinking, and creativity, it is necessary for universities to intensify the training of university professors in the integration of ICT in their teaching activity [80–82].

The literature that deals with describing digital competence and ICT use habits in higher education, discriminating by areas of knowledge of the professors, usually focuses on the analysis of a specific area [69]. The works that deal with establishing comparisons and correlations between different areas present diverse results. Some of them show that there is a certain superiority of technical education teachers in terms of knowledge and experience in the use of ICT in teaching [66]. However, other studies identify that the most outstanding digital competence is found among professors of social and legal sciences [83]. These discrepancies suggest that there are factors beyond the area of knowledge—such as, probably, the geographical region—that condition the impact exerted by the area of knowledge in this regard.

In short, the pandemic has caused educational institutions to suddenly become involved in non-face-to-face teaching, which meant a forced adaptation, at the level of infrastructure, methodological adaptation, and technological training, for universities, professors, and students, who were often unprepared for extensive use of ICT in academic activity [58]. The opinion of students and faculty reflects worrying levels of digital competence, as well as an insufficient number of opportunities for the acquisition of skills for the use of ICT, which ends up translating into a certain resistance to the use of computer technologies in training activities [2,78]. Similarly, there is a negative correlation between the stress generated by the precipitous use of ICT and the digital competence of professors and their ability to adapt to virtual environments [61].

After the pandemic, university teaching has been fed with opportunities and challenges to increase its excellence with the implementation of virtual education initiatives, so that, after the recovery of face-to-face teaching, many universities maintain online or hybrid teaching modalities [84]. The educational quality of these new models is conditioned by factors such as the level of technical training of professors, their teaching style, the type of interaction with students, the strategies used to capture the attention and motivation of students, direct contact with them, active and collaborative learning, immediate feedback, diversification of learning, and the appropriate application of existing technology and virtual platforms [85–87].

2.2. Presence of ICT in Latin American Universities

A retrospective on the digitization process in Latin American and Caribbean countries shows that, prior to the pandemic, ICT in education has focused on disruption and innovation. This includes the incorporation of operational activities with a creative sense, such as augmented reality, machine learning, and video games [88].

In the wake of the pandemic, universities in Latin America and the Caribbean experienced relevant changes induced by social and technological trends towards digitization, being permeated by the technological advancement brought by the Industrial Revolution 4.0 [89]. Latin American higher education institutions face a new paradigm based on two key hypotheses: (i) in general, universities should improve their digital maturity [90]; and (ii) less digitally mature institutions are more fragile, while better-digitized universities have proved to be more flexible to the methodological adaptations derived from the pandemic requirements [91].

The previous specialized literature has shown that the digital competence of professors, their training, their experience in this regard, and their attitude towards technology have a decisive influence on the learning process of students [92]. Latin American professors generally consider the training received by their institutions to integrate ICT into their teaching work to be insufficient [93]. This fact is a concern for universities, as revealed by the increase in recent years of publications on the digital competence of university faculty in the region [94].

In the above respects, the area of knowledge of the professors turns out to be an influential variable, not only in terms of experience with the use of technologies, which is greater among technical education professors [66], but also in the impact that the pandemic has had on them from the affective point of view and from the point of view of adaptation to digital environments [60,61]. In this last respect, previous work shows that certain sociological factors, such as gender or the level of digital development of the country of origin, influence the affective impact of digitization resulting from the pandemic is different according to the professor's area of knowledge [60,61]. However, as far as it has been possible to explore, there are no studies that analyze in depth the influence of the area of knowledge on the habits of use of digital tools among professors, beyond the studies that point to the area of social sciences as the most prolific in publications on the digitization of educational processes during the pandemic [95].

The urgency that exists in the specific region of Latin America and the Caribbean to develop strategies that accelerate digital transformation and full inclusion in terms of technologies is evident. In fact, it is expected that more than 20% of jobs in some of these countries will undergo some form of automation, which shows the need for new investments in education and training that will equip future workers with digital skills to cope with this new scenario [96]. Currently, in this context, it is necessary to transcend the exclusive use of technologies for teaching and it is considered imperative to promote greater dissemination about the accessibility, visibility, and interoperability capacity of technological platforms, which respond to the needs of an educational environment that is in an intermediate stage of its development and is affected by social gaps arising from economic and cultural inequalities [97], by the consequences of the COVID-19 pandemic [98], and by the need to develop educational technologies that are sustainable from an environmental and economic point of view [99]. In this sense, it is also necessary to design educational interventions based on providing more training to professors, in accordance with their opinions on the lack of resources and the frequency of ICT use [98].

3. Materials and Methods

3.1. Participants

The study involved 716 Latin American university professors (49.44% male and 50.56% female), who were selected by a non-probabilistic convenience sampling process. The criteria for inclusion in the study were: (i) being a professor of higher education in a Latin American university; and (ii) having attended one of the informative sessions on the didactic use of ICT in higher education given by the authors. The training session consisted of an online session, open, upon registration, for Latin American university professors, which was repeated every two weeks, with different participants, throughout the 2021–2022 academic year. In this session, different tools asked for in the survey were presented, the didactic utilities of each of them, distinguishing the four families of didactic activities considered, and a discussion forum was opened with the participants. All of them were sent an e-mail with a link to enter the survey, voluntarily and anonymously, and were informed of its research purposes. A total of 952 professors attended the course, but responses were received from 716 professors and all of them were validated. All participating professors answered the questionnaire voluntarily, freely, and anonymously and were aware of the research purposes of their participation. The distribution of the participants is not homogeneous by areas of knowledge (chi-square = 105.75, df = 4, p-value < 0.01), but the areas of social sciences and engineering are more frequent than the rest (Figure 1). Within the Latin American region, the countries represented in this study and the number of participants from each country are as follows: Argentina (36), Bolivia (13), Brazil (21), Chile (36), Colombia (102), Ecuador (126), Honduras (19), Mexico (84), Nicaragua (15), Panama (13), Peru (188), Puerto Rico (16), Dominican Republic (15), Uruguay (16), and Venezuela (16). Table 2 shows the distribution of participants from each country by area of knowledge.

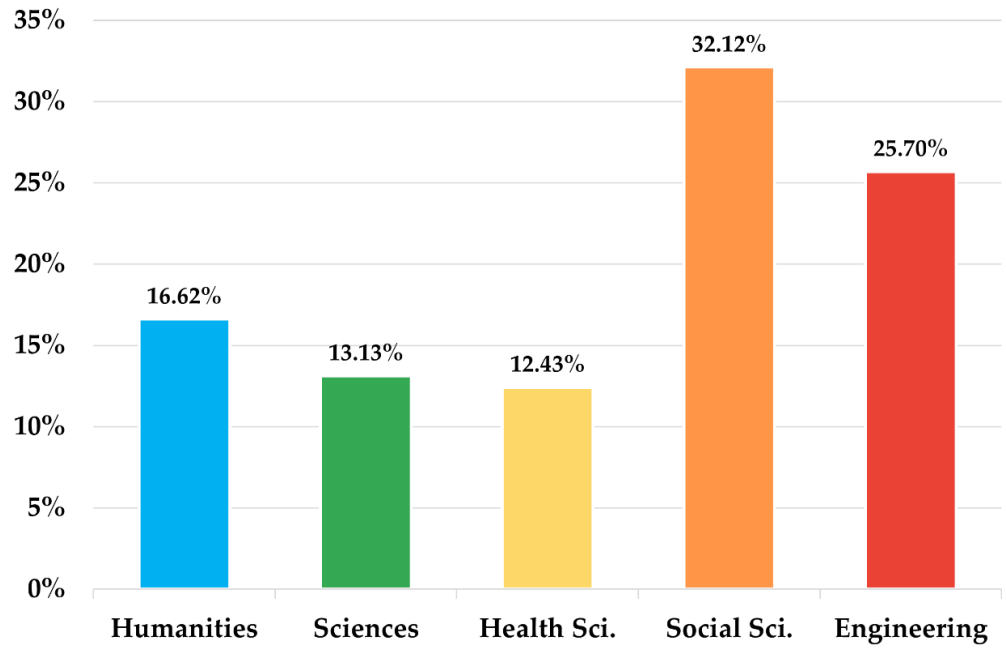

Figure 1. Distribution of participants by knowledge areas.

Table 2. Number of participants, distributed by the considered areas of knowledge, within each country represented in the study.

	Humanities	Sciences	Health Sciences	Social Sciences	Engineering
Argentina	3	3	15	0	15
Bolivia	4	0	0	3	6
Brazil	3	3	3	3	9
Chile	3	0	24	9	0
Colombia	12	3	3	60	24
Ecuador	21	24	3	66	12
Honduras	3	6	0	10	0
Mexico	24	12	6	24	18
Nicaragua	3	6	0	0	6
Panama	8	2	3	0	0
Peru	26	28	14	32	88
Puerto Rico	0	4	9	0	3
Dominican Republic	6	3	0	3	3
Uruguay	0	0	9	7	0
Venezuela	3	0	0	13	0

3.2. Objectives and Variables

The research objectives of this work are: (i) to analyze the impact of the COVID-19 pandemic on ICT usage habits among Latin American university professors; (ii) to identify which specific ICT tools have increased their use during the pandemic by professors in each of the different teaching activities; and (iii) to study whether there are significant gaps in the frequency of ICT usage among Latin American professors of different areas of knowledge, both before and after the pandemic.

To achieve these objectives, the area of knowledge of the professors is defined to be the independent variable of the study. This variable is nominal polytomous. Specifically, the following knowledge areas have been distinguished: arts and humanities (hereafter, humanities, covering philosophy, philology, art, history, and literature); sciences (mathematics, experimental and natural sciences); health sciences (medicine, nursing, and social care);

social and legal sciences (hereafter, social sciences, covering the fields of law, economics and business, sociology, geography, politics, psychology, pedagogy, and education); and engineering and architecture (hereafter, engineering, covering the fields of engineering, manufacturing, construction, and architecture). These fields are defined on the basis of the International Standard Classification of Education (ISCED), of UNESCO [100], but include the area of education together with the rest of the fields of social sciences, since the UNESCO classification separates them.

Four dependent variables of a discrete ordinal quantitative nature are also considered. These variables measure the frequency of use of ICT by the participating professors in each of the four teaching activities indicated in Table 1, disregarding the tools for the student's autonomous work, whose use certainly does not correspond to the professors. Specifically, the teaching activities considered are the following: (i) presentations to support lessons and oral explanations in class and to dynamize the presentation of content during classes—activity 4 of Table 1; (ii) tutorials and meetings with students—activity 1 of Table 1; (iii) ICT for sharing materials with students—activity 2 of Table 1; and (iv) monitoring and evaluation of learning—activity 3 of Table 1. All these variables have been measured on a Likert scale from 1 to 5, where 1 means no frequency—never; 2 corresponds to occasional and extraordinary use—at most, once a month; 3 to infrequent regular use—less than once a week, but, at least, every month; 4 to frequent regular use—weekly but not in every class; 5 means very frequent regular use—in all classes.

3.3. Survey

A survey designed by the authors was used (Appendix A), consisting of 8 Likert-type questions ranging from 1 to 5. The first four questions were asked to assess the frequency of use of ICT tools both before and after the pandemic in each of the teaching activities that define the dependent variables of the study: lessons; tutorials; sharing materials; and evaluation. The last four questions were asked to assess the frequency of use of each of the specific tools indicated in Table 1, within each of the four teaching activities above, both before and after the pandemic. This survey was evaluated and passed on to the registered attendees in the training session that was given repeatedly by the authors throughout the 2021–2022 academic year. The participants were previously informed of the research interests of this survey and these same participants expressly consented to the use of their responses for these purposes, their answers being provided voluntarily, freely, and anonymously.

3.4. Methodology

After collecting the participants' responses to the survey, the main descriptive statistics (mean and standard deviation) were obtained for the assessments of the four dependent variables of the study. The degree of dependence of the frequencies of ICT use in different academic activities, both before and after the pandemic, with respect to the participants' area of knowledge was determined by computing Cramer's V parameters. This parameter measures on a scale between 0 and 1 the correlation between the descriptive nominal variable of the area of knowledge with the quantitative variables that measure the frequencies of ICT use. Thus, a Cramer's V parameter close to 1 indicates that the area of knowledge is a variable that strongly explains the corresponding variable with which it is correlated. After discarding, by means of the Lilliefors normality test, that the responses were normally distributed, it was verified by means of the Levene test for comparison of variances that the frequencies of use of the ICT expressed before and after the pandemic are uniformly distributed. Due to the lack of normality of the data, nonparametric hypothesis tests have been chosen for the comparison of means, instead of the parametric Student's t-tests or ANOVA. Consequently, the Wilcoxon nonparametric test for paired samples was chosen to assess the existence of significant differences in the frequencies expressed before and after the pandemic. The same test has been used to identify which specific ICT tools, within each teaching activity, have suffered the greatest and least variations in terms of their use

by professors due to the pandemic. In addition, the degree of dependence in terms of the use of ICT resources in different teaching activities before and after the pandemic has been assessed by computing Pearson correlation coefficients. Finally, the identification of gaps in the frequencies analyzed, both before and after the pandemic, according to the area of knowledge of the professors has been carried out using the Kruskal-Wallis nonparametric test for independent samples, respectively. All hypothesis contrast tests were performed at the 0.05 significance level.

4. Results

4.1. Impact of the Pandemic on ICT Use Frequencies

From the Lilliefors normality test statistics, it follows that it is not possible to assume normality in the distributions of the responses on frequencies of ICT use, neither before nor after the pandemic (Table 3), since all *p*-values of the Lilliefors test are less than the significance level 0.05. However, there is homoscedasticity in the distributions of responses to the frequencies before and after the pandemic in each of the academic activities, as can be concluded from Levene's test statistics (Table 3). Indeed, as all *p*-values of Levene's test exceed the level of significance, it is not possible to assume the existence of significant differences between the standard deviations of the responses when participants are differentiated by their area of knowledge. For these reasons, non-parametric hypothesis contrasting tests have been chosen in the following.

Table 3. Lilliefors normality test and Levene's variance comparison test statistics of the frequencies of ICT use in each teaching activity before and after the pandemic.

	Pre-COVID		Post-COVID		Levene	Levene *p*-Value
	Lilliefors D	Lilliefors *p*-Value	Lilliefors D	Lilliefors *p*-Value		
Lectures	0.2239	<0.01	0.3691	<0.01	2.1525	0.14
Tutorials	0.1674	<0.01	0.2730	<0.01	0.3693	0.54
Sharing	0.2130	<0.01	0.3760	<0.01	0.2344	0.63
Evaluation	0.1505	<0.01	0.2895	<0.01	0.6439	0.42

Participating professors have increased the frequency of ICT use after the pandemic in all the teaching activities analyzed, and these increases are statistically significant (Figure 2). The activities in which the relative increase in use after the pandemic with respect to the pre-pandemic situation was greatest were tutoring with students (with an increase of 52.71%) and student monitoring and evaluation (with 47.22%). In these activities, professors used ICT significantly less frequently than in the rest before the pandemic (chi-squared = 421.06, df = 3, *p*-value < 0.01), and they also do so after the pandemic, although the differences with the other activities have been reduced (chi-squared = 64.901, df = 3, *p*-value < 0.01), so it can be stated that the pandemic has had a certain effect of homogenizing the frequencies of ICT use in different academic activities. The areas in which there has been the least relative increase are lessons (15.68%) and the sharing of materials (25.63%), which are precisely the areas in which ICTs were less frequently used before the pandemic and, although their use is very frequent after the pandemic, their use has not yet reached the levels of lessons or the sharing of materials.

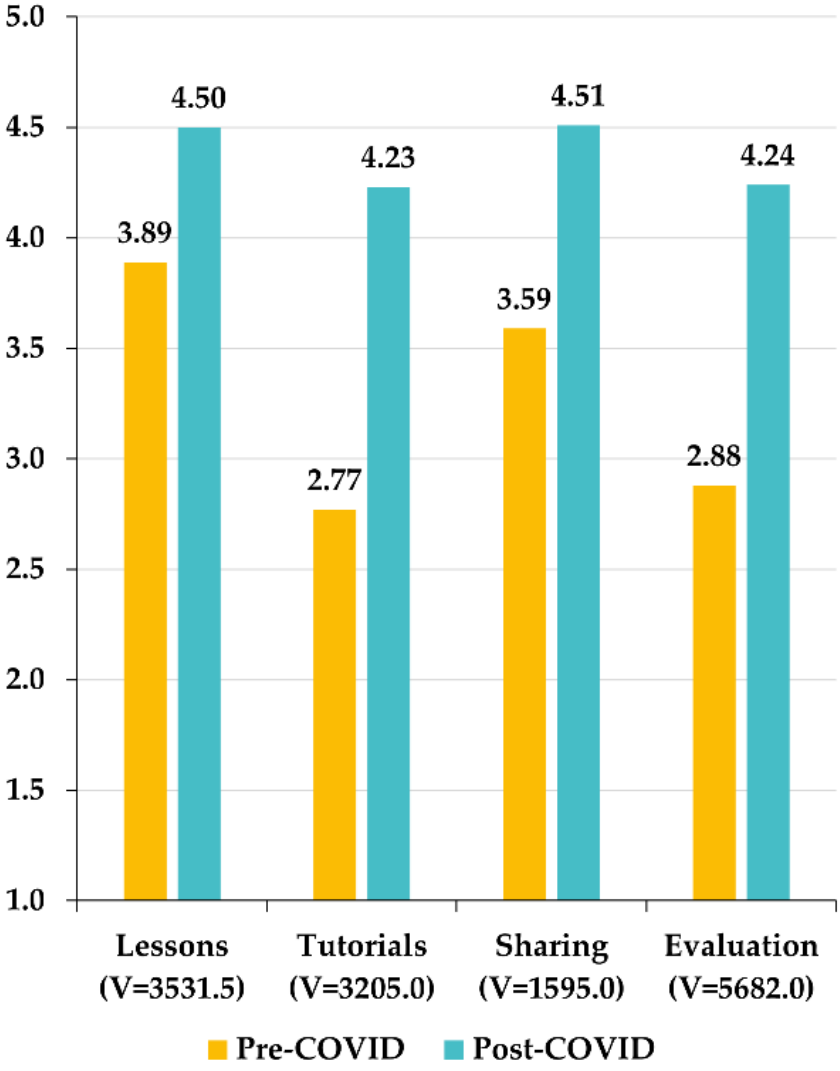

Figure 2. Mean frequencies (out of 5) of ICT use in each of the teaching activities analyzed, before and after the pandemic, and Wilcoxon test statistics for paired samples (one-sided contrast, with all p-values < 0.01).

Before the COVID-19 pandemic, the correlations between the frequencies of ICT use in different academic activities were positive and statistically significant but moderate (Table 4). After the pandemic, the correlations are still positive and significant, but all of them higher than before the pandemic, with the only exception of the correlation between the lowest frequencies—those corresponding to assessment and tutoring activities—(Table 5). The results show, therefore, that after the pandemic, not only has the use of ICT by professors been strengthened but there is also a certain homogenization effect in the frequencies of use of these ICT in different teaching activities. These data indicate that, before the pandemic, professors were more likely to use ICT tools for one type of activity, independently of other activities, than after the pandemic. Therefore, it can be stated that after the pandemic, professors have increased the level of integration of ICT in teaching.

Table 4. Pearson correlation coefficients between the frequencies of ICT use for different activities before the pandemic (all coefficients are statistically significant, with p-values < 0.01).

	Lectures	Tutorials	Sharing	Evaluation
Lectures	1	0.34	0.61	0.36
Tutorials		1	0.51	0.56
Sharing			1	0.57
Evaluation				1

Table 5. Pearson correlation coefficients between the frequencies of ICT use for different activities after the pandemic (all coefficients are statistically significant, with p-values < 0.01).

	Lectures	Tutorials	Sharing	Evaluation
Lectures	1	0.58	0.75	0.55
Tutorials		1	0.62	0.54
Sharing			1	0.58
Evaluation				1

4.2. Impact of the Pandemic on Lesson Tools Use Frequencies

Among the tools for lessons, all the tools that the participating professors were asked about have significantly increased in the frequency of their use, as can be deduced from the Wilcoxon test statistics for paired samples (Figure 3). The frequency of use of Power Point® is very high and this tool was the most used of all the tools surveyed, both before and after the pandemic, by far in comparison with the rest of the resources (Figure 3). This is the tool whose use has increased the least after the pandemic because the frequency of its use before the pandemic was already very high. After Power Point®, the most used tools before the pandemic are Prezi®, Canva®, and Genially®, which are also the ones that have increased the most after the pandemic—14.52%, 33.64%, and 32.00%, respectively. Genially® and Canva® go from a low frequency of use before the pandemic to an intermediate frequency, although below 3, after the pandemic. The GoogleSlides® tool also reaches an intermediate frequency after the pandemic, but the increase in its use has been lower than the previous tools—23.27%. The tools that were used least frequently before the pandemic—Visme®, Intuiface®, and ZohoShow®—are also the ones that have increased the least in the frequency of use—11.54%, 9.02%, and 10.66%, respectively—after the pandemic. The resistance that these tools present for professors to use them more frequently may lie in their limited diffusion, the fact that their license is not free (except for ZohoShow), and the difficulty that professors experience in exporting their respective formats so that the presentations can be easily shared. Some tools that before the pandemic was used with a medium-low frequency, such as Powton®, have also experienced intermediate or low increases in their use, relative to the rest of the tools, during the pandemic (for Powton®, 18.47%).

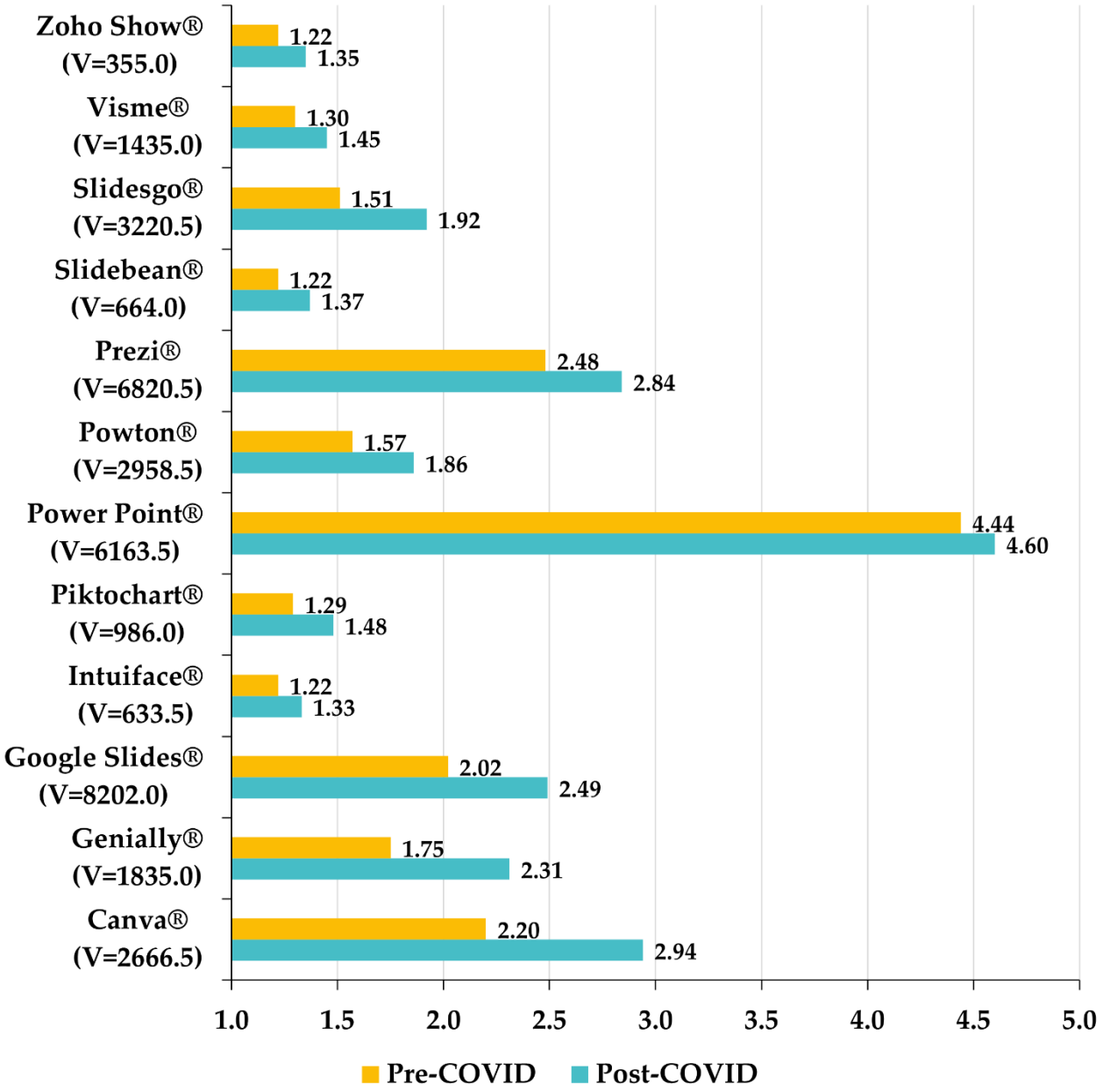

Figure 3. Mean frequencies (out of 5) of the use of each ICT for presentations during lessons, before and after the pandemic, and Wilcoxon test statistic for paired samples of each one (one-sided contrast, with all p-values < 0.01).

4.3. Impact of the Pandemic on Meetings and Tutorials Tools Use Frequencies

Among the tools for holding meetings and tutorials (Figure 4), Google Meet® and Zoom® move from being used with a low-intermediate frequency—slightly above 2—to being used with a high frequency—above 4. Microsoft Teams®, which was used at a low-intermediate frequency before the pandemic—slightly below 2—moves to a high-intermediate frequency after the pandemic—slightly below 3. The rest of the tools, although their frequency of use increases after the pandemic, remain in frequency ranges approximately similar to those they had before the pandemic: LifeSize® and Daily.co® move in low frequencies—close to 1—and Skype®, Google Hangouts®, and Blackboard® move in intermediate ranges—not reaching 3 after the pandemic in any case. From the Wilcoxon test statistics for paired samples, it is shown that tools for tutoring students have also experienced a significant increase in use during the pandemic (Figure 4). This increase is greater

or lesser depending on the specific tool. The ICT for tutoring students most frequently used before the pandemic were Google Meet®, Zoom®, and Skype®. While the first two have increased their use the most after the pandemic—95.75% and 85.65%, respectively, Skype® is the one that has increased the least in the frequency of use, which, after the pandemic, is low—an increase of 10.27% (Figure 4). Microsoft Teams® is, consequently, one of the tools whose use has increased the most after the pandemic. In fact, it was less used than Google Hangouts® before the pandemic but has been used more frequently since the pandemic.

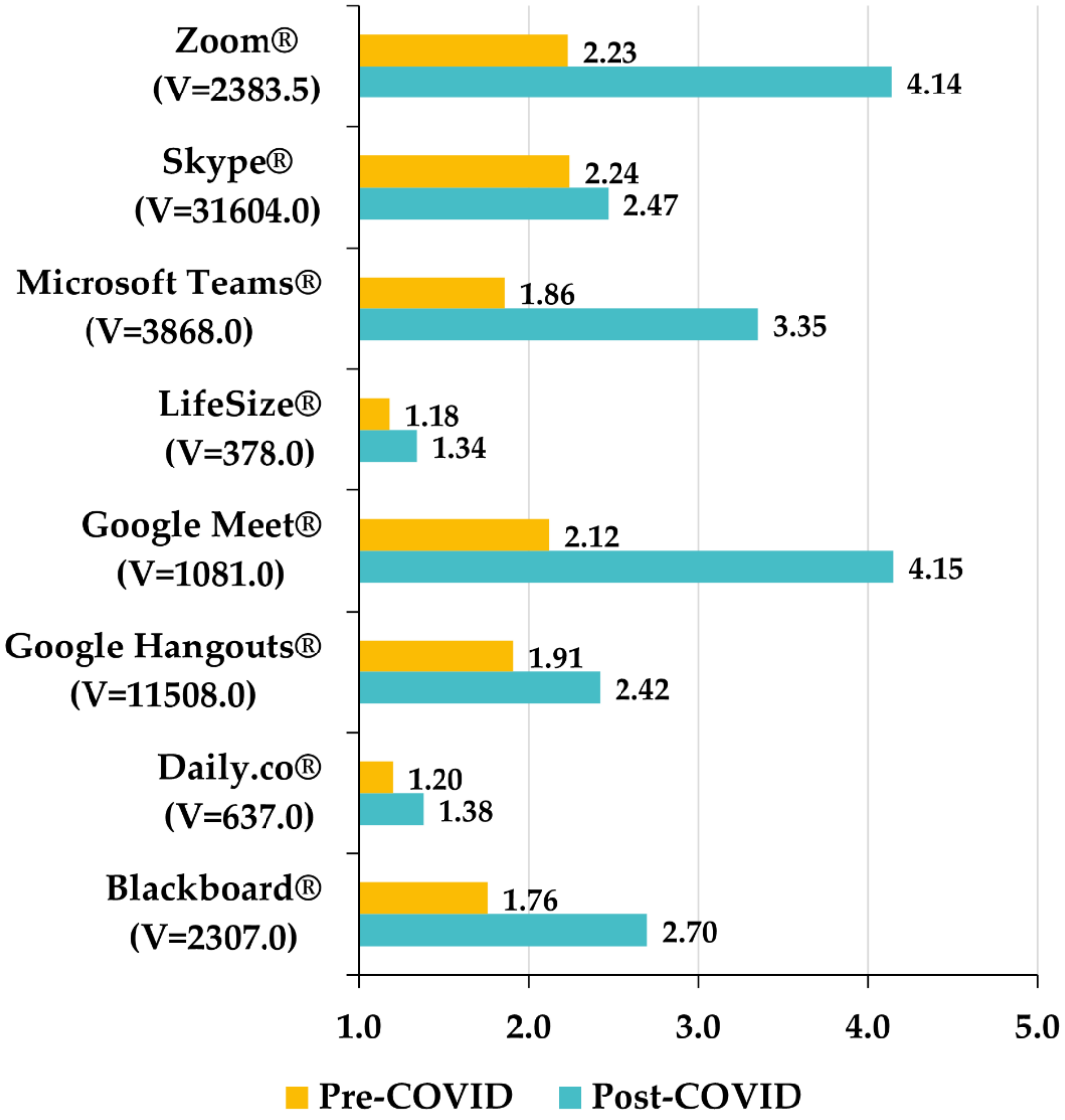

Figure 4. Mean frequencies (out of 5) of the use of each ICT for virtual tutorials with students, before and after the pandemic, and Wilcoxon test statistic for paired samples of each one (one-sided contrast, with all p-values < 0.01).

4.4. Impact of the Pandemic on Sharing Materials Tools Use Frequencies

Among the tools for sharing materials (Figure 5), YouTube®, WhatsApp®, and webinars are the ones with the highest frequency of use, both before and after the pandemic. YouTube® goes from an intermediate frequency—between 3 and 4—to a high frequency—slightly above 4, while WhatsApp and webinars do not reach frequency 4 after the pandemic. TikTok®, Twitch®, and iVoox® are at very low levels of frequency of use, both before and after the pandemic, although their average use grows after the pandemic. The rest of the tools move in intermediate frequencies, without reaching frequency 3. As it is shown in

Figure 5, among the tools for sharing materials, the most used before the pandemic are also the most used after the pandemic—specifically, YouTube® and WhatsApp®—and they are, together with Webinars, TikTok® and Instagram®, the resources whose frequency of use has increased the most. In the case of YouTube®, the increase is 24.45% and, for WhatsApp®, 27.85%. Webinars, TikTok® and Instagram®, on the other hand, have increased by 55.77%, 30.34%, and 32.07%, respectively, the frequency of their use among professors. The least used tools before the pandemic are Twitch® and iVoox®, and these remain the least used tools after the pandemic, with weak but significant increases in usage—14.63% and 11.67%, respectively. All these mentioned increases in the use of tools, platforms, and networks for sharing materials are statistically significant (Figure 5).

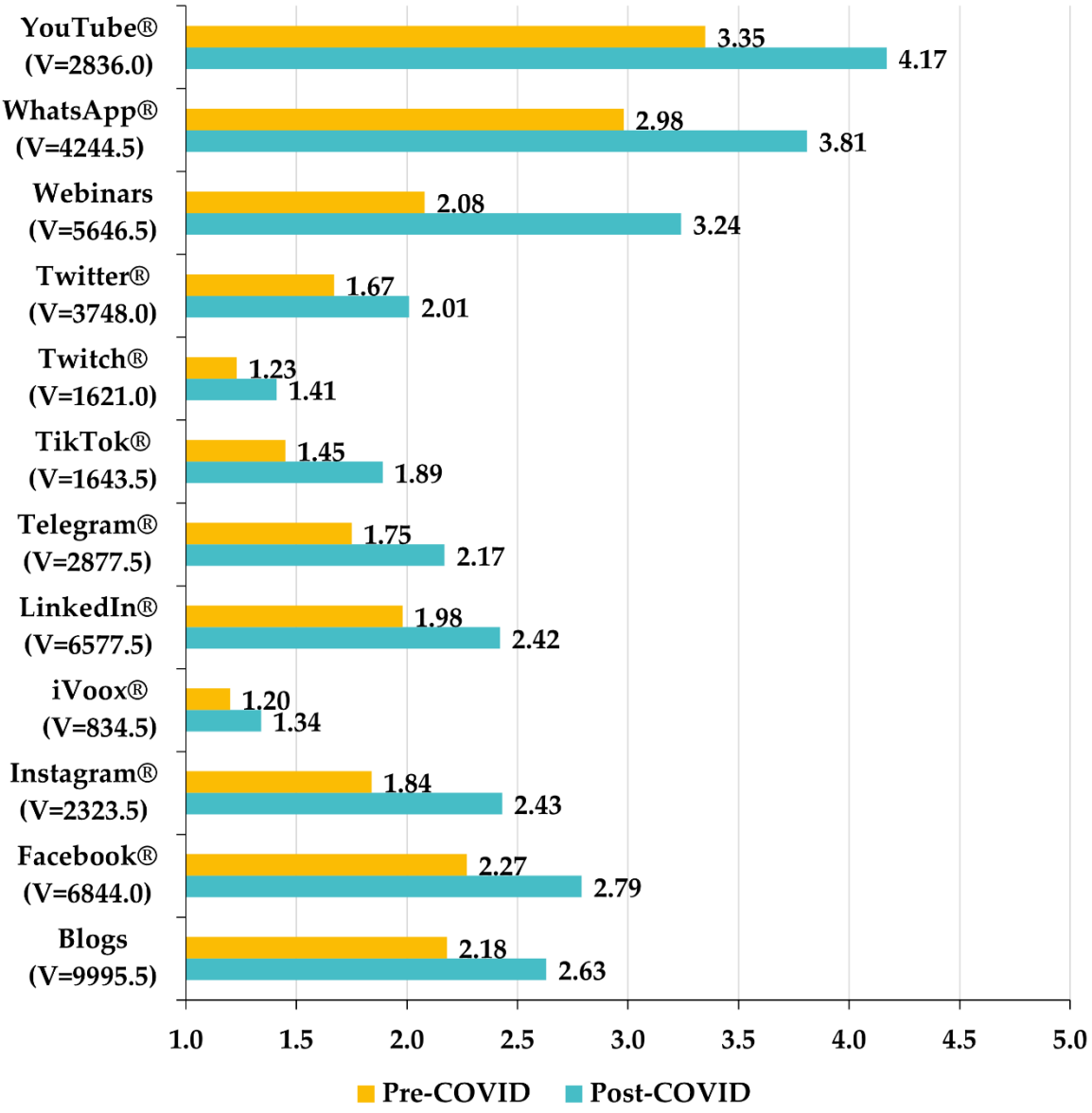

Figure 5. Mean frequencies (out of 5) of the use of each ICT for sharing materials and contents with students, before and after the pandemic, and Wilcoxon test statistic for paired samples of each one (one-sided contrast, with all p-values < 0.01).

4.5. Impact of the Pandemic on Evaluation Tools Use Frequencies

With respect to tools for monitoring and evaluating students (Figure 6), all tools move in low frequencies of use, both before and after the pandemic, except for Google Forms® and Google Classroom®, which move from a low-intermediate frequency before

the pandemic to a high-intermediate frequency, slightly below 4, after the pandemic. The rest of the tools were hardly used before the pandemic and their frequency is also very low after the pandemic. Thus, the most frequently used tools are Google Forms®, Google Classroom®, and Kahoot®, both before and after the pandemic. These three tools are also the ones that have increased the most with the pandemic—42.38%, 56.02%, and 50.56%, respectively. The least used applications before the pandemic—Poll Everywhere® and Plickers®—are also the least used after the pandemic and have seen the least increase in the frequency of use—17.32% and 15.04%, respectively. Again, all the above increases are statistically significant, as proved by the Wilcoxon test statistics shown in Figure 6.

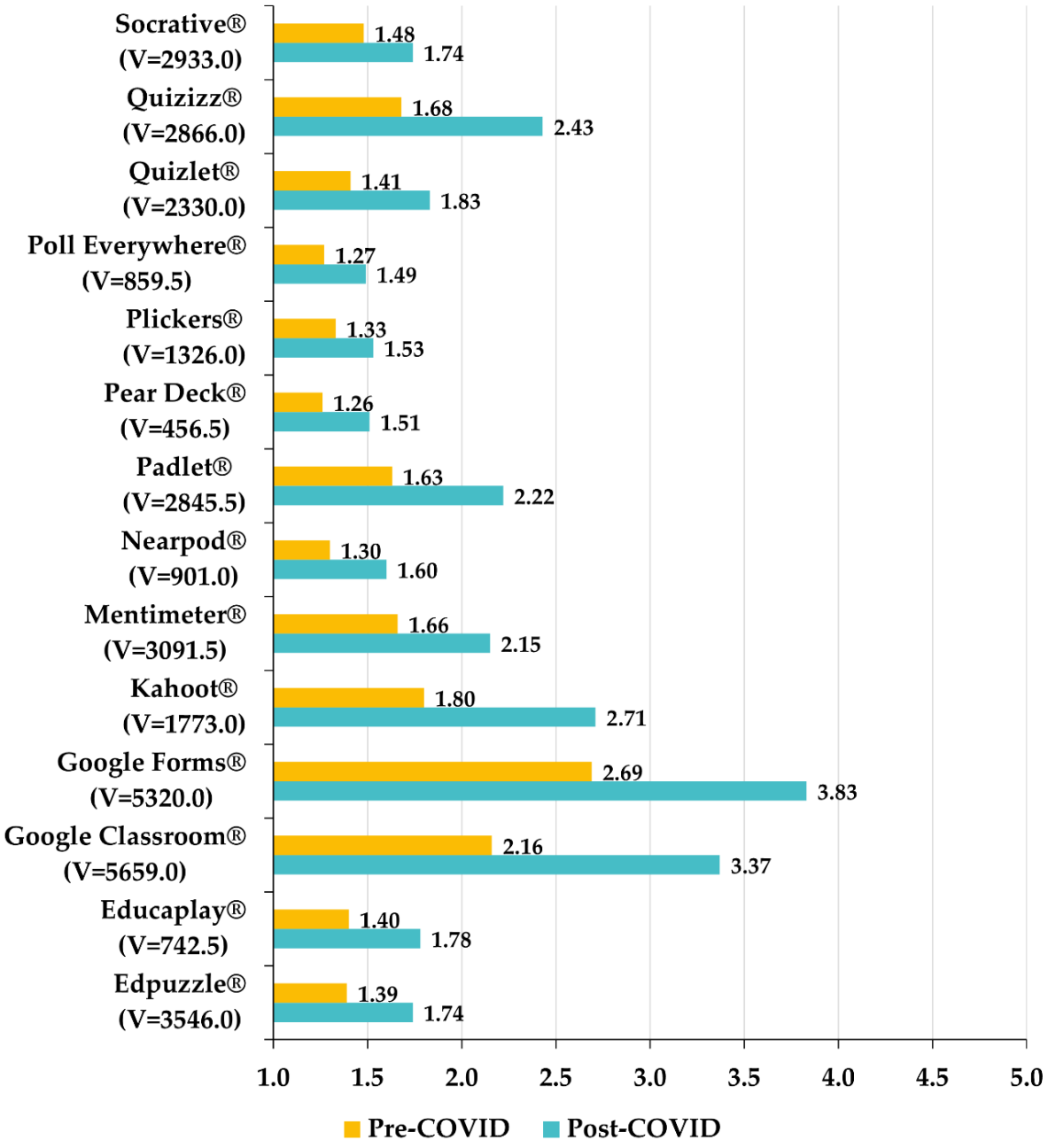

Figure 6. Mean frequencies (out of 5) of the use of each ICT for student monitoring and learning evaluation, before and after the pandemic, and Wilcoxon test statistic for paired samples of each one (one-sided contrast, with all p-values < 0.01).

4.6. Gaps by Area of Knowledge

As shown in Figure 1, the survey was answered by 119 professors from humanities, 94 from sciences, 89 from health sciences, 230 from social sciences and 184 from engineering. Cramer's V parameters, which measure the degree to which the knowledge area variable is explanatory of the distributions of responses on the frequencies of ICT use in different academic activities, are moderate but significant for all activities, both before and after the pandemic (Table 6). Before the pandemic, the area of knowledge is highly explanatory of the use of material sharing and assessment tools, and moderately so for the rest. After the pandemic, the knowledge domain is more explanatory of the use of ICT for tutoring than of all other activities. All the correlations shown in Table 6 are statistically significant.

Table 6. Cramer's V parameters correlating the expressed frequencies of ICT use in different academic activities with the area of knowledge.

	Before the Pandemic	After the Pandemic
Lessons	0.42	0.61
Tutorials	0.57	0.84
Sharing	0.83	0.66
Evaluation	0.88	0.58

The highest frequencies of ICT use before the pandemic were in the area of sciences, while the lowest frequencies were in health sciences in all the studied families of ICT tools (Table 7). On the other hand, after the pandemic, the average frequency of ICT use in sharing materials and tutorials is higher in sciences than in health sciences, and in sharing materials and evaluation than in social sciences. Likewise, evaluation and tutoring activities are the ones with the lowest frequencies, both before and after the pandemic, in all knowledge areas. The Kruskal-Wallis test statistics (Table 8) reveal that before the pandemic, the aforementioned differences between areas of knowledge in terms of the frequency of ICT use among professors were significant in all academic activities since all chi-squares are high and all p-values are less than 0.05. The significant nature of these differences is maintained after the pandemic, except in evaluation activities, where the use of ICT seems to have homogenized in all areas (Table 8). Indeed, in the evaluation activities, the chi-square value is notably lower than in the rest of the activities and the p-value exceeds the 0.05 level of significance, which indicates that, after the pandemic, no significant differences are observed in the use of ICT tools for student evaluation by areas of knowledge, something that did occur before the pandemic. In lesson activities, tutoring, and material sharing, the knowledge area continues to be a discriminating variable in the post-pandemic period, as they were before the pandemic.

Table 7. Mean frequencies (out of 5) of the use of each ICT for different teaching activities before and after the pandemic (Pre means pre-COVID and Post means post-COVID), differentiated by the knowledge area of the professors.

	Humanities		Sciences		Health Sci.		Social Sci.		Engineering	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Lessons	3.88	4.56	4.07	4.33	3.66	4.40	3.83	4.50	3.98	4.61
Tutorials	2.61	4.27	3.00	3.97	2.57	3.93	2.66	4.38	2.97	4.28
Sharing	3.61	4.61	3.85	4.61	3.10	4.42	3.57	4.41	3.69	4.65
Evaluation	2.91	4.23	3.26	4.21	2.36	4.22	2.84	4.19	2.96	4.35

Table 8. Kruskal-Wallis statistics (with 4 degrees of freedom) for comparison of the distributions of the frequencies of ICT use of the academic activities analyzed in different areas of knowledge, before and after the pandemic.

	Before the Pandemic		After the Pandemic	
	Chi-Square	***p***	**Chi-Square**	***p***
Lessons	10.750	0.03	16.291	<0.01
Tutorials	16.903	<0.01	28.379	<0.01
Sharing	27.801	<0.01	20.770	<0.01
Evaluation	28.261	<0.01	6.534	0.16

The graph in Figure 7 has been constructed by measuring the relative increases in the frequency of use of different ICT families in each of the areas of knowledge studied, according to the data indicated in Table 7. In both social sciences and engineering, the highest growth rate occurs in evaluation tools, while in health sciences, humanities and sciences, the highest increase occurs in tutoring activities. The smallest increase is in classroom activities, which are the most frequently used ICT before the pandemic, in all knowledge areas. The two activities in which ICT use is most infrequent—evaluations and tutorials—show the greatest increase in ICT use post-pandemic compared to pre-pandemic use (Figure 7). Finally, social sciences is the area with the largest relative increase in ICT use after the pandemic in all areas, and Sciences is the area with the smallest increase, although it is not the area with the highest absolute frequencies—except in classroom activities, as it is shown in Figure 7. The Wilcoxon test for paired samples (Table 9) shows that all the above increases are statistically significant since all *p*-values are less than 0.05.

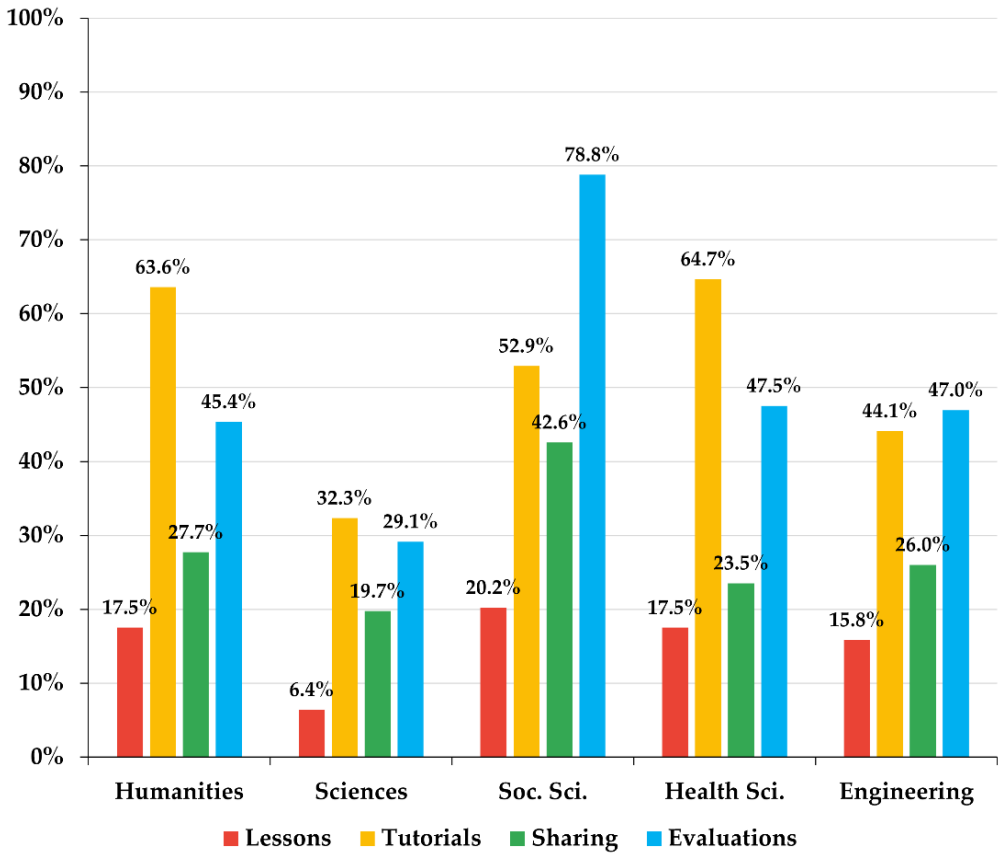

Figure 7. Relative increases in the frequency of ICT use in the teaching activities analyzed, differentiated by areas of knowledge.

Table 9. Wilcoxon test statistics for paired samples (one-sided contrast) for comparison of post-pandemic ICT use frequencies with respect to pre-pandemic frequencies.

	Humanities		Sciences		Health Sci.		Social Sci.		Engineering	
	V	*p*	V	*p*	V	*p*	V	*p*	V	*p*
Lessons	104.0	<0.01	176.5	<0.01	0.0	<0.01	212.5	<0.01	192.0	<0.01
Tutorials	0.0	<0.01	148.5	<0.01	57.0	<0.01	58.5	<0.01	437.0	<0.01
Sharing	0.0	<0.01	51.0	<0.01	0.0	<0.01	412.0	<0.01	0.0	<0.01
Evaluation	222.0	<0.01	219.0	<0.01	0.0	<0.01	684.0	<0.01	185.5	<0.01

5. Discussion

As illustrated in the summary scheme in Figure 8, with respect to the use of ICT in different academic activities, the following conclusions can be drawn: (i) the pandemic has led to an increase in the use of ICT in all families of activities in higher education described by UNESCO [28], and also by those works contextualized in the theory of self-regulated learning [30,31] (Figure 2), although professors in higher education have a lower ICT usage habit than teachers in pre-university education stages [24,25]; (ii) the largest increases have been in the activities where ICT were less used before the pandemic—tutorials and evaluations—(Figure 2); (iii) a greater level of homogeneity in the frequency of ICT use has been reached after the pandemic than before the pandemic (Figure 2 and Tables 2 and 3); and (iv) the use of ICT tools for classroom presentations and sharing materials continues to be slightly more frequent after the pandemic than the rest of the activities, although the increase in their use has been smaller. The results point to an increase in the use of ICT during the pandemic, which may result in an improvement in the quality of training, as suggested by the specialized literature [31,34,37,42]. Likewise, the superiority in the frequency of ICT uses for presentations and sharing materials is consistent with the greater training that the literature attributes, in general, to professors for the use of this type of tool over others that are focused on different didactic activities [67,68].

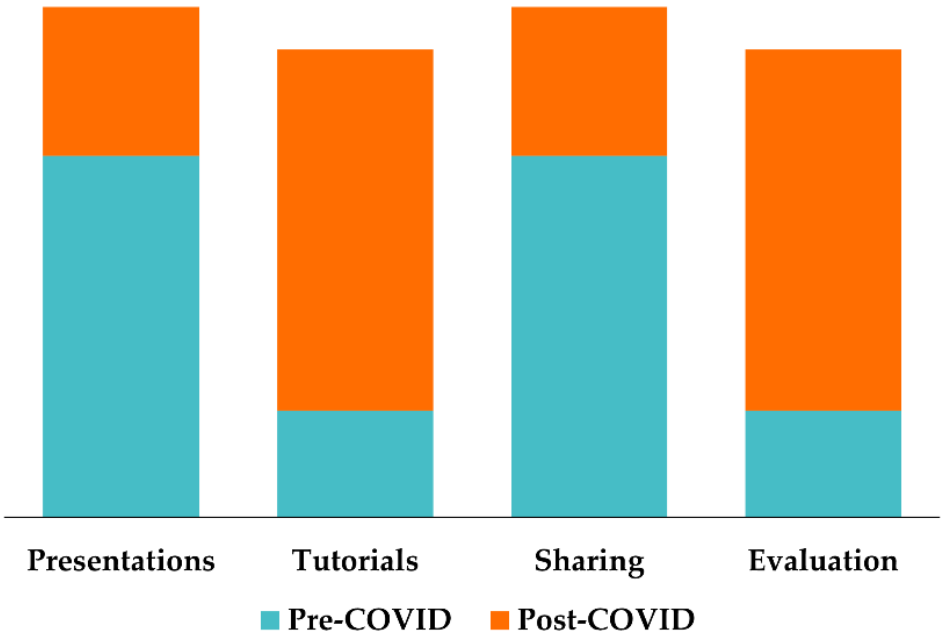

Figure 8. Schematic summary of the results on increases in the frequency of use of ICT tools after the pandemic.

The above observations support the idea that there is a strong tradition in higher education of employing ICT tools to support oral classroom presentations, such as Power Point®, Prezi®, Canva®, or Genially® [39], while the introduction of social networks, apps, or content sharing platforms in higher education finds greater resistance than in other educational stages [24,25]. In fact, except for Power Point®, the presentation tools mentioned are both the most used before the pandemic and the ones whose use increased the most after it (Figure 3). Regarding the sharing of materials, professors have probably found themselves with the advantage that there are content repositories, such as YouTube® [31], messaging platforms, such as WhatsApp® [34], and social networks, such as Instagram® [31] or TikTok® [34], which were already used by young people, although not for educational purposes [21–25]. Among other things, the use of these types of platforms has allowed professors to incorporate innovative methodological recourses in their classes, such as humorous resources [101]. All this has undoubtedly facilitated the integration of ICT tools in academic activities, which may explain why their use has increased during the pandemic to a greater extent than other tools (Figure 5).

The video conferencing tools most used by professors after the pandemic to hold meetings and tutorials are Google Meet® [31] and Zoom® [33], which have seen their use grow the most in recent years (Figure 4). This observation is consistent with the perception of students who have Zoom® among their favorite and most learning-friendly video conferencing tools [33], the effectiveness of adopting ICT tools to encourage discussions with students during classes [102] and the training benefits that the literature attributes to tools known to the public, such as Google Meet® [32]. Skype®, although used by professors before the pandemic with an average frequency like those of Google Meet® or Zoom®, has not experienced a significant increase in use during the COVID-19 pandemic (Figure 4). Further study of this tool would be necessary to identify the reasons for this.

The use of digital assessment tools has also undergone a strong increase after the pandemic (Figure 2), which mainly affects the resources most frequently used before the pandemic—especially Google Classroom®, Google Forms® [31], and Kahoot® [36,37] (Figure 6). Although the literature supports the effectiveness of minority digital assessment tools, such as Padlet®, Poll Everywhere®, or Quizizz® [35,36,38,103], the results seem to suggest that professors' lack of experience in their use exerts a strong opposition to their integration, despite the needs arising from the pandemic [2,78].

Consequently, the observed inclinations of professors towards the use of one or the other tools usually correspond to the fact that they were already familiar with them before the pandemic or that they are tools habitually used by students in their daily lives. In any case, the results suggest that, if professors had access to and received specific training on the didactic application of certain ICT tools, they would probably incorporate them into their teaching methodologies. Consequently, it is recommended that universities reinforce investment in equipment and devices that facilitate professors' access to the use of ICT [58] and the implementation of faculty training plans in the field of the use of ICT tools in different teaching activities and their didactic applicability, in order to achieve the transformation of professors' attitudes towards the integration of technologies in the classroom suggested by the literature [43,45,62–66]. Likewise, these recommendations are consistent with the digitalization needs identified in the previous literature in universities in the Latin American region [87,97] and with the positive correlation established in previous works between the digital training and experience of Latin American professors and the learning and digital skills developed by their students [92]. This is also consistent with professors' demand for training to increase their digital teaching competence [21,22] and with the need, confirmed by the specialized literature, to favor the real integration of ICT in higher education teaching activities through faculty training [29].

The area of knowledge has been shown to be a discriminating variable of the impact of the pandemic on the digital habits of Latin American professors, since it is a variable that significantly explains the answers given by the participants about their usage habits of different ICTs, both before and after the pandemic (Table 6). This is consistent with the

diverse affective impact that the pandemic has had on Latin American professors according to knowledge areas, as shown in the literature [60,61]. Although the pandemic has led to increases in the use of ICT in all academic activities and in all areas of knowledge, reaching very high frequencies in all of them (Table 7), the largest increases are in social sciences (Figure 7), except in ICT for tutorials and meetings. However, professors in this area are not the most frequent users of ICT after the pandemic, in general, although the frequencies expressed after the pandemic are more homogeneous among knowledge areas than those before the pandemic (Table 7). Consequently, the results suggest that the greatest effort to digitize academic processes has been made by professors in social sciences, but it would be necessary to increase the sample of participants from other areas to confirm this point. These results are consistent with those obtained by other studies that attribute a greater digital competence and predisposition to the use of ICT to social science professors [83], although there is no study in the literature that expressly analyzes the impact that the pandemic has had on the frequency of ICT use, differentiating by subject area. However, there are studies that do not support the results obtained here [66], so it seems necessary to continue research in this line to find other variables that condition the habits of ICT use among professors of different areas of knowledge. The proportion of scientific publications on faculty digitization is higher in social sciences than in the other knowledge areas [93], which is in line with the results obtained here. All this suggests that the training on digital competencies that it is suggested that universities should carry out should be different for professors in different knowledge areas, because, certainly, the rates of incorporation of ICT tools are different according to the fields.

6. Implications and Limitations

Throughout this research, it has been shown that the area of knowledge is a significantly influential variable in the habit of using ICTs and that it explains how the process of integration of ICTs in higher education has occurred in Latin American universities. It follows that the actions carried out by universities to favor the digitization of educational processes—mainly, increasing technologies, resources, equipment, and teacher training—should be designed specifically to meet the needs of each area of knowledge. Furthermore, given that the results obtained are only partially consistent with previous literature, it is necessary to intensify research in this area. To this end, it is suggested that quantitative studies be carried out to identify new variables that discriminate and explain the impact of the pandemic on the use of ICT and to complete the results obtained here with qualitative or mixed studies that help to clarify the reasons for the differences shown here between areas of knowledge.

The research conducted here has a natural extension with the design, validation, and application of a scale for the use and valuation of ICT in higher education. In this way, a broader instrument would be available with which to perform, for example, factor analysis, which would make it possible to use a classification of ICT families that would emerge from the data collected.

As shown in Table 2, in each country represented in this study there is not a homogeneous distribution of different areas of knowledge. In fact, some of the areas are not represented in certain countries, due to the small population of some of them. For this reason, it is not possible to extrapolate conclusions that affect specific countries, but only conclusions have been drawn for the region. This is, in fact, the main limitation of the study. As a future line of research, it is proposed to increase the size of the sample, homogenizing the participation of different areas of knowledge so that there is sufficient representation of all the countries of the region in all areas. This would make it possible to identify the specific characteristics of each country. Likewise, an increase in the sample size and a homogenization of the distribution of the participants by areas of knowledge would make it possible to strengthen the conclusions drawn here in this regard. The design of the survey and, consequently, the analysis of the responses, depends strongly on the contents worked on in the initial training, which constitutes a second limitation of the work. Finally, other

academic variables have not been considered in this study, like age, teaching experience, or the academic rank in which the participants serve. As a future line of research, it is proposed to study the influence of these types of variables on the impact of the pandemic on the frequency of use of ICT in higher education.

7. Conclusions

The COVID-19 pandemic has caused university professors to increase the frequency of ICT use in all teaching activities, to the point that their use is very frequent in all of them. The greatest increase has been in the use of communication platforms for tutorials and digital tools for monitoring and evaluating learning, which are the activities in which ICT were used to a lesser extent before the pandemic. The digitalization of teaching activity caused by the pandemic has had a homogenizing effect on the habits of ICT use in different academic activities.

In general, the tools most used before the pandemic are also those most frequently used after it, and those that have most increased their use during the pandemic. Specifically, the frequency of the use of ICT resources for tutorials and discussion with students has increased after the pandemic by more than 50% and for evaluation by almost 50%, while the use of ICT for sharing material has increased by just over 25% and for class presentations by just over 15%. Exceptions to this last observation are Power Point®, whose use was already very frequent before the pandemic, and Skype®, whose use has increased only slightly compared to other tools for similar uses, such as Google Meet® or Zoom®.

The increase in the frequency of use of ICT resources has led to a certain, although not complete, homogenization in the use of these tools in various academic activities, which means that the pandemic has helped professors in the region to move towards the integration of ICT in their teaching activities.

The area of knowledge of the professors is an influential variable in the impact of the pandemic on ICT usage habits in the region of Latin America and the Caribbean. Specifically, social sciences professors have increased their use of ICTs, in general, to a greater extent than professors in other areas. In addition, engineering and social sciences professors have increased the use of ICT tools for evaluation more than for the rest of the activities, while, among humanities, sciences, and health sciences professors, the greatest increase has taken place in meetings and tutoring activities. However, it would be convenient to confirm these extremes through a study in which the proportion of participants from areas other than social sciences is increased.

It is recommended that universities intensify their training sessions for faculty on digital competence, focusing on the pedagogical adaptation of different tools, applications, and platforms. It is also suggested that these training sessions be adapted to the singularities of each area of knowledge.

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Institutional Review Board Statement: The protocol was approved by the Ethics Committee of the Project "Influence of COVID-19 on teaching: digitization of laboratory practices at UCAV" (1 September 2021).

Informed Consent Statement: All participants were informed about the anonymous nature of their participation, why the research is being conducted, how their data will be used and that under no circumstances would their data be used to identify them.

Data Availability Statement: The data are not publicly available because they are part of a larger project involving more researchers. If you have any questions, please ask the contact author.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A. Survey

The survey used as a research instrument consisted of 8 questions indicated below. Participants were invited to respond to each of them according to a Likert scale from 1 to 5 in which each value acquires the following meaning:

1. 1: Never;
2. 2: Occasional and extraordinary use—at most, once a month;
3. 3: Infrequent regular use—less than once a week, but, at least, every month;
4. 4: Frequent regular use—weekly but not in every class;
5. 5: Very frequent regular use—in all classes;

Questions:

1. *Classroom presentations and lessons:*
    (a) How often did you use ICT tools for classroom presentations and lessons prior to the COVID-19 pandemic?
    (b) How often do you use ICT tools for classroom presentations and lessons after the COVID-19 pandemic?
2. *Tutorials and meetings:*
    (a) How often did you use ICT tools for tutorials and meetings with students prior to the COVID-19 pandemic?
    (b) How often do you use ICT tools for tutorials and meetings with students after the COVID-19 pandemic?
3. *Sharing materials:*
    (a) How often did you use ICT tools for sharing materials with students prior to the COVID-19 pandemic?
    (b) How often do you use ICT tools for sharing materials with students after the COVID-19 pandemic?
4. *Evaluation:*
    (a) How often did you use ICT tools to evaluate students prior to the COVID-19 pandemic?
    (b) How often do you use ICT tools to evaluate students after the COVID-19 pandemic?
5. How often did you use each of these tools for classroom presentations before and after the pandemic?
    (a) Zoho Show®
    (b) Visme®
    (c) Slidesgo®
    (d) Slidebean®
    (e) rezi®
    (f) Powton®
    (g) Power Point®
    (h) Piktochart®
    (i) Intuiface®
    (j) Google Slides®
    (k) Genially®
    (l) Canva®
6. How often did you use each of these tools for tutorials and meetings before and after the pandemic?
    (a) Zoom®
    (b) Skype®
    (c) Microsoft Team®

(d) LifeSize®
(e) Google Meet®
(f) Google Hangouts®
(g) Daily.co®
(h) Blackboard®

7. How often did you use each of these tools for sharing materials before and after the pandemic?
   (a) YouTube®
   (b) WhatsApp®
   (c) Webinars
   (d) Twitter®
   (e) Twitch®
   (f) TikTok®
   (g) Telegram®
   (h) LinkedIn®
   (i) iVoox®
   (j) Instagram®
   (k) Facebook®
   (l) Blogs
8. How often did you use each of these tools to evaluate students before and after the pandemic?
   (a) Socrative®
   (b) Quizizz®
   (c) Quizlet®
   (d) Poll Everywhere®
   (e) Plickers®
   (f) Pear Deck®
   (g) Nearpod®
   (h) Mentimeter®
   (i) Kahoot®
   (h) Google Forms®
   (k) Google Classroom®
   (l) Educaplay®
   (m) Edpuzzle®

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