The use of technologies by university professors

O uso de tecnologias por professores universitários

El uso de tecnologías por los profesores universitarios

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Abstract
The need to change from the traditional teaching model to the virtual one due to the social isolation leads to discussions about maximizing the use of Information and Communication Technologies (ICT) in education. This study aimed to evaluate the profile of the use of technologies in education and the acceptance and resistance to the use of ICT by faculty members in higher education in health during the COVID-19 pandemic. This study is a quantitative observational cross-sectional study, carried out from March to December 2020, with the universe of investigation being all the teachers linked to the undergraduate level courses in the health area of a higher education institution. The results show that of all the professionals surveyed (n = 248), 46.4% (n = 115) had already had access to knowledge or some training in ICT. When comparing data from before and during the pandemic, we observed a significant increase in the indicators of teachers' experience in remote classes (from 5.2% to 72.2%), knowledge about virtual learning resources (from 8,1% to 60.9%), consideration of the importance of knowledge about ICT (from 46.4% to 98.4%) and training in the area (from 19.4% to

55.7%), besides the reduction in the level of difficulty of teachers regarding the change from the traditional model to the technological one (from 26.6% to 3.6%). We conclude that most teachers improved their acceptance of ICT use during the pandemic. The transition from the traditional to the virtual model positively impacted this process.
Keywords: Information technology ; Health education; Faculty; Social isolation; COVID-19.

Resumo
A necessidade de mudança do modelo tradicional de ensino para o virtual devido ao isolamento social fomenta discussões acerca da maximização do uso das tecnologias da informação e comunicação (TICs) na educação. Este estudo teve como objetivo investigar a capacidade de aceitação e de resistência ao uso de TICs por docentes do ensino superior em saúde durante a pandemia da COVID-19. Trata-se de um estudo quantitativo observacional de caráter transversal, realizado durante os meses de março a dezembro de 2020. O universo de investigação envolveu todos os docentes vinculados aos cursos de nível de graduação na área da saúde de uma instituição de ensino superior. Do total de profissionais investigados (n = 248), 46,4% (n = 115) já tiveram acesso a conhecimento ou a alguma capacitação em TICs. Quando comparados os dados de antes e durante a pandemia, observou-se um aumento significativo nos indicadores de experiência dos docentes em aulas remotas (de 5,2% para 72,2%), de conhecimento sobre recursos virtuais de aprendizagem (de 8,1% para 60,9%), de consideração da importância de conhecimentos sobre TIC (de 46,4% para 98,4%) e de capacitação na área (de 19,4% para 55,7%), além da redução no nível de dificuldade dos professores quanto à mudança do modelo tradicional para o tecnológico (de 26,6% para 3,6%). Pode-se concluir que a maioria dos docentes melhorou aceitação ao uso de TIC durante o período de pandemia e que a transição do modelo tradicional para o virtual trouxe impactos positivos para esse processo.
Palavras-chave: Tecnologia da informação; Educação em saúde; Docentes; Isolamento social; Pandemia por COVID-19.

Resumen
La necesidad de cambiar del modelo de enseñanza tradicional al virtual debido al aislamiento social conduce a discusiones sobre la maximización del uso de las Tecnologías de la Información y la Comunicación (TIC) en la educación. Este estudio tuvo como objetivo evaluar el perfil del uso de las tecnologías en la educación y la aceptación y resistencia al uso de las TIC por parte de los docentes de educación superior en salud durante la pandemia COVID-19. Se trata de un estudio cuantitativo observacional transversal, realizado de marzo a diciembre de 2020, siendo el universo de investigación todos los docentes vinculados a los cursos de grado en el área de salud de una institución de educación superior. Los resultados muestran que de todos los profesionales encuestados (n = 248), el 46,4% (n = 115) ya tenía acceso al conocimiento o alguna formación en TIC. Al comparar los datos de antes y durante la pandemia, observamos un aumento significativo en los indicadores de la experiencia de los docentes en clases remotas (del 5,2% al 72,2%), el conocimiento sobre recursos de aprendizaje virtual (del 8,1% al 60,9%)consideración de la importancia del conocimiento sobre las TIC (del 46,4% al 98,4%) y de la formación en el área (del 19,4% al 55,7%), además de la reducción del nivel de dificultad del profesorado en el cambio del modelo tradicional al tecnológico (del 26,6% al 3,6%). Concluimos que la mayoría de los docentes mejoraron su aceptación del uso de las TIC durante la pandemia. La transición del modelo tradicional al virtual impactó positivamente en este proceso.
Palabras clave: Tecnología de la información; Educación en salud; Facultad; Aislamiento social; Pandemia de COVID-19.

1. Introduction

Given the global context of the dissemination of SARS-CoV2, since mid-December 2019, several countries, including Brazil, have started to adopt social distancing as one of the ways to prevent and delay the spread of the virus. Thus, many educational institutions have opted not to close the academic term and to continue it through remote education. Hence, many schools and colleges have started using teleconferencing programs and teaching platforms to transmit lectures and classes to their students, ensuring the continuity of the educational process (Aquino et al., 2020; Lei & So, 2021; Mian & Khan, 2020; Qian & Jiang, 2020).

Before the pandemic, ICT were used in the health area at several universities to maximize the teaching-learning process (Frehywot et al., 2013; Masic, 2008; Pereira et al., 2016). Thus, tools such as applications, social networks, telepresence, and virtual or augmented reality can be used to promote effective learning (Tori, 2010). Meantime, many university professors preferred the face-to-face teaching model and felt difficulty with the introduction of technologies in the academic environment (Carlini & Scarpato, 2008).

The COVID-19 pandemic has negatively impacted several aspects of education, including factors such as location, impossibility of face-to-face classes; resources, difficulty accessing libraries; and health, with the risks of contamination and necessary protection measures. In addition, the lack of interest in e-learning by some faculties, their inexperience in producing content for this teaching modality and their insufficient specialization in the area were aspects that made this transition from face-to-face classes to e-learning difficult (Karimian et al., 2022; Saeedi et al., 2022).

Thus, due to the new educational scenario created by the pandemic, it would be important to analyze how the transition from face-to-face teaching to e-learning was and how this impacted the use of technologies by the teachers. Hence this research aims to evaluate the use of technologies in health schools' education and to develop and validate an instrument to analyze the acceptance and resistance to the use of ICT by higher education health faculty during the COVID-19 pandemic.

2. Material and Methods

This study is a cross-sectional observational quantitative study conducted from March to December 2019, with the development and validation of an instrument to analyze acceptance and resistance to the use of information and communication technologies by higher education professors in health courses.

Based on previous research, this study firstly involved the construction of a literature review on the theme of ICT in the context of teaching in the health area and the most recent works in the literature on the impact of the pandemic on the use of these technologies (Carlos et al., 2016; Daroda, 2012). Subsequently, data were collected through virtual questionnaires sent to the professors' email, and the research findings consolidated concerning the profile of the professors surveyed and their different areas of activity, making it possible to identify the weaknesses and needs in the teaching and learning process using ICT.

The research universe involved all the professors related to the undergraduate level courses in the health area of a higher education institution located in the city of Fortaleza, state of Ceará, totaling a sample of 248 individuals. It is also noteworthy that the institution was selected because it has a considerable number of courses in the health area and encourages the use of innovative teaching methodologies.

Specifically, regarding the data collection stage, it is essential to emphasize that it was carried out by applying a structured questionnaire previously validated and adapted to the institutional context in which the study unfolded (Daroda, 2012). This questionnaire addressed aspects related to the profile of the professors evaluated and their level of affinity with ICT in teaching in the period before and during the pandemic. It is important to emphasize that the data collection occurred after the institution's agreement.

Additionally, we applied a questionnaire containing two sets of questions: a set related to the characterization of the sample and profile of ICT use before and during the suspension of theoretical classes due to the pandemic, and another with the Technology Acceptance Model (TAM) questionnaire (Holden & Karsh, 2010), which consists of a Likert-type scale with five points of acceptance to the use of ICT (Table 1). For data analysis, the sum of the scores was multiplied by 5 to adjust the TAM scale from 0-100.

The survey data were exported to a Microsoft Excel spreadsheet and subsequently coded and analyzed using Statistical Package for the Social Sciences (SPSS) software version 20.0 on Windows.

The absolute and percentage frequencies of each questionnaire item were expressed. The internal validity of the questionnaire was calculated using Cronbach's alpha coefficient, both for the construct as a whole and to exclude items, to assess the influence of each item. Next, the Kaiser-Meyer-Olkin factor reduction model and Bartlett's test of sphericity were used to construct

the domains of the questionnaires. The items in each domain were summed, and since the number of items in each domain was different, the scale was adjusted to 0-100 to enable comparison of the two domains (Wilcoxon's test and Spearman's correlation).

Thus, the frequencies of activities before and during the pandemic were compared by McNemar's test. The questionnaire domains were categorized based on the median (below and above the median) to cross with the other variables through Pearson's chi-square test or Fisher's exact test. All variables were also used in a multinomial logistic regression model (multivariate analysis).

This project was approved by the research ethics committee of the Centro Universitário Christus, being approved through opinion number 3.319.599. All conducts were performed under Resolution No. 466/2012 of the National Health Council (NHC), considering human dignity and due protection of participants in scientific research involving human beings.

Table 1 - Questionnaire for evaluating adherence/resistance to ICT in professors of health courses.

	Score				
	0	**1**	**2**	**3**	**4**
Q1. How would you rate the importance of knowledge about virtual learning resources in healthcare?	No importance	Little importance	Some importance	A lot of importance	Indispensable
Q2. How would you rate your knowledge about virtual learning resources in adapting pedagogical activities to students' needs?	No knowledge	Little knowledge	Some knowledge	A lot of knowledge	Master the subject
Q3. How would you rate your participation in training courses on virtual learning resources in your institution?	Never	A few times	Sometimes	Often	Always
Q4. How would you rate the availability and use of virtual learning resources in your educational institution?	Always unavailable	Almost always unavailable	Available most of the time	Almost Always available	Sempre disponível
Q5. How would you rate your preference regarding the use of the traditional teaching model to the use of virtual learning resources?	No preference	Low preference	Some preference	A lot of preference	Indifferent
Q6. How would you rate your level of difficulty regarding the change from the traditional to the technological model?	No difficulties	Little difficulty	Some difficulty	A loto f difficulty	Impossible dificulty
Q7. How would you rate your percentage of incorporation of virtual learning resources in your teaching practices?	0%	1% to 25%	26% to 50%	51% to 75%	76% to 100%
Q8. What is the percentage of use of technological resources for personal matters?	0%	1% to 25%	26% to 50%	51% to 75%	76% to 100%
Q9. How would you rate your level of experience with remote classes?	No experience	Little experience	Some experience	A lot of experience	Full mastery
Q10. How much do you know about fatigue from using the virtual environment (zoom fatigue)?	No knowledge	Little knowledge	Some knowledge	A lot of knowledge	Master the subject
Q11. How much do you know about the cognitive overload generated by remote and face-to-face classes?	No knowledge	Little knowledge	Some knowledge	A lot of knowledge	Master the subject
Q12. What is your perception regarding the application of remote learning assessment?	Very bad	Bad	Regular	Good	Very good
Q13. How would you rate your level of knowledge about creating digital resources on platforms (e.g., Moodle and others)?	No knowledge	Little knowledge	Some knowledge	A lot of knowledge	Master the subject
Q14. How would you rate your level of knowledge about responsible use of technologies among students (ways of relating, risk of image exchanges, etc.)?	No knowledge	Little knowledge	Some knowledge	A lot of knowledge	Master the subject

Source: Authors.

3. Results

3.1 Characterization of the sample and profile of ICT use before and during the pandemic

Before presenting the statistical results applied to the study, the inferential analysis of the data collected is essential, considering that the previous study of this information generates more familiarity with the sample and makes it possible to understand the different perceptions of the professors in the periods before and during the process of social isolation.

Table 2 shows the sample characteristics. The mean age was 40.71 ± 9.43 (Median = 38, Range = 25 - 78). Most of the faculty were under 40 years old (n=140, 56.5%) and taught in medical school (n=108, 43.5%). Almost all faculty members taught only one course (n=229, 92.3%). Of all the professionals investigated, 115 (46.4%) had had some access to knowledge or training in ICT.

Table 2 - Characterization of the sample.

	n (%)
Total	**248 (100.0%)**
Age	
<40 years old	140 (56.5%)
40+	108 (43.5%)
Faculty	
Medicine	108 (43.5%)
Nursing	25 (10.1%)
Physiotherapy	21 (8.5%)
Biomedicine	23 (9.3%)
Dentistry	41 (16.5%)
Psychology	34 (13.7%)
Radiology	16 (6.5%)
Nutrition	9 (3.6%)
Number of courses you teach	
1	229 (92.3%)
2	13 (5.2%)
3	2 (0.8%)
4	4 (1.6%)
ICT Knowledge	115 (46.4%)

Source: Authors.

From the period before the pandemic to after the pandemic, there was a significant increase in the use of virtual platforms such as Google Meet (p<0.001), Hangouts (p<0.001), Skype (p<0.001), YouTube (p=0.018) and Zoom (p<0.001) and a significant decrease in the use of Kahoot (p<0.001) and Mentimeter (p=0.021). However, other platforms showed no significant increase in the frequency of use (p=0.210).

The use of resources for professional matters such as Microsoft Word (p=0.011), Microsoft PowerPoint (p<0.001), Microsoft Excel (p<0.001), WhatsApp (p<0.001), email (p<0.001), general search sites (p<0.001), scientific (p<0.001) and entertainment sites (p=0.002) showed a significant increase in the frequency of use from the pre-pandemic period to the period during the pandemic (p<0.001).

Table 3 shows the results of the analysis of the use of ICTs before and after the pandemic. The classification of professors' level of experience in remote classes showed a considerable increase, going from 5.2% of professors with enough experience or total mastery before the pandemic to 72.2% during the pandemic. The level of difficulty regarding the change from the traditional model to the technological one fell, from 26.6% with great difficulty before the pandemic to only 3.6% with great difficulty during the pandemic, noteworthy that no teacher said it was an impossible difficulty in any of the periods compared.

The importance of professors' knowledge of virtual resources more than doubled when comparing before and during the pandemic, from 46.4% of professors who considered it very important or indispensable to 98.4%. Moreover, training courses on ICT use increased from 19.4% to 57.4% of professors who now take such courses very often or always.

When asked about their knowledge about virtual learning resources in adapting teaching activities to students' needs, 7.7% of professors said they had a lot of knowledge, and 0.4% said they knew the topic before the pandemic. However, these numbers increased to 56.5% and 4.4% during the isolation period, which classified understanding as very knowledgeable and knowledgeable about the topic, respectively.

In addition, understanding about virtual environment fatigue and cognitive overload generated by remote and face-to-face classes had a significant evolution between the period before and during the pandemic, increasing from 14.5% to 28.6% of faculty members who had a lot of knowledge or total mastery in the zoom fatigue category and from 4% to 32.6% of those who had a lot of expertise or absolute mastery in the cognitive overload category.

Table 3 - Acceptance/resistance profile of ICT use by professors.

	Mean±SD	Cronbach's Alpha	Before the pandemic					During the oandemic					p-Value
			0	1	2	3	4	0	1	2	3	4	
Q1.	3.11±0.92	0.820[a]	0 (0.0%)	23 (9.3%)	110 (44.4%)	87 (35.1%)	28 (11.3%)	0 (0.0%)	1 (0.4%)	3 (1.2%)	58 (23.4%)	186 (75.0%)	*<0.001*
Q2.	2.14±0.81	0.820[a]	5 (2.0%)	97 (39.1%)	126 (50.8%)	19 (7.7%)	1 (0.4%)	0 (0.0%)	9 (3.6%)	88 (35.5%)	140 (56.5%)	11 (4.4%)	*<0.001*
Q3.	2.08±1.20	0.825[a]	42 (16.9%)	96 (38.7%)	62 (25.0%)	27 (10.9%)	21 (8.5%)	5 (2.0%)	31 (12.5%)	74 (29.8%)	86 (34.7%)	52 (21.0%)	*<0.001*
Q4.	2.67±0.81	0.841[a]	7 (2.8%)	31 (12.5%)	94 (37.9%)	70 (28.2%)	46 (18.5%)	0 (0.0%)	1 (0.4%)	38 (15.3%)	200 (80.6%)	9 (3.6%)	*<0.001*
Q5.	2.37±0.74	0.855[a]	3 (1.2%)	21 (8.5%)	83 (33.5%)	139 (56.0%)	2 (0.8%)	7 (2.8%)	21 (8.5%)	120 (48.4%)	96 (38.7%)	4 (1.6%)	*0.002*
Q6.	1.52±0.86	0.879[a]	20 (8.1%)	66 (26.6%)	96 (38.7%)	66 (26.6%)	0 (0.0%)	28 (11.3%)	149 (60.1%)	62 (25.0%)	9 (3.6%)	0 (0.0%)	*<0.001*
Q7.	2.53±1.31	0.812[a]	22 (8.9%)	120 (48.4%)	68 (27.4%)	28 (11.3%)	10 (4.0%)	2 (0.8%)	1 (0.4%)	17 (6.9%)	71 (28.6%)	157 (63.3%)	*<0.001*
Q8.	2.95±1.05	0.823[a]	6 (2.4%)	42 (16.9%)	86 (34.7%)	78 (31.5%)	36 (14.5%)	1 (0.4%)	4 (1.6%)	20 (8.1%)	67 (27.0%)	156 (62.9%)	*<0.001*
Q9.	1.92±1.19	0.807[a]	81 (32.7%)	97 (39.1%)	57 (23.0%)	9 (3.6%)	4 (1.6%)	0 (0.0%)	5 (2.0%)	64 (25.8%)	153 (61.7%)	26 (10.5%)	*<0.001*
Q10.	1.33±1.06	0.817[a]	0 (0.0%)	117 (47.2%)	95 (38.3%)	30 (12.1%)	6 (2.4%)	17 (6.9%)	52 (21.0%)	108 (43.5%)	66 (26.6%)	5 (2.0%)	*<0.001*
Q11.	1.55±1.00	0.819[a]	67 (27.0%)	117 (47.2%)	54 (21.8%)	9 (3.6%)	1 (0.4%)	11 (4.4%)	48 (19.4%)	108 (43.5%)	73 (29.4%)	8 (3.2%)	*<0.001*
Q12.	2.21±1.21	0.850[a]	38 (15.3%)	78 (31.5%)	48 (19.4%)	18 (7.3%)	66 (26.6%)	5 (2.0%)	24 (9.7%)	97 (39.1%)	101 (40.7%)	21 (8.5%)	*<0.001*
Q13.	1.81±0.97	0.817[a]	46 (18.5%)	112 (45.2%)	72 (29.0%)	16 (6.5%)	2 (0.8%)	0 (0.0%)	27 (10.9%)	117 (47.2%)	92 (37.1%)	12 (4.8%)	*<0.001*
Q14.	1.84±0.94	0.823[a]	26 (10.5%)	118 (47.6%)	65 (26.2%)	35 (14.1%)	4 (1.6%)	6 (2.4%)	39 (15.7%)	110 (44.4%)	85 (34.3%)	8 (3.2%)	*<0.001*
Total		0.823[b]											

[a]Cronbach's alpha; [b]Cronbach's alpha if item deleted; *p<0.05 versus time before the pandemic, McNemar test (n, %). Source: Authors.

3.2 Internal consistency analysis and factor reduction of the questionnaire on acceptance and resistance to the use of ICT in higher education professors of health courses

The questionnaire applied showed high internal validity with a Cronbach's alpha value of 0.823. The item-by-item removal did not significantly alter Cronbach's alpha value, indicating that all construct items contribute to a good internal validity. The item that presented the highest average was item Q1 and the item that presented the lowest average was item Q6.

The items Q1, Q2, Q3, Q7, Q8, Q9, Q10, Q11, Q12, Q13 and Q14 showed a significant increase from the pre-pandemic period to the pandemic period, reflecting that most of the professors evaluated started using ICT tools for teaching. The items Q4, Q5 and Q6 showed a significant reduction in scores, leading to the understanding that the professors surveyed became more accepting of new technologies during the period of social isolation.

The Kaiser-Meyer-Olkin coefficient was relatively high with a value of 0.916, and Bartlett's Test of Sphericity was statistically significant ($p<0.001$). The factor reduction analysis of the items suggested the construction of three domains, of which only components 1 and 3 presented items with good adherence rates, according to Table 4.

Thus, two domains were created: domain 1, entitled "ICT Acceptance/Adherence Domain," including the sum of items 1, 2, 3, 7, 8, 9, 10, 11, 12, 13, and 14, which were the items that showed a significant increase from the pre to the pandemic period; and domain 2, entitled "ICT Difficulties and Resistance Domain" including the sum of items 4, 5, and 6, which were the items that showed a significant decrease from the pre to the pandemic period.

The ICT Acceptance/Adherence Domain had a mean of 23.46 ± 8.29 (Range = 5 - 43), while the ICT Difficulty and Resistance Domain had a mean of 6.57 ± 1.39 (Range = 2-10). The values of these domains correlated inversely ($p<0.001$, $r = - 0.164$). When adjusted to a scale of 0 to 100, the ICT Acceptance/Acceptance Domain had a mean of 35.61 ± 12.14 (Median = 35.42, Range = 10.42 - 79.17) and the ICT Difficulties and Resistance Domain a mean of 54.10 ± 14.75 (Median = 58.33, Range = 16.67 - 91.67), values significantly higher than Domain 1 ($p<0.001$).

3.3 Analysis of predictors of acceptance and resistance to the use of ICT in higher education professors of health courses

When the median categorized the scores of each teacher, two groups were created in each domain: in domain 1, the professionals were categorized into low (up to 35) and high (>35) Acceptance/Adherence to ICT; in domain 2, the professionals were categorized into low (up to 60) and high (>60) ICT Difficulties/Resistance.

Professors who teach in the biomedicine course ($p=0.006$), who had already undergone some ICT training ($p<0.001$), who did not start using Google Meet ($p<0.001$) and YouTube ($p<0.001$) showed an increase in the prevalence of high Acceptance/Adherence to ICT. The professors of the medical course ($p=0.044$), who switched to using Google Meet ($p=0.023$) or Zoom ($p=0.011$) and who increased their use of scientific search sites ($p=0.016$), showed a low prevalence of Difficulties/Resistance (Table 5).

In multivariate analysis, ICT knowledge/skills ($p<0.001$), switching to other virtual platforms ($p=0.047$), and increasing use of instant communication sites and apps professionally ($p=0.037$) significantly increased ICT acceptance/adherence, and switching to YouTube significantly reduced these rates ($p=0.011$). Switching to using Google Meet ($p=0.036$) and increasing the use of scientific search sites professionally ($p=0.014$) significantly reduced resistance/difficulty with ICT.

Table 4 - Factor Reduction.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings			Itens	Component			Domain
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumu-lative %	Total	% of Va-riance	Cumu-lative %		1	2	3	
1	6,232	44,512	44,512	6,232	44,512	44,512	5,905	42,179	42,179	Q1	*0.740	-0.182	-0.058	1
2	1,237	8,832	53,344	1,237	8,832	53,344	1,500	10,715	52,894	Q2	*0.812	-0.004	-0.098	1
3	1,073	7,662	61,007	1,073	7,662	61,007	1,136	8,112	61,007	Q3	*0.659	0.071	-0.039	1
4	0,844	6,026	67,033							Q4	0.317	-0.585	*0.527	2
5	0,796	5,683	72,715							Q5	-0.072	0.408	*0.832	2
6	0,673	4,809	77,524							Q6	-0.586	0.180	*0.185	2
7	0,618	4,413	81,937							Q7	*0.811	0.081	-0.063	1
8	0,550	3,931	85,868							Q8	*0.682	0.039	0.121	1
9	0,476	3,403	89,271							Q9	*0.857	0.008	-0.021	1
10	0,377	2,693	91,964							Q10	*0.740	0.221	-0.003	1
11	0,346	2,474	94,438							Q11	*0.739	0.233	-0.014	1
12	0,300	2,145	96,583							Q12	*0.296	-0.716	0.124	1
13	0,283	2,020	98,603							Q13	0.794	0.130	0.023	1
14	0,196	1,397	100,000							Q14	0.686	0.123	0.138	1

Source: Authors.

Table 5 - Risk factors for resistance/acceptance to ICTs by professors of health courses.

	Domain 1 (Acceptance/Adherence to ICT)			Domain 2 (ICT Difficulties/Resistance)		
	Up to 35	>35	p-Value	Up to 60	>60	p-Value
Age						
<40 years old	70 (57.4%)	70 (55.6%)	0,772	105 (58.7%)	35 (50.7%)	0.259
40+	52 (42.6%)	56 (44.4%)		74 (41.3%)	34 (49.3%)	
Faculty						
Medicine	58 (47.5%)	50 (39.7%)	0,212	85 (47.5%)*	23 (33.3%)	*0.044*
Nursing	9 (7.4%)	16 (12.7%)	0,164	14 (7.8%)	11 (15.9%)	0.057
Physiotherapy	13 (10.7%)	8 (6.3%)	0,223	15 (8.4%)	6 (8.7%)	0.936
Biomedicine	5 (4.1%)	18 (14.3%)*	*0,006*	16 (8.9%)	7 (10.1%)	0.769
Dentistry	25 (20.5%)	16 (12.7%)	0,099	30 (16.8%)	11 (15.9%)	0.877
Psychology	12 (9.8%)	22 (17.5%)	0,081	21 (11.7%)	13 (18.8%)	0.145
Radiology	6 (4.9%)	10 (7.9%)	0,333	9 (5.0%)	7 (10.1%)	0.142
Nutrition	5 (4.1%)	4 (3.2%)	0,697	6 (3.4%)	3 (4.3%)	0.707
Course Quantity						
1	114 (93.4%)	115 (91.3%)	0,797	168 (93.9%)	61 (88.4%)	0.107
2	6 (4.9%)	7 (5.6%)		8 (4.5%)	5 (7.2%)	
3	1 (0.8%)	1 (0.8%)		0 (0.0%)	2 (2.9%)	
4	1 (0.8%)	3 (2.4%)		3 (1.7%)	1 (1.4%)	
ICT Knowledge						
Não	84 (68.9%)*	49 (38.9%)	*<0,001*	97 (54.2%)	36 (52.2%)	0.775
Sim	38 (31.1%)	77 (61.1%)*		82 (45.8%)	33 (47.8%)	

Virtual plattforms started to use

Google meet	122 (100.0%)*	111 (88.1%)	*<0,001*	172 (96.1%)*	61 (88.4%)	*0.023*
Hangouts	46 (37.7%)	42 (33.3%)	0,472	63 (35.2%)	25 (36.2%)	0.879
Kahoot	2 (1.6%)	2 (1.6%)	0,974	3 (1.7%)	1 (1.4%)	0.899
Mentimeter	2 (1.6%)	1 (0.8%)	0,542	3 (1.7%)	0 (0.0%)	0.279
Skype	22 (18.0%)	22 (17.5%)	0,906	33 (18.4%)	11 (15.9%)	0.645
Youtube	26 (21.3%)*	9 (7.1%)	*0,001*	26 (14.5%)	9 (13.0%)	0.764
Zoom	78 (63.9%)	62 (49.2%)	0,019	110 (61.5%)*	30 (43.5%)	*0.011*
Other	7 (5.7%)	8 (6.3%)	0,840	9 (5.0%)	6 (8.7%)	0.278
Increased use						
Microsoft Word	18 (14.8%)	25 (19.8%)	0,290	27 (15.1%)	16 (23.2%)	0.131
Microsoft PowerPoint (or similar)	23 (18.9%)	28 (22.2%)	0,512	35 (19.6%)	16 (23.2%)	0.526
Microsoft Excel (or similar)	23 (18.9%)	26 (20.6%)	0,725	33 (18.4%)	16 (23.2%)	0.400
Social networking sites and apps (Facebook, Instagram, etc.)	36 (29.5%)	29 (23.0%)	0,245	47 (26.3%)	18 (26.1%)	0.978
Websites and instant messaging apps (WhatsApp, etc.)	50 (41.0%)	62 (49.2%)	0,193	83 (46.4%)	29 (42.0%)	0.538
Email	32 (26.2%)	28 (22.2%)	0,461	44 (24.6%)	16 (23.2%)	0.818
Search engines in general	36 (29.5%)	28 (22.2%)	0,190	48 (26.8%)	16 (23.2%)	0.559
Scietific Search engines	32 (26.2%)	22 (17.5%)	0,094	46 (25.7%)*	8 (11.6%)	*0.016*
Entertainment websites	25 (20.5%)	19 (15.1%)	0,265	34 (19.0%)	10 (14.5%)	0.406

*p<0.05, Fisher's exact test or Pearson's chi-square test (n, %). Source: Authors.

4. Discussion

In terms of the profile of use of technologies in education by the teachers in the sample, it was possible to identify that a considerable portion of them had no previous preparation for handling ICT before the pandemic period since less than half had some access to knowledge or training in the area. Pre-pandemic studies also corroborate for this result, revealing a certain difficulty of the professors for the use of technologies in medical education (O'Doherty et al., 2018; Pereira et al., 2016).

However, with the emergency change to the remote learning methodology, a significant increase in the levels of knowledge about the use of virtual resources and the appreciation of this understanding, the participation in training on the use of ICT, the experience with remote classes, the understanding about the fatigue of the virtual environment and cognitive overload was noticed, reflecting in a more manageable process of change from the traditional model to the technological one.

Another study verified an increase in the level of experience of university professors with virtual resources during the pandemic and attested that the majority of participants had no previous experience with online teaching (87.2%), which would decrease the confidence and satisfaction of these professionals with this methodology (Lei & So, 2021).

Furthermore, it was found, in a survey conducted in nursing courses at different universities in the USA, that the degree of effectiveness of online teaching is not related to the teacher's experience in the classroom, but to the online teaching experience (Hampton et al., 2020). Therefore, one notes the importance of educators' experience with virtual learning resources to facilitate and maximize these tools in the teaching process.

In this same theme, another study assessed the perception of teachers' readiness for online teaching and learning in the pandemic emergency period and found that teachers with previous experience in this methodology were more likely to be attributed to the profile of high readiness, with high evaluations of self-efficacy and strong confidence in their abilities (Scherer et al., 2021). This finding corroborates the results of this research, which also identified the greater ease of adaptation to the virtual learning model by teachers with prior knowledge in ICT.

In addition, there have been an increase in the use of video calling and video sharing platforms, email and messaging applications, material preparation resources, and research and entertainment sites. There has also been a significant reduction in interactive applications in virtual classrooms compared to face-to-face classrooms. These technological tools are free or have free versions available, which implies that the financial conditions of the interviewed professors did not impact the results regarding their use.

Professionals with training in virtual learning resources had better acceptance and adherence to these technologies, highlighting the relationship of educators' education with the level of approval and engagement to ICT use. This finding agrees with a study conducted with teachers in Andalusia, which identified that previous training in ICT is a determining factor in establishing substantial knowledge about digital tools, as well as in problem-solving (Sánchez-Prieto et al., 2021) .

Still, in terms of teacher training, another study discussed a relevant point which is the relationship with ICT performance, since the educators who had the training to teach some tools had a greater adherence and acceptance to new ICT (Sangeeta & Tandon, 2021). The decrease in resistance to the use of ICT shown in the results of this study may reflect the increase in training conducted during the pandemic and the experience gained in the process.

In terms of adherence to the use of ICT by the evaluated teachers, the transition to virtual teaching generated greater acceptance of these technologies. The reduction in the difficulty level of teachers regarding the change from the traditional model to the technological one (from 26.6% to 3.6%) shows that during the pandemic, the exposure to ICT is related to a greater adaptation of teachers to work in the virtual environment. These data were similar to another study that identified that there was a positive

impact of the need to use e-learning by university professors in health during the pandemic, since the need to use technologies leads to a better perception and adaptation of its use in teaching (Hayat et al., 2020).

5. Conclusion

We found that many of the professors analyzed had no previous preparation for the use of ICT in education before the pandemic and that most professors improved their acceptance of the use of technologies during the pandemic period. Thus, the transition from the traditional to the virtual model positively impacted the inclusion of ICT in the teaching-learning method. Moreover, the necessity of social isolation due to the COVID-19 pandemic propitiated advances in educational technology policies in institutions.

There were limitations to this study that must be considered. First, we can highlight the sample size involving one specific area, which does not make it possible to generalize the findings to other fields of education. Second, the possibility of the changes in the use of technologies by the faculties impacting the teaching process after the pandemic was not analyzed.

It is suggested for future studies the replication of the model developed with an expanded study sample involving professors from different areas and a more extended period, which would allow the comparison between various courses from different institutions, evaluating whether there is the permanence of this acceptance over time and after the return to classroom activities.

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