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THE ADAPTATION TO TECHNOLOGY OF TEACHERS AND STUDENTS IN THE PERIOD 2020-2022: A NON-PARAMETRIC ANALYSIS

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Abstract

The adjustment of educators and pupils to the technological modifications enforced on the educational process during the epidemic is a crucial factor for forthcoming educational reforms. So, the primary objective of this study was to assess the perception of teachers and students in the pre-university setting regarding their adaption to technology during the period of 2020-2022. The data was collected in 2022 by administering questionnaires to a sample of 100 teachers and 100 students. It is important to note that 53% of the teachers and 59% of the students surveyed come from rural areas. The results revealed significant disparities between the participants (teachers and students) in terms of their utilization of IT resources and their level of engagement in online coursework (7 out of 11 items). Disparities were also identified between the instructors and the students originating from urban and rural regions. The findings illustrate the impact of respondents' IT skill and engagement in the learning process on their technological response patterns from 2020 to 2022.

Key words**:** *IT technology, non-parametric test, professors, pupils, COVID-19 pandemic, adaptability*

INTRODUCTION

The COVID-19 pandemic has had far-reaching consequences on our society, impacting the educational system. During the pandemic, advancements in technology have facilitated the development of flexible learning environments that are readily available. Professors utilized computer-based educational technology to communicate with pupils, exchange text and video resources, participate in online training and meetings, and manage job-related tasks [3]. Nevertheless, educators faced obstacles in immediately adjusting their instructional strategies [5]. Teachers lacking extensive training in educational technology had to quickly adapt their instructional plans to incorporate a variety of technological tools. Their goal was to facilitate student learning through the use of technology, particularly digital platforms. This rapid integration of technology was necessary to address the challenges posed by the pandemic within the school community [1]. O the other hand, students and pupils encountered issues in adapting to the online learning environment and in achieving their learning goals, especially those who lack self-accountability [4]. Nevertheless, research conducted during the epidemic has shown that students who display a readiness to use online learning technologies are more likely to continue using them [10]. Actually, individuals are more likely to adopt instructional technology when it is seen as straightforward to comprehend and use. Different studies have investigated the substantial influence of perceived usefulness and perceived simplicity of use on consumers' desire to adopt technology [6].

Specifically, in educational environments, instructors' perception of the usefulness and simplicity of use of educational technology is positively correlated with their intention to incorporate it into their teaching practice [7].

Before the pandemic, we could encounter teachers that used in the classroom different types of technologies (like interactive presentations, software, virtual travels, etc) or universities/schools which offered 100% online classes, while models such as flipped learning or hybrid (blended learning) were rarer and generally in lower classes or during extracurricular activities. Online education, as we have become accustomed to it during the pandemic, has been a mixture of models based on the use of the Internet. Lectures, assignments, tests were activated on virtual platforms and classes were held synchronously [8]. Actually, during the pandemic, an abundance of online resources became accessible, varying in terms of ease of use. Consequently, both learners and teachers had to undergo substantial adaptation to effectively utilize technological tools for educational course delivery. [2]. However, more than 80% of teachers returned to traditional methods of teaching and they are using digital methods only for presentations [9]. In this context, the purpose of this study was to assess the perception of teachers and students in the pre-university setting regarding their adaption to technology during the period of 2020-2022. Also, it aimed to identify the differences between instructors and students originating from urban and rural regions.

MATERIALS AND METHODS

This report presents preliminary findings from a survey carried out in 2022 across seven educational institutions, comprising two high schools and one urban school, as well as three schools and one high school from rural locations. As part of our research, we aimed to investigate whether there is a disparity in the overall perception of online education between 2020 and 2022. To achieve this, we designed and administered questionnaires using the 5-Linkert scale to a sample of 100 teachers and 100 students. The data was encoded and analyzed using IBM SPSS Version 20 software. The present study employed descriptive statistics and the Mann Whitney U test to analyze variations in values across different responder categories.

The participants were instructed to evaluate their level of adjustment to technology during the epidemic by assigning ratings ranging from 1 to 5 (where 1 represents "Strongly Disagree," 2 represents "Disagree," 3 represents "Indifferent," 4 represents "Agree," and 5 represents "Strongly Agree") for various items. Specifically, pupils were asked to assess 16 statements, while instructors were asked to rate 15 statements. To carry out this comparative analysis, we selected 11 common statements. These statements are as follows: *1. "It was easy for me to work/study online" 2. "I worked harder than in face-to-face schooling" 3. "I changed my teaching/learning technique" 4. "I am at an intermediate-advanced level of laptop/PC use" 5. "I worked for the first time with a tablet/laptop/PC" 6. "I was more stressed and tired than in face-to-face schooling" 7. "I received online teaching/learning support from the institution" 8. "I needed more time to prepare the lessons than in face-to-face schooling" 9. "It was easy to learn to work with online programs" 10. "The schedule was malleable" 11. "I had several teaching/learning tools at my disposal".*

The reliability test conducted on the study questionnaire (the above 11 items) yielded a Cronbach alpha value of 0.59, which was considered acceptable for further analysises.

We employed the Mann Whitney U test to make comparisons between groups. This is a non-parametric method used to assess the distribution of data. It serves as a non-parametric substitute for the t-test when comparing independent samples. This statistical method is employed to assess the disparities between two distinct groups. It compares the medians of the two groups under examination, namely teachers and students, and determines whether their ranks exhibit significant differences. This test utilizes 5-point Linkert ordinal variables. Null

hypothesis: there is no statistically significant disparity between the two groups, with a significance level set at 0.05. The test considers both the central and dispersion tendencies and calculates the ordination score for each of the groupings. Although the outcome may lack statistical significance, it is still possible to compare the two groups based on their score values. The working hypothesis H1 in our research posits that there are no substantial disparities in the perception of technological adaptation between teachers and students. In the Mann-Whitney U test model in SPSS, the dependent variable is represented by the statement variables, while the independent variable (grouping variable) is represented by the respondent category.

Fawad (2021) states that by utilizing Cohen's (1988) criterion, we can determine the approximate value of r starting with the value of Z. In this context, r represents the effect size and is calculated as z divided by the square root of N, where z is the z statistic and N is the number of cases. The resulting value of r indicates the significance of the effect. A range of values from 0.1 to 0.3 or -0.1 to -0.3 indicates a modest effect. A range of values from 0.3 to 0.5 or -0.3 to -0.5 indicates a medium effect. A value of 0.5 or larger, or -0.5 or less, indicates a strong influence. The interpretation of the effect size is done in conjunction with the significant threshold.

RESULTS AND DISCUSSIONS

The Mann-Whitney U Test was employed to investigate discrepancies in viewpoints between professors and students. The test revealed statistically significant differences for 8 of the examined assertions ($p < .05$), leading to the rejection of the null hypothesis (Table 1).

Table 1. Summary of Mann-Whitney U Test based on category of respondents

Statement	Respondent	N	Median	Mean rank	Sum of Ranks	Mann-Whitney U	Z	Asymp. Sig. (2-tailed)	Effect of Z test	Efect type
It was easy for me to work/study online	Professor	100	2	85.64	8,563.50	3,513.500	-3.441	**.001**	-0.2	Modest
	Pupil	97	3	112.78	10,939.50					
It was easy to learn to work with online programs	Professor	99	4	94.10	9,315.50	4,365.500	-1.144	.253	-0.1	Modest
	Pupil	97	2	102.99	9,990.50					
The schedule was malleable	Professor	97	2	92.71	8,993.00	4,240.000	-1.462	.144	-0.1	Modest
	Pupil	99	3	104.17	10,313.00					
I worked harder than in face-to-face schooling	Professor	100	3	131.10	13,109.50	1,940.500	-7.715	**.000**	-0.5	Large
	Pupil	100	4	69.91	6,990.50					
I had more teaching/learning tools at my disposal	Professor	97	0	102.85	9,976.00	4,477.000	-.957	.339	-0.1	Modest
	Pupil	100	2	95.27	9,527.00					
I changed my teaching/learning technique	Professor	91	3	84.82	7,718.50	3,532.500	-2.243	**.025**	-0.2	Modest
	Pupil	95	3	101.82	9,672.50					
I am at an intermediate-advanced level of laptop/PC use	Professor	96	3	84.38	8,100.00	3,444.000	-3.016	**.003**	-0.2	Modest
	Pupil	95	3	107.75	10,236.00					
I worked for the first time with a tablet/laptop/PC	Professor	46	4	80.48	3,702.00	1,979.000	-1.405	.160	-0.1	Modest
	Pupil	100	3	70.29	7,029.00					
I was more stressed and tired than in face-to-face schooling	Professor	97	4	111.55	10,820.00	3,439.000	-3.502	**.000**	-0.2	Modest
	Pupil	98	4	84.59	8,290.00					
I received online teaching/learning support from the school	Professor	97	3	111.81	10,845.50	3,607.500	-3.194	**.001**	-0.2	Modest
	Pupil	100	3	86.58	8,657.50					
I needed more time to prepare the lessons than in face-to-face schooling	Professor	97	3	123.96	12,024.00	2,235.000	-6.653	**.000**	-0.5	Large
	Pupil	98	4	72.31	7,086.00					

Source: Own calculation.

No statistically significant variances have been noticed in the level of satisfaction about working with online applications, working time, or the availability of working materials.
Concerning these variables, the effect is minimal, suggesting that the analysis lacks practical importance. However, the obtained ranking clearly shows that the students demonstrated a greater level of consensus than the teachers when it comes to the convenience of using online apps and the program's increased flexibility.
Still, the test holds importance in both statistical ($p<0.05$) and practical ($r>0.5$) terms when assessing the claims of the online effort in terms of physical and temporal aspects, as well as the level of adaptation to IT equipment.
However, the test holds importance in both statistical ($p<0.05$) and practical ($r>0.5$) terms when assessing the claims of the online effort in terms of physical and temporal aspects, as well as the level of adaptation to IT equipment. Teachers are currently earning increased recognition for their diligent work throughout the pandemic, while kids are demonstrating a diminished level of proficiency in utilizing information technology equipment.
Concerning the other elements, it is crucial to acknowledge that they have statistical significance, implying that the probability of the observed impact happening randomly is minimal. Moreover, these variables exhibit a moderate impact, indicating their practical significance. After examining the test results (the average rank attained), it is clear that there are contrasting perspectives between teachers and students. Hence, the students greatly appreciate the convenience of working online and the opportunity to evaluate their competence in utilizing the laptop/PC.

Table 2. Summary of Mann-Whitney U Test for Professors based on residential environment

Statement	Location	N	Median	Mean rank	Sum of Ranks	Mann-Whitney U	Z	Asymp. Sig. (2-tailed)	Effect of Z test	Efect type
It was easy for me to work online	Urban	47	3	59.48	2,795.50	823.500	-3.193	**.001**	-0.3	Medium
	Rural	53	2	42.54	2,254.50					
It was easy to learn to work with online programs	Urban	46	3.5	50.82	2,337.50	1,181.500	-.273	.785	0.0	Modest
	Rural	53	4	49.29	2,612.50					
The schedule was malleable	Urban	46	3	46.67	2,147.00	1,066.000	-.822	.411	-0.1	Modest
	Rural	51	3	51.10	2,606.00					
I worked harder than in face-to-face schooling	Urban	47	4	54.98	2,584.00	1,035.000	-1.558	.119	-0.2	Modest
	Rural	53	4	46.53	2,466.00					
I had more teaching/learning tools at my disposal	Urban	44	3	50.95	2,242.00	1,080.000	-.674	.501	-0.1	Modest
	Rural	53	3	47.38	2,511.00					
I changed my teaching/learning technique	Urban	44	2.5	48.91	2,152.00	906.000	-1.106	.269	-0.1	Modest
	Rural	47	2	43.28	2,034.00					
I am at an intermediate-advanced level of laptop/PC use	Urban	45	3	51.26	2,306.50	1,023.500	-.980	.327	-0.1	Modest
	Rural	51	3	46.07	2,349.50					
I worked for the first time with a tablet/laptop/PC	Urban	28	2	21.18	593.00	187.000	-1.503	.133	-0.2	Modest
	Rural	18	3.5	27.11	488.00					
I was more stressed and tired than in face-to-face schooling	Urban	46	3	54.20	2,493.00	934.000	-1.919	.055	-0.2	Modest
	Rural	51	3	44.31	2,260.00					
I received online teaching/learning support from the school	Urban	46	4	55.68	2,561.50	865.500	-2.403	**.016**	-0.2	Modest
	Rural	51	2	42.97	2,191.50					
I needed more time to prepare the lessons than in face-to-face schooling	Urban	46	4	55.13	2,536.00	891.000	-2.379	**.017**	-0.2	Modest
	Rural	51	4	43.47	2,217.00					

Source: Own calculation.

They also recognize to a greater extent the necessity to alter their behavior in relation to the teaching process. In contrast, instructors experience a notably greater degree of contentment when they receive assistance from the school in fulfilling their teaching duties. Furthermore, they indicate encountering higher levels of stress and exhaustion in comparison to teaching in person. The study sought to ascertain if there were discrepancies in the aforementioned characteristics depending on the living setting of the subjects. The results are presented in Tables 2 and 3.

The professor's findings reveal significant disparities in the level of convenience in online work (Mean Ranks 59.48 vs 42.54, p = 0.001), support from the school (55.68 vs 42.97, p = 0.016), and the extra time needed (55.13 vs 43.47, p = 0.017) depending on the individual's place of residence (urban vs rural). There were no significant discrepancies in the other statements. However, it can be deduced that professors in distant areas had a more flexible schedule in contrast to traditional in-person teaching, but they are also less acquainted with information technology.

Table 3. Summary of Mann-Whitney U Test for Pupils based on residential environment

Afirmație	Respondent	N	Median	Mean rank	Sum of Ranks	Mann-Whitney U	Z	Asymp. Sig. (2-tailed)	Effect of Z test	Efect type
It was easy for me to study online	Urban	38	4	56.62	2,151.50	831.500	-2.208	**.027**	-0.2	Medium
	Rural	59		44.09	2,601.50					
It was easy to learn to work with online programs	Urban	38	4	54.82	2,083.00	900.000	-1.724	.085	-0.2	Modest
	Rural	59		45.25	2,670.00					
The schedule was malleable	Urban	40	4	63.41	2,536.50	643.500	-3.926	**.000**	-0.4	Medium
	Rural	59		40.91	2,413.50					
I worked harder than in face-to-face schooling	Urban	41	1	38.49	1,578.00	717.000	-3.632	**.000**	-0.4	Medium
	Rural	59		58.85	3,472.00					
I had more teaching/learning tools at my disposal	Urban	41	4	51.27	2,102.00	1,178.000	-.228	.819	0.0	Modest
	Rural	59		49.97	2,948.00					
I changed my teaching/learning technique	Urban	36	3	45.97	1,655.00	989.000	-.583	.560	-0.1	Modest
	Rural	59		**49.24**	2,905.00					
I am at an intermediate-advanced level of laptop/PC use	Urban	36	4	44.83	1,614.00	948.000	-.909	.363	-0.1	Modest
	Rural	59		**49.93**	2,946.00					
I worked for the first time with a tablet/laptop/PC	Urban	41	3	58.33	2,391.50	888.500	-2.356	**.018**	-0.2	Modest
	Rural	59		45.06	2,658.50					
I was more stressed and tired than in face-to-face schooling	Urban	39	3	42.91	1,673.50	893.500	-1.924	.054	-0.2	Modest
	Rural	59		**53.86**	3,177.50					
I received online teaching/learning support from the school	Professor	41	3	52.24	2,142.00	1138.000	-.515	.606	-0.1	Modest
	Pupil	59		49.29	2,908.00					
I needed more time to prepare the lessons than in face-to-face schooling	Urban	39	3	46.49	1,813.00	1033.000	-.872	.383	-0.1	Modest
	Rural	59		**51.49**	3,038.00					

Source: Own calculation.

The results for the students show significant differences in the level of difficulty in studying online (Mean Ranks 56.62 vs 44.09, p = .027), the flexibility of the program (63.41 vs 40.91, p = .000), the intellectual effort required (38.49 vs 58.85, p = .000), and IT literacy (58.33 vs 45.06, p = .018) based on their place of residence (urban vs rural).

These results suggest that students from rural areas exhibited greater effort in their studies, whereas students from metropolitan areas found it easier to study online and adapt to class schedules, likely due to their greater familiarity with computers.

The other seven statements don't show significative differences. Although students from rural areas are more familiar with IT equipment, they felt, more than students from cities, a greater pressure in the educational process, including fatigue, stress or the need to change the way of learning.

CONCLUSIONS

The study's findings indicate that professors and students exhibited distinct responses during the period of 2020-2022 when online, hybrid, and physical classes were conducted. The teachers exhibited varying responses, primarily attributing the situation to weariness, stress, and the time required for class preparation. Conversely, students hold a more favorable viewpoint towards working online and utilizing computer apps, while possessing less expertise in the field of information technology compared to teachers. Conversely, teachers from metropolitan regions exerted greater effort, whilst students from rural areas encountered more challenges in adapting to technology.

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