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A comparison of the perception of online study during and after the pandemic lockdown

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Abstract. To understand and improve the educational process regarding online study, we decided to collect data based on a questionnaire completed by students during and after the Covid-19 pandemic. Their perceptions were compared using statistical tools and revealed that most of the students interviewed preferred and now prefer online study. Moreover, it also shows the weaknesses such as the institution's support or even the bandwidth of the communications infrastructure.

1. Introduction

With the exit from the social isolation imposed by the pandemic period, which brought important challenges to the psycho-affective states of the students, with possible negative impacts on physical and mental health, online learning methods and work were perpetuated, where was possible, although as we all know, isolation has an impact on both psychological and physical health, from reduced ability to handle stressful situations to difficulties in making decisions, remembering and processing information to the onset of depression, anxiety, panic attacks and an increased risk of disease.

For this reason, the ability of the students to adapt to the online curriculum must consider some psychological aspects for better learning engagement. Of course, it tries to focus on the tools and materials that teachers can use to create improved online courses.

Although several years have passed since the end of the pandemic period, few studies have been conducted to measure the impact of online learning and education on students.

For this reason, we propose a comparison of students' perception of online learning between a group that studied during the pandemic and another that studies at this moment, after the end of the Covid-19 pandemic.

2. Data gathering and processing

The study was carried out with the full consent of all participants, students at the Titu Maiorescu University in Bucharest, Romania, Faculty of Informatics.

The research was conducted on a "self-selected" convenience sample, and the close-ended survey was completed by students from the Faculty of Informatics (full-time and distance learning), the average response time for students being from 7 to 9 minutes.

In 2021, a number of 218 students participated in the survey, and in 2024, a total of 275 respondents answered.

3. Differential Statistics

The differential analysis was applied on the data presented above to find out if there are statistically significant differences between the two groups of students who answered in 2021 and the one who answered in 2024 from the point of view of the distribution of answers.

Eight independent Chi-square analyzes were performed to test the null hypothesis of whether there was any relationship between the years in which the responses were collected and the questionnaire items. The statistical results for every item (question) are presented below.

I1. What do you think about distance education?

Answer	Observed Value			Expected Value		$(O - E)^2 / E$	
	2021	2024	TOTAL L	2021	2024	2021	2024
Good	56	96	152	67.35	84.65	1.91	1.52
Medium	20	39	59	26.14	32.86	1.44	1.15
Poor	14	4	18	7.98	10.02	4.55	3.62
Very good	128	135	263	116.53	146.47	1.13	0.90
TOTAL	218	274	492				

$$\chi^2 = \sum(O_i - E_i)^2 / E_i \quad 16.22$$

$$df = (\text{No Rows} - 1) * (\text{No Columns} - 1) \quad 3.00$$

$$p\text{-value} = \text{CHISQ.DIST.RT}(\chi^2, df) \quad 0.00$$

$p < 0.05$ = there is an association between answers and student's group

I2. Do you have access to an online learning device?

Answer	Observed Value			Expected Value		$(O - E)^2 / E$	
	2021	2024	TOTAL L	2021	2024	2021	2024
No	1	1	2	0.89	1.11	0.01	0.01
Yes	210	263	473	209.58	263.42	0.00	0.00
Yes, but it doesn't work well	2	4	6	2.66	3.34	0.16	0.13
Yes, but the network is weak	5	6	11	4.87	6.13	0.00	0.00
TOTAL	218	274	492				

$$\chi^2 = \sum(O_i - E_i)^2 / E_i \quad 0.33$$

$$df = (\text{No Rows} - 1) * (\text{No Columns} - 1) \quad 3.00$$

$$p\text{-value} = \text{CHISQ.DIST.RT}(\chi^2, df) \quad 0.95$$

$p > 0.05$ = no association between answers and student's group

I3. What device do you use for distance learning?

Answer	Observed Value			Expected Value		$(O - E)^2 / E$	
	2021	2024	TOTAL L	2021	2024	2021	2024
Others	2	4	6	2.66	3.34	0.17	0.13
Desktop	73	75	148	65.71	82.29	0.81	0.65
Laptop	141	193	334	148.29	185.71	0.36	0.29
Smartphone	2	1	3	1.33	1.67	0.34	0.27
TOTAL	218	273	491				

$$\chi^2 = \sum(O_i - E_i)^2 / E_i \quad 3.00$$

$$df = (\text{No Rows} - 1) * (\text{No Columns} - 1) \quad 3.00$$

$$p\text{-value} = \text{CHISQ.DIST.RT}(\chi^2, df) \quad 0.39$$

$p > 0.05 =$ no association between answers and student's group

14. How much time do you spend daily on distance learning?

Answer	Observed Value			Expected Value		$(O - E)^2 / E$	
	2021	2024	TOTAL	2021	2024	2021	2024
1-3 hours	71	131	202	89.50	112.50	3.83	3.04
3-5 hours	82	94	176	77.98	98.02	0.21	0.16
5-7 hours	53	28	81	35.89	45.11	8.16	6.49
7-10 hours	9	13	22	9.75	12.25	0.06	0.05
Over 10 hours	2	4	6	2.66	3.34	0.16	0.13
zero hours	1	4	5	2.22	2.78	0.67	0.53
TOTAL	218	274	492				

$$\chi^2 = \sum(O_i - E_i)^2 / E_i \quad 23.48$$

$$df = (\text{No Rows} - 1) * (\text{No Columns} - 1) \quad 5.00$$

$$p\text{-value} = \text{CHISQ.DIST.RT}(\chi^2, df) \quad 0.00$$

$p < 0.05 =$ there is an association between answers and student's group

15. How effective has distance learning been for you?

Answer	Observed Value			Expected Value		$(O - E)^2 / E$	
	2021	2024	TOTAL	2021	2024	2021	2024
Extremely effective	28	49	77	34.43	42.57	1.20	0.97
Ineffective	9	2	11	4.92	6.08	3.39	2.74
Rather no	9	19	28	12.52	15.48	0.99	0.80
Rather yes	94	110	204	91.21	112.79	0.09	0.07
Not at all	4	14	18	8.05	9.95	2.04	1.65
Very much	156	177	333	148.88	184.12	0.34	0.28
TOTAL	300	371	671				

$$\chi^2 = \sum(O_i - E_i)^2 / E_i \quad 14.54$$

$$df = (\text{No Rows} - 1) * (\text{No Columns} - 1) \quad 5.00$$

$$p\text{-value} = \text{CHISQ.DIST.RT}(\chi^2, df) \quad 0.01$$

$p < 0.05 =$ there is an association between answers and student's group

16. How stressful has it been to support remote work during the COVID-19 pandemic?

Answer	Observed Value			Expected Value		$(O - E)^2 / E$	
	2021	2024	TOTAL	2021	2024	2021	2024
Extremely stressful	4	3	7	3.10	3.90	0.26	0.21
Little bit	34	67	101	44.75	56.25	2.58	2.06
Moderate	34	61	95	42.09	52.91	1.56	1.24
Not at all	89	127	216	95.71	120.29	0.47	0.37

Very stressful	57	16	73	32.35	40.65	18.79	14.95
TOTAL	218	274	492				

$$\chi^2 = \sum(O_i - E_i)^2 / E_i \quad 42.49$$

$$df = (\text{No Rows} - 1) * (\text{No Columns} - 1) \quad 4.00$$

$$p\text{-value} = \text{CHISQ.DIST.RT}(\chi^2, df) \quad 0.00$$

$p < 0.05$ = there is an association between answers and student's group

17. How well could you manage your time while online?

Answer	Observed Value			Expected Value		$(O - E)^2 / E$	
	2021	2024	TOTAL	2021	2024	2021	2024
Extremely good	43	61	104	45.96	58.04	0.19	0.15
Good	39	51	90	39.78	50.22	0.02	0.01
Moderate	18	26	44	19.45	24.55	0.11	0.09
Very good	107	127	234	103.42	130.58	0.12	0.10
Weak	10	9	19	8.40	10.60	0.31	0.24
TOTAL	217	274	491				

$$\chi^2 = \sum(O_i - E_i)^2 / E_i \quad 1.33$$

$$df = (\text{No Rows} - 1) * (\text{No Columns} - 1) \quad 4.00$$

$$p\text{-value} = \text{CHISQ.DIST.RT}(\chi^2, df) \quad 0.86$$

$p > 0.05$ = no association between answers and student's group

18. Do you like distance learning?

Answer	Observed Value			Expected Value		$(O - E)^2 / E$	
	2021	2024	TOTAL	2021	2024	2021	2024
Not at all	12	1	13	5.76	7.24	6.76	5.38
Sometimes Yes, sometimes not	59	73	132	58.49	73.51	0.00	0.00
Yes, absolutely	128	167	295	130.71	164.29	0.06	0.04
Yes, but I would like to change a few things	19	33	52	23.04	28.96	0.71	0.56
TOTAL	218	274	492				

$$\chi^2 = \sum(O_i - E_i)^2 / E_i \quad 13.52$$

$$df = (\text{No Rows} - 1) * (\text{No Columns} - 1) \quad 3.00$$

$$p\text{-value} = \text{CHISQ.DIST.RT}(\chi^2, df) \quad 0.00$$

$p < 0.05$ = there is an association between answers and student's group

4. Conclusions

The current study differentially investigates the perceptions and points of view of students from a University in Romania (Bucharest) in two socially important moments, during the pandemic (group 2021) and after the pandemic (group 2024), regarding the online education of students of at the bachelor's degree, Faculty of Informatics (part-time and distance learning).

The first question (I1) determined relatively different answers on the two groups of students - the 2021 group answered ~6.5% "Poor" to the question, compared to the 2024 group with ~1%, which can be interpreted that the students are already accommodated with online activities:

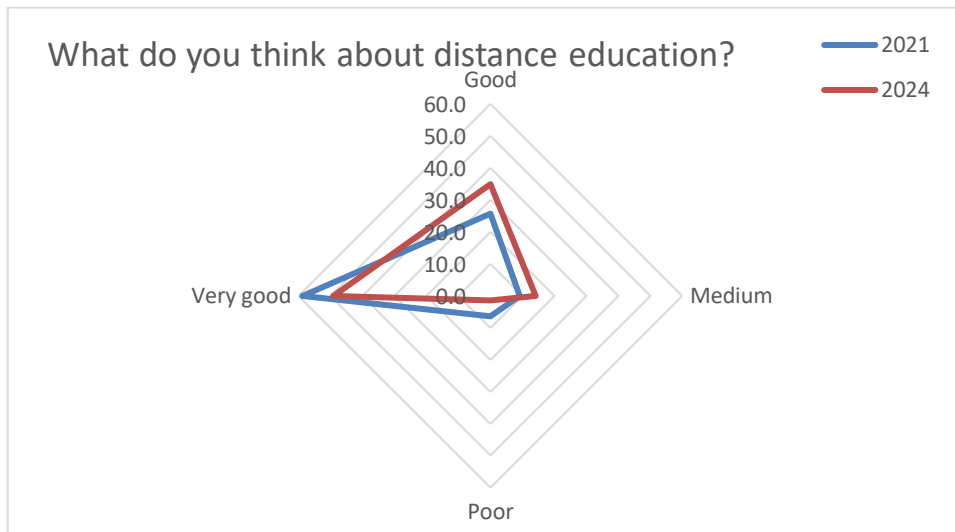


Figure 1 – Graphic with percentage's distribution of answers for question I1

The answers to the questions: the second (I2), the third (I3), the fifth (I5) and the seventh (I7) are practically equivalent for the two groups of students.

For the fourth question (I4) the answer options "5-7 hours" (~24% for 2021 compared to ~10% for 2024) and "1-3 hours" (~33% for 2021 compared to ~48% for 2024) differentiated the two groups in the sense of accommodation and efficiency when working online, thus validating the analysis from I1.

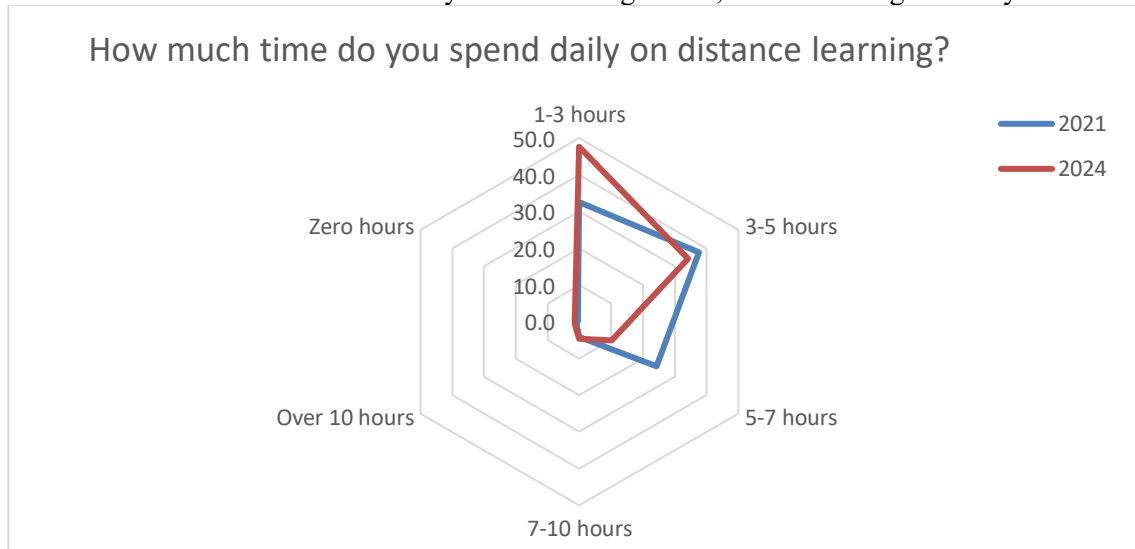


Figure 2 – Graphic with percentage's distribution of answers for question I4

The sixth question (I6) brought major differences for the two groups, to the answer "Very stressful" answering ~26% of the 2021 group and ~6% of the 2024 group, demonstrating the good adaptation to remote work of the subjects from the 2024 group compared to those from the 2021 group.

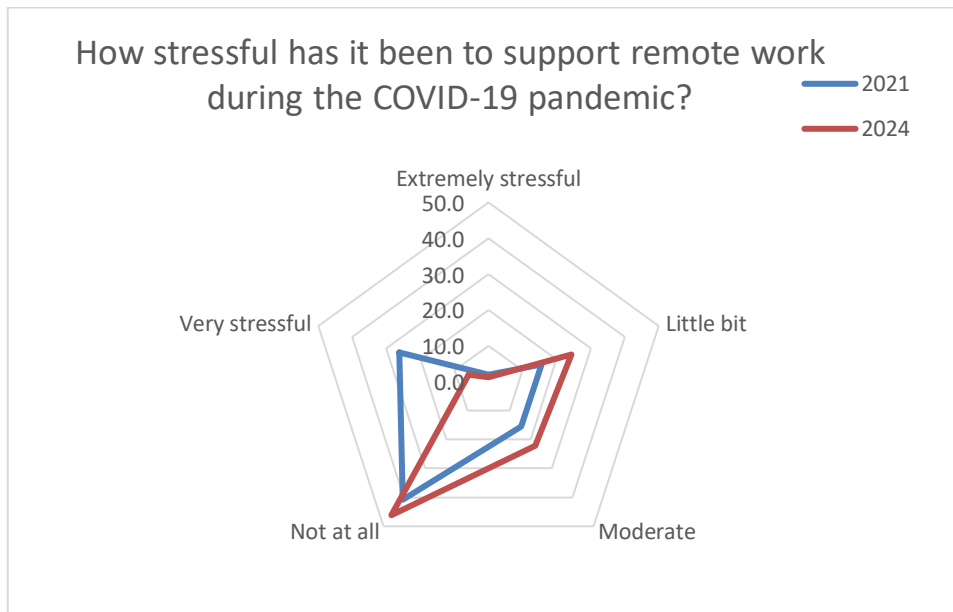


Figure 3 – Graphic with percentage's distribution of answers for question I6

In the eighth question (I8), the difference was made in the answer "Not at all" with ~6% for the 2021 group compared to ~0.5% for the 2024 group, which reinforces the analysis made in (I1), namely that the students of the 2021 group do not they were comfortable enough with online work.

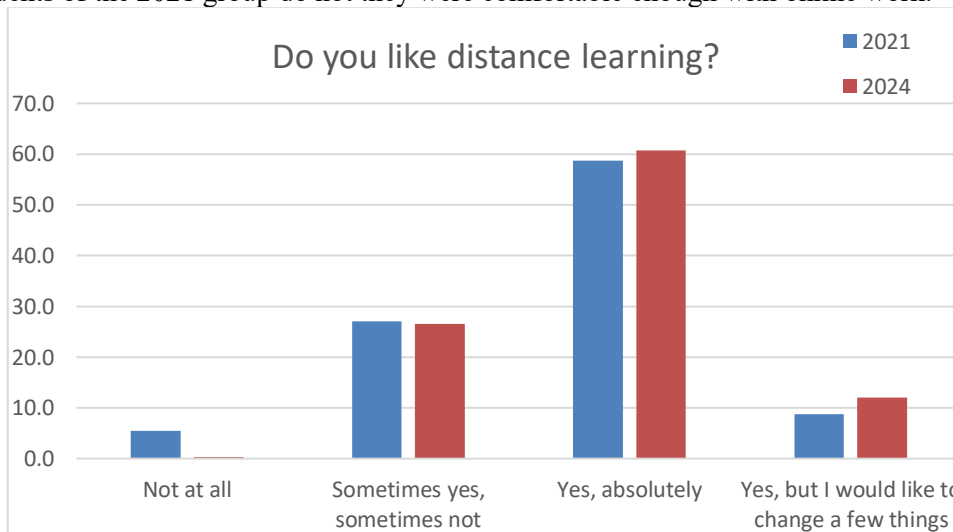


Figure 4 – Graphic with percentage's distribution of answers for question I8

As a final conclusion, it can be said unequivocally that the perception of online study, from all points of view, is much improved among the students of the Faculty of Informatics from the year 2024 compared to the year 2021, the stress being dramatically reduced, and the efficiency being greatly increased.

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