Exploring Romanian Engineering Students' Perceptions of Covid-19 Emergency e-Learning Situation. A Mixed-Method Case Study

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Abstract: The Covid-19 pandemic is the most disturbing event in the lifetime of most of our planet's citizens. The lockdown measures directly impacted many areas of our lives, including the educational sector, because locking down countries meant implicitly locking down the educational system. Moreover, what was first considered a temporary solution for an extraordinary situation began to look more and more like a medium to long-term general rule. Nevertheless, the questions are: are we all ready to move the entire educational process online and fully understand the challenges and implications for all stakeholders involved? This two-part research aims to provide some answers to these questions by identifying and analyzing the perceptions of Romanian engineering students enrolled at "Gheorghe Asachi" Technical University of Iasi (TUIASI) regarding the changes registered in the past year once the emergency e-learning situation started. The first part of the research was conducted between April and May 2020 through an online survey among 134 engineering students. It aimed at identifying the students' perception of the online learning systems provided by their university, considering the significant speed with which changes were imposed. In addition, this research phase focused on students' access to resources and knowledge to use and integrate online learning into their study routine. The second part of the research was carried out after almost a year of e-learning between March and April 2021 and consisted of six online focus groups with 36 students and aimed at identifying the main advantages and challenges students experience throughout the online educational process. The research revealed that although students are digital natives, they still have difficulties harnessing e-learning's advantages and integrating them into their study routine. Another significant aspect refers to the changing role of the professor perceived not only as an instructor but as a mentor during a time of crisis. The study results can offer higher education institutions insight and valuable information that can be used in designing and implementing online and hybrid activities and classes that better fit the students' needs and expectations in terms of e-learning.

Keywords: online learning; emergency e-learning; virtual teaching; Covid-19; technostress; teaching culture

1. Introduction

The Covid-19 pandemic is a massive global health crisis that has disrupted all areas of our lives, changing patterns of behaviors and forcing us to find new coping mechanisms (Bavel et al., 2020). In this context, the educational system was forced to convert to "emergency mode" and adapt and identify solutions to carry out the educational process and implement measures to protect students and academia from Covid-19.

Neither online learning nor distance learning were new concepts for higher education institutions, as the use of Information and Communication Technologies to deliver educational content and learning support has become, even before the Covid-19 pandemic, the accepted norm for many institutions in the higher education sector across the world (Latchem, 2017; Sharma et al., 2020; Johnson et al., 2021). Moreover, various e-learning advocates consider that it can significantly positively impact the quality of education, students' performance, and engagement levels (Shen and Ho, 2020).

What is significant and worth exploring is the context and the way higher education institutions transitioned to fully online mode and radically transformed their educational processes, as universities, even the ones that previously were reluctant to change their educational approach, had no option but to shift entirely to online teaching-learning (Dhawan, 2020; Hodges et al., 2020; Tian, Zheng and Chao, 2020).

At the beginning of the emergency e-learning, most universities focused more on course continuity and less on online learning best practices. Therefore, this "emergency mode" does not come without consequences: on the one hand, forced e-learning can be seen as an opportunity to "convince the unconvinced" of the advantages offered by e-learning (Kulikowski, Przytuła and Sułkowski,, 2021). However, on the other hand, these changes were implemented almost without proper planning and design and did not fully take advantage of the affordances and possibilities of the online format. As a result, there is a significant risk to seal the perception of e-learning detractors that e-learning is just a weak alternative option for traditional education.

Considering all the above, the current study investigates the perceptions and attitudes of "Gheorghe Asachi" Technical University of Iasi students towards e-learning and how these evolved throughout the emergency e-learning period considering that the research stages were conducted one year apart. The research took place between April 2020 and April 2021. It involved two phases: the first phase consisted of quantitative research conducted between April and May 2020 after almost two months of online learning. The research aimed to evaluate the students' perceptions and expectations toward using online technology for learning in terms of access to resources and knowledge and their perception of the impact on their overall academic performance.

The second phase of the research consisted of a qualitative study conducted between March and April 2021, after almost a year of emergency e-learning. It focused on evaluating the students' perception regarding the advantages and challenges imposed during this time and their willingness to continue in an online format. The students included in the second phase of the research were both 2nd and 3rd year students who participated in the first stage of the research and 1st year students who had started studying exclusively online.

2. Contextual background

2.1 E-learning Usage In Romanian Higher Education Institutions

As a member of the European Union, the Romanian Higher Education system is aligned with the European Higher Education Area, the Bologna Agreement (Curaj et al., 2015), and the national policies concerning education and digitalization are directed by the EU level decisions (Goldbach and Hamza-Lup, 2017). In this context, digital inclusion has been one of the main priorities on the Romanian Ministry of Education and Research agenda and several major educational programs were centered around developing the ICT infrastructure and internet connection for Romanian education institutions. In addition, several other major educational programs focused on training professors, developing quality online resources, and providing access to online learning spaces (Grosseck, Holotescu and Andone, 2020). This was done because, starting with 2014, the European Council has recommended the EU Member States to focus on improving teachers' digital skills: "The rapid spread of digital learning tools and open educational resources also creates the need for teachers to gain a sufficient understanding of them in order to develop relevant digital skills and use them effectively and appropriately in teaching. These new tools can also help to ensure equal access to high-quality education for all" (EU 2014, online).

Regarding internet access, Romania has 15.35 million internet users and an overall Internet penetration rate, as of January 2020, of 80% (Kemp, 2020). However, the data shows that 83% of urban households have an internet connection, while only 67% of rural areas households have one. This shows that there is a significant gap between the urban and rural areas, and this has the potential to generate massive disruption in the educational process, accentuating the Urban-Rural Divide (Stoica and Ilas, 2013) or the general inequality of opportunities in education (Edelhauser and Lupu-Dima, 2020; Hosszu and Rughinis, 2020).

Regarding the use of technology and digital tools in Romanian higher education institutions prior to 2020, previous research shows that starting with 1995, 58% of Romanian universities declared that they use some type of e-learning solutions in didactic and non-didactic activities for their distance learning (DL) education programs (Edelhauser and Lupu-Dima, 2020). However, the aforementioned studies also revealed that online learning activities implemented before the Covid-19 pandemic were mostly focused on the online presentation of learning materials and short online tests (Traistaru and Cotoc, 2013; Grabara and Bosun, 2014) and that the majority of university professors had limited knowledge regarding the process of adapting the course content and activities to the requirements of the fully online environment.

In this context, the swift adjustments imposed by the new Covid-19 context were challenging for all parties involved: universities, professors, and students, as the transition was done under time constraints without proper preparation and neither party knew what to expect or how long this temporary solution will be in place.

2.2 The Impact of Covid-19 on Romanian Higher Education

Starting with March 11, 2020, all Romanian universities suspended face-to-face teaching activities and followed the trend in education systems worldwide by shifting to "emergency e-learning" protocols (Murphy, 2021).

Analyzing the national context and the developments, experts from Bucharest University, Faculty of Psychology and Educational Sciences, considered that the forced online teaching has been done at "different speeds" from one community to another, from one school/university to another (University of Bucharest, 2020). Because although Romania has a centralized education system, universities have autonomy in terms of their mission, institutional strategy, structure, activities, organization, and functioning. In this context, the strategies for translating the educational activities from face-to-face to online teaching were significantly different from one university to another. This aspect is confirmed by other studies highlighting that the emergency e-learning responses to Covid-19 occurred primarily on an institution-by-institution or system-by-system basis all over the world (Murphy, 2021).

During the first stage of the transition from face-to-face to fully online classes, changes were fast-paced. The transition consisted mainly in either accessing third-party platforms, such as Microsoft Teams, Google Classroom, or Zoom, or using their in house Learning Management Systems on Moodle or Blackboard to move all their classes online without having proper time to design and adjust the course contents and activities for an online environment.

Consequently, this phase focused primarily on identifying technological and logistical solutions and professors were left out of the equation, so they had to start to prepare and deliver classes from home, without proper planning and organization, facing various practical and technical challenges, and often lacking proper technical support (Hodges et al., 2020; Rapanta et al., 2020). For technical university professors, the challenges were even more significant as many of their disciplines required careful planning and design and hardware or access to laboratories during the teaching process (Samantray, 2020).

Several authors have recognized the professors' level of digital literacy to be a critical factor in the successful transition to online learning (Ali, 2020; Chung, Subramaniam and Christ Dass, 2020; Naji et al., 2020; Rapanta et al., 2020), as digital literacy goes beyond knowing how to use devices and applications. Because teaching during the Covid-19 pandemic is not only about teaching in extraordinary times but also about developing an understanding of who professors are and how they teach their disciplines in a new context and setting (Smith and Hornsby, 2020). Furthermore, many professors, forced to use e-learning without previous practice and instruction in e-learning tools and techniques, ended up feeling that they would need to compromise their standards and deliver low-quality classes (Kulikowski, Przytuła and Sułkowski, 2021).

At the same time, a study conducted with Romanian university professors revealed that only one-third of them have participated in digital knowledge improvement courses in the last five years and over 50% of them consider that they need to improve their IT knowledge to cope with online learning (Ionescu et al., 2020). As a result, many universities developed resources platforms and workshops designed to educate educators on this process.

Furthermore, just like universities had different strategies for the online learning process, professors from the same university had different approaches for their classes, which led to students' perception of inconsistency and lack of structure at the beginning of the process.

3. Research methodology

The past 12 months, starting with March 2020, have been filled with numerous research articles analyzing various aspects of the impact of the Covid-19 pandemic on almost all aspects of our lives, from buying behavior to coping mechanisms and from entertainment to education.

The present study comes to enrich the body of research conducted to evaluate the impact of the emergency e-learning imposed by the Covid-19 pandemic on students worldwide (Edelhauser and Lupu-Dima, 2020; Händel

et al., 2020; Nur Agung, Surtikanti and Quinones, 2020; Odriozola-González et al., 2020; Adnan et al., 2020; Bączek et al., 2021; Calhoun et al., 2020; Iyer, Aziz and Ojcius, 2020; Kapasia et al., 2020; Lovrić et al., 2020; Al Rawashdeh et al., 2021) and in Romania (Tartavulea et al., 2020; Dospinescu et al. 2020; Stavre and Ilie-Prica, 2020; Obrad, 2020). Furthermore, the research brings added value because it employs both quantitative and qualitative research methods and is conducted in two different stages of the emergency e-learning process: at the beginning (April-May 2020) and after over a year of online learning (March-April 2021).

Another relevant aspect of novelty is that the second stage of the research involved both students who experienced entirely face-to-face learning and participated in the first stage of the study and 1st year students who enrolled in October 2020 and had online classes with just one face-to-face laboratory.

The effectiveness of the online learning process depends on a mixture of elements such as access to resources and knowledge in using ICT equipment, the students' ability to focus and self-discipline, the designed and prepared learning material, the lecturer's engagement in the online environment, the lecturer-student or student-student interaction (Aristovnik et al., 2020; Bao, 2020). Considering this and the fact that there is a significant difference between traditional e-learning and emergency e-learning, we believe it is essential to analyze and evaluate the students' perception of their online learning experience and use the results to change and improve the educational process, both in terms of the general approach and in terms of specific activities. Because this emergency e-learning crisis was an exceptional situation, but e-learning is "here to stay" in academia. With all its challenges and implications, this period can provide valuable lessons, especially for institutions implementing online learning for the first time.

This research was carried out to answer two main questions, one for each stage of the study, both focusing on the students perspective over their online learning experience:

1. April - May 2020 - What are students' perceptions and expectations of using online technologies during the Covid-19 pandemic?
2. March – April 2021 - What are the students' perceptions regarding the overall e-learning experience and the advantages and disadvantages of the online education process?

3.1 Phase 1 (April - May 2020) – Quantitative research

The first stage of the research took place between April and May 2020 and consisted of a web-based questionnaire comprising of 43 questions, mostly 5-point Likert scale type (Strongly agree, Agree, Neutral, Disagree, Strongly disagree).

Because the translation from face-to-face teaching to fully online classes was done very fast and most Romanian universities did not previously provide distance or online learning, the research goal was to identify the students' general perspective regarding the online learning process. Therefore, the questions included in the questionnaire covered various aspects regarding access to resources and knowledge to use online learning platforms, perception over easiness of study, control over the studying process, compatibility with personal study style, and impact over academic performance.

The validity and reliability of the questionnaire were assessed using SPSS Software. The validity was tested using the Pearson correlation method, while reliability was tested using Cronbach's alpha method.

Using the Pearson Correlation analysis, the scale's validity was tested, and the results indicated that all six items included in the questionnaire (Control, Compatibility, Resources, Ease, Knowledge and Satisfaction) were statistically validated, the significance level (sig. = 0.000) having a lower level than the 0.05 threshold (Table 1).

Table 1: Items' Validity - Correlations

		Control	Compatibility	Resources	Ease	Knowledge	Performance
Control	Pearson Correlation	1	.523**	.263**	.762**	.319**	.439**
	Sig. (2-tailed)		.000	.002	.000	.000	**.000**
	N	134	134	134	134	134	134
Compatibility	Pearson Correlation	.523**	1	.241**	.549**	.185*	.506**
	Sig. (2-tailed)	.000		.005	.000	.032	**.000**
	N	134	134	134	134	134	134
Resources	Pearson Correlation	.263**	.241**	1	.290**	.587**	.350**
	Sig. (2-tailed)	.002	.005		.001	.000	**.000**
	N	134	134	134	134	134	134
Ease	Pearson Correlation	.762**	.549**	.290**	1	.267**	.489**
	Sig. (2-tailed)	.000	.000	.001		.002	**.000**
	N	134	134	134	134	134	134
Knowledge	Pearson Correlation	.319**	.185*	.587**	.267**	1	.312**
	Sig. (2-tailed)	.000	.032	.000	.002		**.000**
	N	134	134	134	134	134	134
Satisfaction	Pearson Correlation	.439**	.506**	.350**	.489**	.312**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	
	N	134	134	134	134	134	134

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

In order to test the scale's internal consistency, a reliability analysis was conducted. Based on the rules developed by George and Mallery (2003), the value for Cronbach's alpha is 0.806 (greater than 0.8), meaning the current scale made of 6 items has a high consistency.

Table 2: Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Ease	17.98	10.954	.688	.745
Control	17.83	11.542	.675	.749
Compatibility	17.84	12.244	.568	.775
Resources	17.13	13.606	.441	.802
Knowledge	17.08	14.241	.437	.802
Satisfaction	17.51	13.019	.587	.772

The questionnaire was applied online using Google forms and was completed by 206 students from all over Romania, out of which 134 students from "Gheorghe Asachi" Technical University of Iasi, both from bachelor and master programs. The questionnaire was posted online on faculties intranet and sent to student organizations and other professors. Both the professors disseminating the questionnaire and the students received precise information about the research goal. Students were informed that participation is entirely voluntary and anonymous and that their answers will be used to identify solutions for improving the online learning experience. No incentives were offered to gain respondents, and the students could stop filling in the questionnaire at any time. They gave their consent to participate in the study by completing the questionnaire. The average time necessary to answer the questionnaire was 12 minutes.

Table 3: Respondents profile

	Category	Percentage
Study level	Bachelor	83.58%
	Master	16.42%
Gender	Female	70.15%
	Male	29.85%
Age	Under 22	56.72%
	Over 23	43.28%
E-learning experience	No experience	14.9%
	Somewhat experienced	60.4%
	Experienced	24.6%

More than 80% of respondents were bachelor students, out of which 70.15% (94 students) were female. The data aligns with the 2021 statistics regarding the male/female proportion for post-secondary educational institutions, where most Romanian students are female – 69.3% compared to male – 30.7 (Statista, 2021). The data provided by the Romanian ministry of education reports for 2016-2020 show that the male/female proportion for bachelor programs favors 9% to 14% of female students. For master programs, female students are 21% higher than male students (EDU, 2020).

When asked to evaluate their previous e-learning experience, only 14.9% (20 students) declared they had no experience, and 24.6% (33 students) considered themselves experienced. In comparison, the rest of 60.4% (81 students) declared that they are somewhat experienced. This question is relevant as the analysis revealed a significant statistical association between the respondents' level of e-learning experience and their perceived easiness to study using online platforms (sig=0.033) or their perceived control over all aspects of their education (sig=0.030)

3.2 Phase 2 (March – April 2021) – Qualitative research

The second stage of the research took place between March and April 2021 and consisted of 6 online focus groups with 36 students (24 F and 12 M) from "Gheorghe Asachi" Technical University of Iasi enrolled in bachelor programs. The focus groups were conducted online via Zoom, a proprietary video teleconferencing software used successfully in other qualitative research studies (Archibald et al., 2019). They consisted of 7 open-ended questions derived from the main research question covering various aspects of their online learning experience.

Five focus groups were conducted with 2nd and 3rd year students who participated in the first stage of the research by completing the questionnaire. One focus group included only 1st year students, enrolled in October 2020 which began their studies online with only one face-to-face laboratory each semester.

The research team considered that a qualitative design through focus groups was the most appropriate option for this stage of the research, as the method allows in-depth exploration of respondents experience and perceptions (Berg, 2009) and provides the unique opportunity to obtain rich group interaction data (Stahl, Tremblay and LeRouge, 2011).

The aim of the qualitative research through focus groups was to identify and evaluate the students' perception after over a year of online learning and pinpoint the main advantages and challenges perceived by students. Therefore, the research team developed and refined a focus group guide based on the results obtained in the first stage of the study, the literature review, and the pilot testing with a student.

Each focus group started with an introduction and a brief presentation of the research aim and procedure and continued with the questions inquiring students about their perception toward the overall e-learning experience, their expectation at the beginning of the academic year, the level of satisfaction with the classes and the evaluation process, the main advantages perceived and the challenges encountered throughout the experience. The last question referred to their preferred option to study for the 2021-2022 academic year. The transcripts resulting from the focus groups were further analyzed using thematic analysis as the research team focused on students' experience and perception over the online learning period. In order to have an inter-coder agreement, the authors have read one transcript and conducted line-by-line coding of one transcript together. After this, the other transcripts were coded in pairs. A deductive approach was used to establish the general categories at the beginning and an inductive approach was used to develop the themes and subthemes. The

ultimate core themes and subthemes were agreed by all authors and consisted of (1) Educational impact, (2) Personal impact, (3) Perceived advantages and challenges. The last question regarding their preference for the 2021-2022 academic year was not included as a separate theme in the analysis.

4. Results and discussions

4.1 Quantitative study

The questionnaire was completed by 134 students from "Gheorghe Asachi" Technical University of Iasi. The profile of the respondents is presented in the table below.

Considering that this phase of the research took place at the beginning of the emergency e-learning period, the questions included in the questionnaire focused on elements such as the availability of resources and knowledge to use online learning platforms, students perception over different aspects related to online learning such as compatibility with other aspects of their education or easiness to study and control over their studies. Table 4 presents an overview of the students' perceptions regarding the previously mentioned aspects.

Table 4: Students' perception towards using online technology

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I have the necessary resources to use an online learning platform (Resources).	0.75 %	8.21 %	16.42%	45.52%	29.10 %
I have the necessary knowledge to use an online learning platform (Knowledge).	1.49 %	2.24 %	15.67%	56.72%	23.88 %
Using an online learning platform makes it easier for me to study (Ease).	7.46 %	26.12 %	27.61%	26.87%	11.94 % %
Using an online learning platform is compatible with all aspects of my education (Compatibility).	5.22 %	18.66 %	33.58%	32.09%	10.45 %
Using an online learning platform gives me greater control over my study (Control).	2.99 %	25.37 %	26.87%	33.58%	11.19 %
I am satisfied with the performance of the online learning platforms (Satisfaction).	1.49 %	11.19 %	26.87%	50.75%	9.70 %

All students from "Gheorghe Asachi" Technical University of Iasi participating voluntarily in the study declared that they are currently using Google Classroom or Microsoft Teams as their primary online learning platforms.

In terms of access to resources and knowledge, 74.63 % of students opted for Agree and Strongly agree with the statement "During this pandemic, I have the necessary resources to use a virtual platform" and 80.6 % opted for Agree and Strongly agree with the statement, "I have the knowledge necessary to use a virtual platform". These statements confirm the overall importance of technology for students and the ease of use as their everyday life and practices have been entwined with social media, smartphones, tablets, and Internet use (Boulianne and Theocharis, 2018; Iivari et al. 2020).

However, when evaluating the impact of the online learning process in terms of facilitating the study, only 38.81 % of students opted for Agree and Strongly agree with the statement "Using a virtual platform in the university makes it easier for me to study". In comparison, 33.58 % chose Disagree and Strongly disagree for the same statement. The study results are consistent with other studies comparing e-learning with face-to-face teaching, which revealed that e-learning has a lower impact than face-to-face learning (Ionescu et al., 2020; Bali and Liu, 2018). This can be directly related to the fact that although university students are digital natives, they are not fully prepared to harness the advantages of e-learning due to a lack of skills in time management and self-directed learning (Parkes, Stein and Reading, 2015). These outcomes are further confirmed by the results obtained after conducting the focus groups in the second stage of the research, highlighting that further improvements in the online teaching-learning process are needed for students to better integrate online e-learning into their study routine.

The Chi-Square test done to evaluate the relationship between the students' level of previous experience with e-learning and their perception over easiness of study during online learning showed a significant dependence between the two (sig = 0.033, lower than the 0.05 threshold).

Table 5: Experience * Ease Crosstabulation

			Ease					Total
			Strongly disagree	Disagree	Neutral	Agree	Strongly agree	
Experience	Experienced	Count	3	6	7	11	6	33
		% of Total	2.2%	4.5%	5.2%	8.2%	4.5%	24.6%
	No experience	Count	4	8	2	6	0	20
		% of Total	3.0%	6.0%	1.5%	4.5%	0.0%	14.9%
	Some-what experienced	Count	3	21	28	19	10	81
		% of Total	2.2%	15.7%	20.9%	14.2%	7.5%	60.4%
Total		Count	10	35	37	36	16	134
		% of Total	7.5%	26.1%	27.6%	26.9%	11.9%	100.0%

Table 6: Chi-Square Tests (Experience*Ease)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	16.705[a]	8	.033
Likelihood Ratio	18.482	8	.018
N of Valid Cases	134		

a. 4 cells (26.7%) have an expected count of less than 5. The minimum expected count is 1.49.

At the same time, 44.78 % of respondents opted for Agree and Strongly agree with the statement "Using a virtual platform technology in the university gives me greater control over my study", which is understandable considering that one of the main advantages of the online environment is flexibility and the study was conducted at the beginning of the pandemic when students were still straggling to adapt to changes and find a rhythm in the new digital context. However, in the second phase of the study, the focus groups discussions revealed that although they felt fully motivated and organized at the beginning of the emergency e-learning period, they lost their motivation and began to feel less and less in control of their educational journey.

When analyzing the correlation between the respondents' level of experience with online learning and their perceived control over their study during online learning, the Chi – Square test significance level (sig = 0.030) was lower than the 0.05 threshold, suggesting a dependence (significant statistical association).

Table 7: Experience * Control Crosstabulation

			Control					**Total**
			Strongly disagree	**Disagree**	**Neutral**	**Agree**	**Strongly agree**	
Experience	Experienced	Count	2	5	11	7	8	33
		% of Total	1.5%	3.7%	8.2%	5.2%	6.0%	24.6%
	No experience	Count	1	8	6	5	0	20
		% of Total	0.7%	6.0%	4.5%	3.7%	0.0%	14.9%
	Some-what experienced	Count	1	21	19	33	7	81
		% of Total	0.7%	15.7%	14.2%	24.6%	5.2%	60.4%
Total		Count	4	34	36	45	15	134
		% of Total	3.0%	25.4%	26.9%	33.6%	11.2%	100.0%

Table 8: Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.049[a]	8	.030
Likelihood Ratio	18.156	8	.020
N of Valid Cases	134		

a. 5 cells (33.3%) have an expected count of less than 5. The minimum expected count is .60.

In terms of overall satisfaction with the use of online learning platforms, 60.45 % of respondents declared that they Agree and Strongly agree with the statement "I am satisfied with the performance of the online learning

platforms". The students' answers need to be correlated with the general perception that this is a temporary situation and that face-to-face interactions will be resumed shortly. Another relevant aspect refers to the fact that most students moved back home with their families during this specific time frame, which provided some extra comfort, which was confirmed in the second stage of this research.

4.2 Qualitative study

The second stage of the research took place between March and April 2021 and consisted of 6 online focus groups with 36 students (24 F and 12 M) from "Gheorghe Asachi" Technical University of Iasi enrolled in bachelor programs from 1st year to 3rd year students. This part of the study aimed to evaluate the student's experience with the online learning platforms after almost a year of usage. The focus group guide consisted of seven questions covering three core themes and the subsequent subthemes (1) Educational impact, (2) Personal impact and, (3) Perceived advantages and challenges, as shown in Table 9.

Table 9: Focus group themes and subthemes

Main theme	Subtheme
(1) Educational impact	Content understanding
	Workload
	Student focus
	Time management and organization
	Evaluation process
	Professor - student communication
	Student – student communication
(2) Emotional impact	Lack of sense of community
	Student motivation
	Technostress
(3) Perceived advantages and challenges	Comfort
	Flexibility
	Adaptability
	Technical challenges

4.2.1 Educational impact

The first part of the focus group discussions was centred around various aspects of their online learning experience. Throughout the six focus group discussions, seven subthemes emerged, namely: (1) Content understanding, (2) Student focus, (3) Workload, (4) Time management and organization, (5) Evaluation process, (6) Professor-student communication and (7) Student-student communication. Some of the subthemes included in this theme are also relevant for the Emotional impact theme, such as professor - student communication and student – student ik, as these are also elements related to the senses of community and belonging.

The participants had diverse opinions with significant differences between 1st year students and 2nd or 3rd year students in terms of content understanding. This result can be explained because 1st year students had limited experience with face-to-face classes, as they started the year online and only had one face-to-face laboratory each semester. However, all participants agreed that for some disciplines, e-learning works better than for others which is understandable considering that many technical disciplines require hardware or lab equipment in the teaching/learning process. Moreover, this also affects the students' workload and time management, as they declared that they require extra time to learn specific disciplines. Another interesting perspective offered by the students participating in the focus groups was that the online environment favours students who are not very keen to learn and provides disadvantages for students who are more focused on their education due to the increased efforts.

> *"For some disciplines, it's almost impossible to learn if it's only online. At first, I didn't really grasp, but if you really want to learn something, I feel that I have to work double the time to understand what the teacher told us during the online lecture."*

Another aspect related to workload mentioned in all focus groups was that online classes had the same timeline as regular face-to-face classes. Also, the professors' online teaching styles varied significantly, which impacted the students' ability to maintain concentration and focus throughout the day. This aspect is confirmed by other studies done during the Covid-19 pandemic, which highlighted that, in terms of frequency and duration of classes, most students consider that the optimal length for an online class is 45 minutes and that they can focus

for a maximum of two to four hours of online classes a day (Muthuprasad et al., 2021). The students included in the focus groups had two and some of them three days a week with six to eight hours of online classes. Many of them affirmed that they find themselves easily distracted during their online lectures and unable to focus after a certain amount of time. A relevant aspect in this context is that most Romanian universities had exclusively synchronous classes on the same timeline as the previous face-to-face classes.

"I have days when we have so many classes that at the end of the day I have a headache and sore eyes."

"It's not that I don't like a class or a professor, I'm having difficulties focusing even when it's a subject that I really enjoy and I regret it because I feel that I'm missing something important. But there are so many distractions around: if I get a phone notification, I'll stop and check my phone."

The participants in the study, especially 2nd and 3rd year students, stated that they feel overwhelmed by the increased number of individual homework and projects they had to deliver as part of their online activity and evaluation. In addition, several other studies mention the increased academic workload of students during online classes in the form of various types of assignments (Armstrong-Mensah et al., 2020, Giray, 2021) which shows that this was a growing trend in universities all over the world.

Furthermore, connected with this aspect, students also listed the difficulty of cooperating with their colleagues when working to create and deliver group assignments and projects, an aspect mentioned in other studies as well and connected with the lack of on-site socialization (Alsoud and Ahmad, 2021; Hebebci, Bertiz and Alan, 2020).

"I always feel like I'm working on my own and that I am somehow alone. We use the WhatsApp and Facebook groups to communicate and exchange info about assignments and projects, but it's not the same".

One of the results of this part of the study revealed that almost all students miss face-to-face classes and live interactions with their professors and colleagues. The result is in line with other studies analyzing the students' perception of face-to-face learning in comparison with online or hybrid learning conducted before and during the Covid-19 pandemic (Castle and McGuire, 2010; Giannoulas et al., 2021; Ionescu et al., 2020; Muthuprasad et al., 2021). Another relevant aspect, also confirmed by previous studies, is that students' engagement and satisfaction are directly connected with the ability to have personal dialogues with professors and peers (Chigeza and Halbert 2014; Nortvig, Petersen and Balle, 2018; Giray, 2021).

Another important aspect that impacts the student-professor and student-student interaction is the visibility of other people's faces, as most students choose to keep their cameras closed during classes either by choice or because the online platform does not accept a high number of cameras being open at the same time.

The lack of professor-student interaction and lack of professor's support was constantly mentioned as a motive for dissatisfaction throughout the focus groups with 2nd and 3rd year students, which is in line with previous studies conducted on the matter. However, during the focus groups with 1st year students, one exciting result focused on the professor's role and how some professors managed to connect with the students and provide much-needed academic and organizational support. The perception that arose referred to the changing role of the professor, not only as an instructor, but as a mentor during a time of crisis. This result highlights the strong connection between the students' emotional state and their academic performance.

"I have to admit that the professors were way greater than what I was expecting and I was impressed with the way the professors (1st year tutors) attached to us and helped us out anytime we had a problem or a question".

This also confirms that the quality of teaching, and implicitly, the quality of learning, particularly during emergency e-learning, depends on emphatic interactions between professors and students and is driven by professors' motivations and interests.

4.2.2 Emotional impact

The emotional impact theme was highly debated during the focus groups discussions and is analyzed under three subthemes, namely (1) Lack of sense of community, (2) Student motivation and, (3) Technostress.

Most participants' responses throughout the focus groups were centered around their perception of lack of sense of community and disconnection from professors and colleagues, which influenced their motivation and self-discipline to carry on with their studies.

When asked what aspect of their university experience they missed most, all students ranked first social interactions and colleagues, highlighting the importance of the overall students' experience and the university community. Other previous studies highlight the concern over students' lack of sense of community during online learning classes both before the Covid-19 (Joksimovic et al., 2015) and during the pandemic (Giray, 2021; Muthuprasad et al., 2021). In addition, these studies reveal the importance of the sense of community for students' well-being and overall engagement and the impact on their social, psychological, and academic outcomes (Gopalan and Brady, 2020).

> *"When this started, we thought it's going to be like a short vacation, and then we'll get back to normal. But now that there is a "new normal", I don't like it. I never thought I was going to miss school so much. All I wonder is when will we return to school?"*

Many participants declared that they felt fully motivated and organized at the beginning of the emergency e-learning period, but they lost their motivation at some point and began to feel less and less focused and willing to make an effort. This is highlighted by other studies that emphasize that after a period of online learning, students begin to lose their focus and miss deadlines for different tasks (Gherghes et al., 2021). This can also explain the studies revealing that online courses have a 10% to 20% higher failed retention rate than traditional classroom environments (Herbert, 2006).

The aspects of motivation and self-discipline are mentioned in previous research regarding online learning, as this learning environment comes with extra challenges. The challenges are more significant for students who have low self-regulating or self-motivation capacities when it comes to learning, as they tend to face extra difficulties in engaging and succeeding in the online learning process (Dabbagh and Kitsantas, 2004; Golladay, Prybutok and Huff, 2000) and so they begin to skip classes or fail on assignments. In this context, the professor's role becomes crucial, as several studies reveal that the teachers' support is one of the most critical factors in fostering student motivation and engagement (Allen et al., 2013; Chiu, 2021; Roorda et al., 2011)

During the focus groups discussions, most 2nd and 3rd year students used words and expressions such as anxiety, fatigue, demotivation, lack of productivity, inability to focus, all aspects relevant to technostress, the stress induced due to technology and defined as the "problem of adaptation that individual experiences, when he or she is unable to cope with new technology" (Tarafdar, 2007). The prolonged hours spent in front of the computer, the increased number of assignments, and the sense of isolation felt by students after almost a year of online learning contributed to technostress. The emergency e-learning environment, even in a synchronous format, provides a less personal connection than face-to-face instruction. This combination of increased mental health stress and less contact with professors and peers must be an essential consideration for pedagogical planning (Murphy, 2021). And there is extensive research highlighting that this type of technology that induces stress is affecting all members of the academic community: students, professors, and staff (Charles et al. 2020; Penado Abilleira et al., 2020), showing that universities need to provide better solutions to monitor and provide support for this specific matter.

4.2.3 Perceived advantages and challenges

The perceived advantage theme is discussed under three subthemes, namely (1) Comfort, (2) Flexibility, and (3) Adaptability. The first two subthemes were pointed out in different variations by all students. For example, the idea that they can continue living and working in their cities while also continuing their university education gives them comfort. Another positive aspect listed by students referred to the fact that they manage to save time by studying online, as they don't need to commute anymore.

All students mentioned family and friends that having them close during the emergency e-learning period was a significant source of comfort. More than half of the students mentioned the perceived flexibility and relaxed atmosphere of some classes.

The third subtheme was somewhat surprising for the research team and emerged during the 1st year students' focus group when students declared that they perceive this experience as a test for their capacity to adapt and succeed in exceptional situations.

> *"I'm looking at this as an opportunity to keep up with technology, adapt to exceptional situations and learn how to do things differently. Who knows, maybe I'll start an online business."*

When asked about specific challenges, most of the students participating in the focus groups initially discussed only the technical challenges encountered. However, the main technical challenges listed by participants referred to internet access and connectivity, problems with the devices (camera/microphone), or the inability to connect and use the online platform selected by the professor. These results align with previous studies in which students listed the aspects of access to internet connection or infrastructure as the main challenges encountered during online learning (Giray, 2021). However, during the focus groups discussions, other challenges emerged and were included in other themes and subthemes, such as the high number of assignments and projects, the inability to focus due to distractions, the doubled time and effort put into understanding certain subjects or the lack of motivation due to sense of disconnection from the "student life."

> *"I often have problems with the internet connection during online lectures and I keep getting disconnected and it's frustrating and some professors don't believe me."*

> *"My microphone does not work and I have to write on chat or rely on my colleagues to tell the professor that I am present when he asks me a question and I am not able to answer it"*

The challenges listed by students are confirmed by other studies and analyses done in the past year (Khalil, Mansour and Fadda, 2020; Chung, Subramaniam and Christ Dass, 2020; Casey, 2020), which also pinpoint the fact that this swift translation to e-learning has the potential to not only reveal but deepen the gap and inequalities between students. This may also be connected with the fact that students from rural areas who remained home during online learning could only access the online learning platforms through mobile internet.

Regarding preferences for the next academic year, only three students participating in the focus groups opted for fully online classes, the rest choosing entirely face-to-face or hybrid options. The results partially confirm previous studies which reveal the order of preference among students: hybrid, face-to-face, and e-learning (EDUCAUSE, 2020). It is not surprising that most students chose entirely face-to-face, as this is the most standard model for Romanian students. However, what was surprising was that over 50% of participants said that they prefer to have evaluations and exams in an online format, the most common explanation being that they feel there is less pressure and stress during the online exams.

5. Conclusions

Online teaching was one of the main trends in education even before the emergency e-learning situation imposed by the Covid-19 pandemic. However, the Covid-19 and the aftermath bring significant changes and challenges for academia, and the experience from the past year has plenty of lessons to be learned in terms of vulnerabilities and opportunities for all stakeholders involved in the process.

This mixed-method research aims to provide a valuable image of the students' perception of the overall e-learning experience providing information from two different moments of the Covid-19 emergency e-learning process: at the beginning (April – May 2020) and after almost a year of online learning (March – April 2021). The study also involves students who experienced fully face-to-face classes and students who only had one face-to-face laboratory and the rest exclusively online.

On the plus side, the study revealed that students have the necessary resources and knowledge to study using online platforms and to use digital tools and methods, as 74.63 % declared that they have the necessary resources to use a virtual platform and 80.6 % declared that they know how to use a virtual platform. However, the fact that students have digital competencies and access to technology does not necessarily mean that they use a complex variety of digital tools or that they are fully exploiting all options to enhance all aspects of the teaching-learning process. So universities should provide access and instruction for digital tools to facilitate collaborative work among students and students, and professors. This highlights an aspect nominated in other studies, that universities need to tap into students' tech-savviness and translate it to make them more capable of handling the rigor involved in online learning (Sarbottam and Dan, 2020).

The research revealed a statistically significant association between the students' level of previous e-learning experience and their perceived easiness of studying using online platforms (sig=0.033) or their perceived control over all aspects of their education (sig=0.030). This result is in line with other studies highlighting that students

who were used to online or blended learning managed to harness better the advantages provided by e-learning during Covid-19. At the same time, during the second stage of the research, the discussions with 1st year students revealed that although they started the academic year entirely online and had no previous e-learning experience, they managed to adapt and even enjoy the experience due to their professors' and tutors' involvement.

During the qualitative research stage, many students declared that although they felt motivated and organized at the beginning of the online learning period in March 2020, they lost their motivation and started feeling less and less in control of their studies as the Covid-19 e-learning period progressed. The difficulty to remain on task and maintain focus and self-motivation through-out the online-learning period is confirmed by other studies (Kalman, Esparza and Weston, 2020; Giray, 2021) and highlights another relevant aspect, namely the fact that improving access to information does not necessarily translate to knowledge and skill acquisition, as professors are essential in guiding these processes for students (Njenga and Fourie, 2008). Related to the same aspect, the study revealed a change in the perception of the professors' role as it is no longer perceived just as an instructor and deliverer of information but as a facilitator and mentor. And this can put even more pressure on professors who are already forced to rethink and redesign their curricula and teaching pedagogies and instruments for the online environment.

The study also pointed out several drawbacks perceived by students that can be considered when designing and delivering online classes and highlighted the importance of community and social interactions as an intrinsic part of the learning process. The prolonged social distancing and the lack or limited interactions with professors and colleagues took a toll on students' motivation and overall mental health. So, although online education can provide many advantages in terms of flexibility and access, universities must develop strategies to encourage collaboration between students and create opportunities for connection. Because the results of the study highlight once again the importance of the overall "students experience" that goes beyond the academic aspects, and finding solutions to build a sense of community when designing and implementing e-learning should be a pivotal point of the process.

The lesson to be learned in this context is that we are all in this together, equally affected and equally responsible. The way we decide to approach our teaching and learning environment sets the tone for how we will come out of this pandemic and this emergency e-learning experience. Because this may be an exceptional situation, but e-learning is "here to stay" in academia, and when properly designed, it can bring significant benefits to all parties involved.

The research has several limitations because it included only students from "Gheorghe Asachi" Technical University of Iasi. Further research could be done to cover a higher number of students from different universities. Another aspect not included in this particular study but is highly relevant is the professors' perception of the online teaching experience. They are also facing challenges and difficulties in this process, which impacts their motivation and performance. Plus, as revealed by this study, the professor's role and job characteristics are changing under the influence of this new context, and so future research should focus on this relevant unintended consequence of this situation.

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