Impacts of the COVID-19 Pandemic on Life of Higher Education Students: A Global Perspective

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Abstract: The paper aims to present the most comprehensive and large-scale study to date of students' perceived impacts of COVID-19 crisis on different aspects of their lives on a global level. The study with a sample of 30,383 students from 62 countries reveals that due to worldwide lockdown and transition to online learning students were most satisfied with the support of teaching staff and universities' public relations. Nevertheless, a lack of computer skills and the perception of increased workload prevented them from perceiving higher performance in a new teaching environment. Students were mainly concerned about their future professional career and studying issues, and were feeling boredom, anxiety and frustration. The pandemic encouraged some hygienic behaviors (i.e. wearing masks, washing hands) and discouraged certain daily habits (i.e. leaving home, shaking hands). Students were also more satisfied with the role of hospitals and universities during the epidemic, compared to government and banks. Further findings demonstrate that students with selected sociodemographic characteristics (male, part-time, first level, applied sciences, lower living standard, from Africa or Asia) were, in general, more strongly affected by the pandemic as they were significantly less satisfied with their academic work/life. Key factors influencing students' satisfaction with the role of university have also been identified. Policymakers and higher education institutions worldwide may benefit from these findings when formulating policy recommendations and tactics on how to support students during the pandemic.

Keywords: COVID-19; university student; sociodemographic factors, satisfaction; perception; online learning; mental health; habits; institutions; continents

1. Introduction

In the beginning of 2020, the COVID-19 (Coronavirus Disease 19) pandemic shocked and stopped the world. The new coronavirus started to spread (1) in December 2019 from China to Thailand, Japan, Republic of Korea (first confirmed cases on 20 January 2020), and then to the United States, Vietnam, Singapore, (2) in the end of January 2020 to Australia, Nepal, Europe (first cases in France on 25 January 2020 and later in Germany, Finland, Italy etc.), Malaysia, Canada, Middle East and other countries of Western Pacific Region and South-East Asia Region, and (3) in the next steps to Russia, Africa and Latin America [1]. On 11 March 2020 the World Health Organization (WHO) declared the COVID-19 as a pandemic [2]. By 31 July 2020 the COVID-19 has spread across 217+ countries and territories, with almost 17.1 million confirmed cases and 668,073 deaths. America confirmed 9.15 million cases, Europe 3.31 million, South-East Asia 2 million, Eastern Mediterranean 1.53 million, Africa 0.75 million and Western Pacific 0.31 million cases [1]. The severe consequences of the COVID-19 pandemic are already reflected in the historic recession of most developed parts of the world, e.g. in the United States, where, in the second quarter of 2020, according to the "advance" estimate, GDP decreased at an annual rate of 32.9% [3], and in the euro area GDP went down by 12.1% and in the European Union (EU) by 11.9%, compared with the previous quarter [4].

As far as health is concerned, the novel coronavirus SARS-CoV-2 (severe acute respiratory syndrome-coronavirus-2) affected all age groups, but the most severe manifestations and the highest death rates were noticed for older individuals in the population and patients with comorbidities [5,6]. Besides bringing to the fore many problems and challenges in the field of health, the COVID-19 pandemic caused unsuspected turbulences in the society and economy [7-10], as any other pandemic in the history did. In the last few hundred years, the pandemics, e.g. bubonic plague, Spanish flue, SARS, Ebola, influenza A (H1N1), etc., caused significant changes in geopolitical and demographic situations by changing the patterns of migration, travelling, urbanization, trade and technology use [11-13]. After the first few months of the novel coronavirus (COVID-19) pandemic it is clear that the corona crisis and its consequences on all levels will last for years, and will thoroughly change our lives forever. The challenges brought about by COVID-19, in one way or another, affect and will affect each of us – the wellbeing of all groups of the society in each affected county and globally [8,13,14].

Although being young and therefore, in general, not among any specific risk groups endangered to be infected by the coronavirus and to have severe health consequences because of COVID-19, students are the group in population that felt severe effects of the first wave of the COVID-19 pandemic and therefore a huge change in their everyday lives, and, probably even more alarming, in the prospects for their near and distant future. The majority of countries, affected by the pandemic, managed to slow down the pace of coronavirus spread more or less successfully also by taking drastic measures, such as banning public events and gatherings, workplace closures, stay-at-home restrictions, restrictions in domestic and international transport, testing and contact tracing and closing down of educational institutions [15,16]. Physical closure of education institutions (schools, universities) was definitely an efficient way of minimizing the spread of the virus, but it brought about many challenges [15,17] for both students and teachers, and even more, for their families, friends, employers and thus society and global economy. Moreover, the reopening of the educational institutions after the lockdowns will not bring back the same situation as it was before the COVID-19 pandemic. The standards of normality in many parts of our lives will be reformulated in-depth in the post-pandemic context [18] and the profound effects of this disease will forever change how future workforce is educated [19].

As of 1 April 2020, the number of learners that had to stay at home due to the closure of educational institutions at all levels, reached the peak of 1.598 billion learners from 194 countries [20]. The pandemic heavily hit higher education students' habits regarding the academic work and life (e.g. switch to online lectures/tutorials, closed libraries, changed communication channels for teachers' and administrative support, new assessment methods, different workloads and performance levels etc.) [7,12,15,21-27] and social life (closed dorms and therefore moving back home, no meetings with friends, university colleagues, relatives, no parties, no traveling, staying trapped overseas etc.) [7,13,29-31], as well as their financial situation (losing a student's job, worries about own financial situation, about future education and career) [14,32,33] and emotional health (fears, frustrations, anxiety, anger, boredom etc.) [7,14,28,29,34]. Besides many challenges, the COVID-19 pandemic brought also some positive changes in habits and mindsets, such as paying more attention to personal hygiene, taking care of their own (quitting smoking, eating organic food from local farms) and relatives' health, especially of those in risk groups, taking more time for doing sports, etc. [30,33,35].

A number of papers have already been published by researchers from all over the world, presenting the studies on different aspects of the COVID-19 pandemic crisis - especially on its consequences for physical and mental health, economy, society and environment. When examining the previous studies on student's life during the physical closure of the higher education institutions, one can find that, in general, their main limitations are, (1) the data deriving from early stages of the pandemic, (2) studying a relatively small sample, and (3) focusing mainly on a limited number of aspects of student's life. Indeed, the majority of the studies are limited to the academic work or life issues [36,37] or student's mental health [38-43] or a combination of both [44]. Additionally, most of the studies focus (1) on a single higher education institution and/or country (e.g. from Asia - China [7,29], India [45], Pakistan [46], Philippines [47] Saudi Arabia [26], Vietnam [48]; from Europe -

Germany [36], Spain [49], Switzerland [33], Ukraine [50]; from Africa - Ghana [15]; from North America - the U.S. [51,52]) and/or (2) on a single academic field (e.g. medical students from Iran [53], Mexico [54], Philippines [55], Saudi Arabia [56], Turkey [57], the US [19,58] and nursing students from Croatia [59], England [60], Israel [61] and the U.S. [62]). Only few surveys include student samples from more universities or countries (e.g. Russia and Belarus [63], Sub-Saharan Africa [64]). Studying the state-of-the-art literature, we concluded that there is a significant research gap in the existing literature, and in order to fill it, we implemented a comprehensive large scale survey on how students from all over the world experienced the unexpected and unprecedented COVID-19 pandemic crisis and its impacts on their present and future life. Our study upgrades the global study on measuring worldwide COVID-19 attitudes and beliefs [65] wherein it focuses on student's life during and after the COVID-19 pandemic.

The goal of the paper is to highlight the main results of the global survey on impacts of the COVID-19 pandemic on life of higher education students that was carried out by the international consortium of universities, other higher education institutions and students' associations. The questionnaire based on and extended European Students' Union Survey [66] and targeted higher education students - on what student life looked like during the COVID-19 pandemic, including teaching and learning, social contacts, habits/routines as well as how students are coping with the situation emotionally and financially, and what do they expect as support measures from different institutions, e.g. universities, government, banks etc. (see Aristovnik et al. [67]). The purpose of the study was to illuminate the impacts of the COVID-19 crisis on student's life and to design a set of recommendations for policymakers and higher education institutions on how the students could be supported in the crisis that COVID-19 pandemic caused to this important group of population.

In order to understand the consequences of the COVID-19 pandemic for many aspects of student's life, the following research questions were addressed:

R1: How were the students satisfied with and how did they perceive different aspects and elements of student's life during the COVID-19 pandemic worldwide?

R2: Are there any sociodemographic and geographic differences in:
- Students' satisfaction with and perception of selected elements of academic work and academic life due to transition from onsite to online lectures? (R2.1)
- Students' perception of the COVID-19 pandemic consequences for their social and emotional life, for personal circumstances and their habits? (R2.2)
- Students' satisfaction with the role of selected institutions and their measures during the COVID-19 pandemic? (R2.3)

R3: How selected sociodemographic, geographic and other factors determine students' satisfaction with the role of university during the COVID-19 pandemic?

The remaining sections of this paper are organized as follows. In the next section, research design and methods are presented, including study participants and procedure, data and variables, and the background of the statistical analyses. The third section describes main empirical results of the global student questionnaire survey and an application of the logistic regression analyses. The paper ends with the discussion and conclusions in which the main findings, limitations and future research avenues are considered.

2. Materials and Methods

2.1. Study Participants and Procedure

The target population comprised higher education students, who were at least 18 years old. The respondents in the target populations were recruited by snowball sampling facilitated by advertising on university communication systems and social media. The online questionnaire was at first designed in English. It was based on European Students' Union Survey [66] and extended with selected elements that enabled us to understand in detail additional personal and financial circumstances as well as the perception of support measures and changes of behavior during the

COVID-19 pandemic. Additionally, some questions were offered to selected respondents only. For instance, if respondents' on-site classes had been cancelled due to the COVID-19 pandemic, a set of questions about the new learning environment was opened to those who selected that option. Similar applies to paying the tuition fees, receiving a scholarship etc. [67]. In the next phase, when our web-based survey gained an international visibility, it was translated to 6 other foreign languages, i.e. Italian, North Macedonian, Portuguese, Romanian, Spanish and Turkish. The web-based survey was launched via the open source web application 1KA (One Click Survey; www.1ka.si) on 5 May 2020 and remained opened until 15 June 2020.

By 15 June 2020, 31,212 students participated in the survey, coming from 133 countries and 6 continents, whereby 308 students did not report the country information. The response rate was 33.1% (31,212 out of 94,246 who opened the link). The participation was unequally distributed among the countries as follows: 1) 1,000 responses or more were collected in 10 countries (Poland, Italy, Mexico, Chile, Turkey, India, Ecuador, Bangladesh, Portugal, Slovenia); 2) more than 500 but less than 1,000 were collected in 7 countries (Romania, Croatia, Pakistan, Indonesia, Brazil, Hungary, Ghana); 3) more than 200 and less than 500 were collected in 19 countries; 4) a total of 3,041 responses were collected from 97 countries with less than 200 responses. In the next step, we focused on those countries with at least 30 or more respondents. Accordingly, the final sample consisted of 30,383 students from 62 countries. The participants were also grouped into six continental subsamples in accordance with the geographical classification defined by the Worldometers [68]. The distribution of the final sample across the continents was the following: Europe (44.9%) (EU; i.e., 47.0% of the total participants: Poland, Italy and Turkey), Asia (23.7%) (AS; i.e., 47.8%: India, Bangladesh and Pakistan), South America (14.4%) (SA; i.e., 75.8%: Chile and Ecuador), Africa (8.6%) (AF; i.e., 54.4%: Ghana, Nigeria and Egypt), North America (7.8%) (NA; i.e., 81.4%: Mexico), and Oceania (0.6%) (OC; i.e., 100%: New Zealand). A relatively low number of observations (171 responses) for Oceania (New Zealand) required a great caution in the analysis, however, its inclusion allowed the identification of global differences in students' perceived impacts of the COVID-19 crisis on different aspects of their lives. Finally, the respondents were not obliged to fully complete the questionnaire, meaning that the number of respondents varied across questions. Accordingly, a complete case analysis approach is applied to mitigate missing data issues [69]. With the assumption of "missing completely at random", meaning that the complete cases are a random sample of the originally identified set of cases, a complete case approach is the most common method for handling missing data in many fields of research, including educational and epidemiologic research [70,71].

2.2. Measures

The data were obtained through a web-based comprehensive questionnaire composed of 39 predominantly closed-ended questions, covering sociodemographic, geographic and other characteristics as well as different aspects/elements of higher education student's life, such as academic online work and life, social life, emotional life, personal circumstances, change of habits, roles and measures of institutions as well as personal reflections on COVID-19 [67].

Originally, the questionnaire was divided into seven sections. The first section consisted of eight questions on sociodemographic and academic characteristics of students, e.g. country and institution of study in northern hemisphere spring semester 2020, level and field of study, citizenship, age and gender (see Table 1). The second section was asking students about their academic life and included twelve questions on how the COVID-19 pandemic affected student's experiences with teaching (lectures and tutorials/seminars), supervisions/mentorships, assessment and workload, teaching and administrative support as well as student performance and expectations. This was followed by a segment covering the infrastructure and skills for studying from home, offering two questions on conditions to study from home (workspace, equipment, internet connection etc.) and students' computer skills. The fourth section was about the social life and covered two questions on students' support network during the COVID-19 pandemic crisis and who they would first turn to in different situations. The next segment concerned emotional life by one question on students' emotions since the outbreak of the COVID-19 pandemic. The sixth section was asking students about their general

circumstances with thirteen questions on worries, financial circumstances, support measures and behaviors. Finally, the last section was about general reflections consisting of one open-ended question on general reflections regarding the COVID-19 pandemic.

Table 1. Sociodemographic and geographic characteristics of the survey respondents.

Sociodemographic and geographic characteristics	Number (%)
Age	
Under 20	6,211 (26.9)
20-24	12,670 (54.9)
25-30	2,269 (9.8)
Over 30	1,934 (8.4)
Gender	
Male	10,210 (34.4)
Female	19,495 (65.6)
Citizenship	
Yes	28,273 (94.1)
No	1,758 (5.9)
Status	
Full-time	26,418 (88.1)
Part-time	3,575 (11.9)
Level of study	
First	23,986 (80.5)
Second	4,408 (14.8)
Third	1,386 (4.7)
Field of study	
Arts and humanities	2,998 (10.2)
Social sciences	10,878 (37.0)
Applied sciences	9,157 (31.1)
Natural and life sciences	6,392 (21.7)
Scholarship	
Yes	5,769 (29.2)
No	13,976 (70.8)
Ability to pay [1]	
Yes	10,374 (52.6)
No	9,349 (47.4)
Cancelled onsite classes	
Yes	22,758 (86.7)
No	3,486 (13.3)
Lost Job [2]	
Yes	3,391 (61.7)
No	2,101 (38.3)
Continent	
Africa	2,621 (8.6)
Asia	7,212 (23.7)
Europe	13,629 (44.9)
North America	2,381 (7.8)
Oceania	171 (0.6)
South America	4,369 (14.4)

Note: Final sample consists of 30,383 respondents. The number of respondents may differ due to the missing values.
[1] Respondents who were able to pay overall costs of study before the Covid-19 pandemic quite easily, easily or very easily.
[2] Respondents who had a paid job before the Covid-19 pandemic.

The individual aspects/elements of student life (i.e. satisfaction, agreement, importance or frequency) were measured on a 5-point Likert rating scale ranging from 1 (lowest value) to 5 (highest value) [72]. Where relevant, an additional option "not applicable" was offered to the respondents. Descriptive statistics was calculated using continent- or country- level post-stratification and population weights while other empirical considerations were grounded on unweighted student-level survey data. A detailed methodological notes as well as the full version of the questionnaire is available in the Methodological framework of the global survey (see Aristovnik et al. [67]).

2.3. Statistical Analysis

The data preparation, aggregation and cleaning process were performed in Python programming language using libraries Pandas and Numpy [73]. The same libraries were used for the presentation of sociodemographic characteristics of the sample. We reported students' gender, citizenship, status, level of study, field of study, scholarship, ability to pay, lost job and continent they came from. To test the relationships between the sociodemographic and geographic characteristics and selected aspects/elements of the student's life statistical tests (independent samples t-test, ANOVA, chi-squared with Holm–Šidák pairwise comparison method) were used. The computed p-values were adjusted using Bonferroni correction [74]. For testing statistical hypotheses Python libraries Scipy and Statsmodels were used [75]. The results of testing hypotheses are reported in comprehensive tables (see Tables 2 - 6). where each relationship (between a sociodemographic and geographic characteristics and a selected aspect of student life) is presented with a cell, containing: (1) the information on which group of students (based on sociodemographic characteristic) reported the highest mean value of the analyzed aspect, (2) the range (difference between the highest and the lowest mean across all groups), and (3) significance of the differences. Moreover, a qualitative analysis (word cloud) of students' personal reflections on the COVID-19 pandemic was facilitated by Orange software [76].

To analyse which factors influence the students' satisfaction with the role of university, the ordinal logistic regression analysis was used (see Table 7). This methodological approach is considered to be the best-fitting and most appropriate for models with ordinal outcomes. Such statistical approach was often used also in previous research, addressing predominantly students' satisfaction [77]. Thus, the ordinal logistic regression analysis was an ideal estimation technique since the dependent variable (students' satisfaction with the role of university during the COVID-19 pandemic) is ordinal in its nature (1 - Very dissatisfied; 2 - Dissatisfied; 3 - Neutral; 4 - Satisfied; 5 - Very satisfied). The standard interpretation of the ordinal logit coefficient is that for a one unit increase in the predictor, the response variable is expected to change by its respective regression coefficient in the ordinal log-odds scale while the other variables in the model are held constant. In other words, a positive coefficient indicates that the chances that a respondent with a larger score on the independent variable will be observed in a higher category. Conversely, a negative coefficient indicates that the chances that a respondent with a lower score on the independent variable will be observed in a lower category [77]. Moreover, independent variables covering different aspects/elements of student's life were included in their 5-point Likert scale form, measuring satisfaction, agreement or frequency. Finally, since some of the independent variables are nominal, i.e. categorical with no order in categories (especially sociodemographic and geographic characteristics, i.e. gender, citizenship, status, level of study, field of study, ability to pay, scholarship and continents), a dummy coding was used in order to recode the categorical predictor data so that the regression coefficients of the newly created dummy variables would be meaningful to identify between-group differences [78]. The ordinal regression analysis together with testing of multicollinearity was performed in SPSS 26.0, while Spearman correlation heatmap was designed by using Python's most powerful visualization libraries, i.e. Matplotlib and Seaborn [79,80].

2.4. Ethical Considerations

All participants were informed about the details of the study. Participation in the study was anonymous and voluntary, and students could withdraw from the study without any consequences. For data protection reasons, the online survey was open to people aged 18 or over and enrolled in a higher education institution. Only the researchers had access to research data. The procedures of this study complied with the provisions of the Declaration of Helsinki regarding research on Human participants. Ethical Committees of several involved higher education institutions approved this study, such as University of Verona (Ethical code: 2020_12), ISPA- Instituto Universitário (Ethical Clearance Number: I/035/05/2020), University of Arkansas (IRB protocol number: 2005267431) and Walter Sisulu University (Ethical Clearance Number: REC/ST01/2020).

3. Results

The sociodemographic and other characteristics of the study population are shown in Table 1. In the sample of 30,383 higher education students, approximately two thirds were female (65.6%) and more than half (54.9%) of the population fit into the range of 20-24 years. Most of the respondents were domestic (94.1%), full-time (88.1%) and first level (80.5%) students. A bit more than one-third of participants (37.0%) were studying social sciences, followed by applied sciences (31.1%) and natural and life sciences (21.7%). 70.8% of respondents didn't have a scholarship in 2019/2020 and a bit more than a half of them (52.6%) were able to pay the overall costs of their study before the COVID-19 pandemic. Due to the pandemic, the on-site classes were cancelled for 86.7% of respondents and 61.7% of them lost their paid job. As already presented more in detail (subsection 2.1.), a majority of the respondents were from Europe (44.9%), followed by Asia (23.7%), South America (14.4%), Africa (8.6%), North America (7.8%) and Oceania (0.6%).

3.1. Overview of the Questionnaire Results

The results of the global student survey include findings from different aspects of student's life, e.g. academic work, infrastructure and skills needed for studying from home, social life, emotional life and other circumstances, which are presented in the sub-sections 3.1.1.-3.1.10., including their elements (see also Aristovnik et al. [81,82]). In addition, the impact of sociodemographic and geographic characteristics was statistically tested. In general, the empirical results reveal that from the majority of studied aspects/elements of student's life females, full-time students, students who study at second level of study (postgraduate level) and social sciences students were mainly less affected by the COVID-10 pandemic (see Tables 2 - 6). Moreover, students with better standard of living (i.e. students with scholarships and students who didn't lose their jobs and were able to pay the overall cost of their study) and those coming from Oceania or Europe also show more positive attitude toward the majority of aspects/elements of student's life in the time of the COVID-19 pandemic.

3.1.1. From Onsite to Online Lectures

In order to reduce the spread of a novel coronavirus, universities around the world moved rapidly to transfer various courses from onsite to online [44,83], thus online learning (e-learning) became a mandatory teaching and learning process of educational institutions. Teaching online is not just putting learning materials online. Lecturers must organize the content and learning methods accordingly to the new mode of delivery, so that students do not feel isolated and alone in the learning process. Therefore, appropriate knowledge and skills of lecturers as well as ICT equipment have to be ensured, which is pointed out by the authors of researches in countries where online learning has not yet been widespread before the COVID-19 pandemic [26,55,64,83]. In our survey students were asked about the attitudes toward different online forms of teaching and learning, including also the satisfaction with organization and support of their institutions after the cancellation of onsite classes due to the physical closure of higher education institutions.

On a global level, 86.7% of students reported that the onsite classes were cancelled due to the COVID-19 pandemic (see Table 1). Consequently, several different forms of online lectures were established. The most dominant forms of online lectures were real-time video conferences (59.4%); followed by asynchronous forms: sending presentations to students (15.2%), video recording (11.6%), and written communication using forums and chats (9.1%)- The most rare form was audio recording (4.7%), which is not surprising as learning platforms and videoconferences systems (e.g. Moodle, Zoom, MS Teams, BigBlueButton, etc.) are widespread and freely available for quite some time. On a global level, the students were most satisfied with real-time video conferences (3.30), followed by video recording (3.26), sending presentations (3.10) and written communication (3.14), while they were at least satisfied with audio recording (2.98). The highest satisfaction with all of the presented forms was found in Oceania, North America and Europe (e.g. Malta), followed by Asia and South America, while students from Africa (e.g. Egypt and South Africa) appeared to be least satisfied with

online lectures' forms (except written communication), which may be due to the unequally developed ICT infrastructure over the continent, where many of higher education institutions did not have a possibility to deliver lectures online and on the other hand many students had a limited access to internet (see Owusu-Fordjour et al. [15], Anifowoshe et al. [64], and Kapasia et al. [84]). The impact of sociodemographic factors was in general the same as for the majority of aspects/elements, as explained in section 3.1. (see Table 2).

3.1.2. Academic Work

Universities all over the world cancelled onsite classes and shifted pedagogical processes to the online media. For some universities online mode of delivery was not new, unlike others who encountered such forms of teaching for the first time. The transition was quick and there was not much time for a thoughtful organization of new forms, however the quality of teaching and learning in new circumstances needs proper attention [44]. On the other hand, students from undeveloped remote and rural areas had problems with poor internet connectivity or even lack of electricity. We cannot ignore neither poverty, so as a result they have a negative attitude towards the online mode [15,64,83,84]. Nevertheless, on a global level, the students' satisfaction with the organization of three segments of pedagogical process was quite high and nearly the same - for lectures 3.30, tutorials and seminars 3.12, and mentorships 3.20. However, there was a big difference between again the lowest ranked continent, Africa, where students were the most unsatisfied (2.70, 2.46, 2.70), and the highest ranked Oceania (3.76, 3.37, 3.47).

Effectiveness of online learning depends on the designed and prepared learning material, lecturer's engagement in the online environment and the interaction lecturer-student or student-student (e.g. Sun [85], Wu and Liu [86], and Bao [87]). Further, when studying online from home, students must have the opportunity to ask questions and expect a timely answer. Therefore, in the context of academic work, students were asked about lecturers' responsiveness and whether the assignments were provided online. The students agreed that the lecturers were preparing regular assignments, e.g. readings, quizzes or course work (3.73), followed by timely lecturers' responses to posted questions and being open to students' suggestions. The last two statements, which do not differ much from the above in terms of agreement, were addressing the information about exams in new circumstances (3.44) and giving feedback on students' performance (3.21). The highest levels of agreement were noted in Oceania and in North America. Once again, students in Africa reported the lowest level of agreement for all five statements (<3.36), which we can relate to the limited access to the internet and also a lack of digital competencies [15,64,88]. When considering country rankings, Pakistan stands out as it ranks among the bottom countries on all scales concerning online delivery mode (see Aristovnik et al. [82]), which is related to the negative experiences with the rapid transition to online classes [46,83].

Studying from home commonly requires more self-discipline and motivation to follow through online lessons, particularly in the earlier period when students are getting used to the new system, which could affect the feeling of increasing study obligations. On the other hand, lecturers who are not familiar with the new mode of delivery could overload the students with study material and assignments. Therefore, the students were asked to compare the workload before onsite classes were canceled with the new circumstances after the lockdown. On a global level slightly less than a third students (30.8%) reported that their study workload has been smaller or significantly smaller, however the share of students with the same workload was even smaller (26.6%). The largest proportion of students reported that their workload was larger or significantly larger (42.6%). An increase in workload was reported by students from Oceania (59.8%), Europe (58.0%) and North America (54.7%), while in South America, Asia and Africa the workload decreased (see Figure 1). In all three continents the key challenges are the problems with an underdeveloped internet network, lack and inexperience of using ICT equipment, and the fact that the only available gadgets for attending online classes are the mobile phones [15,44,46,64,84,88]. Almost 80% of students from Germany (76%), Portugal (77%), Malaysia (78%) and Mexico (73%) reported a larger or significantly larger workloads. Same was revealed for female students, first level (undergraduate) students and

arts students (see Table 2). Students also found it difficult to focus during the online teaching in comparison to on-site teaching and reported worse perceived study performance since on-site classes were cancelled, however, they adapted quite well to the new teaching and learning experience (for details see Aristovnik et al. [82]). Undergraduate students found it more difficult to focus, while graduate students and social sciences students could even improve their perceived performance (see Table 2) (for more see Gonzalez et al. [27]). When studying isolated at home, students may face a lack of self-discipline or inappropriate learning environments [87], which evoke a feeling of work overload and consequently a higher level of stress [36]. Therefore, the lecturers should carefully balance online teaching and self-learning of students when planning and designing the teaching and learning process.

In a crisis situation, such as the COVID-19 pandemic, many questions rise up and the support of various services is needed by students. The results from the survey revealed that the students, regardless of the continent, were most satisfied with the support of teaching staff; overall 57.6% of students were satisfied or very satisfied (the highest ranked Oceania - 78.8%, the lowest Africa - 33.2%) (see Figure 1). The lowest levels of satisfaction with the support were found for finance and accounting, 30.2% (the lowest ranked Africa - 21.1%) and international offices, 26.0% (the lowest ranked Africa - 13.6%). The Philippines ranked at the bottom of satisfaction with the teaching staff, which is in accordance with a survey where almost 94% of students reported poor communication with the teaching staff [55]. The impact of sociodemographic factors on the satisfaction with the support of teaching staff was similar as mentioned above; female students and students from the social science showed greater satisfaction (see Table 2).
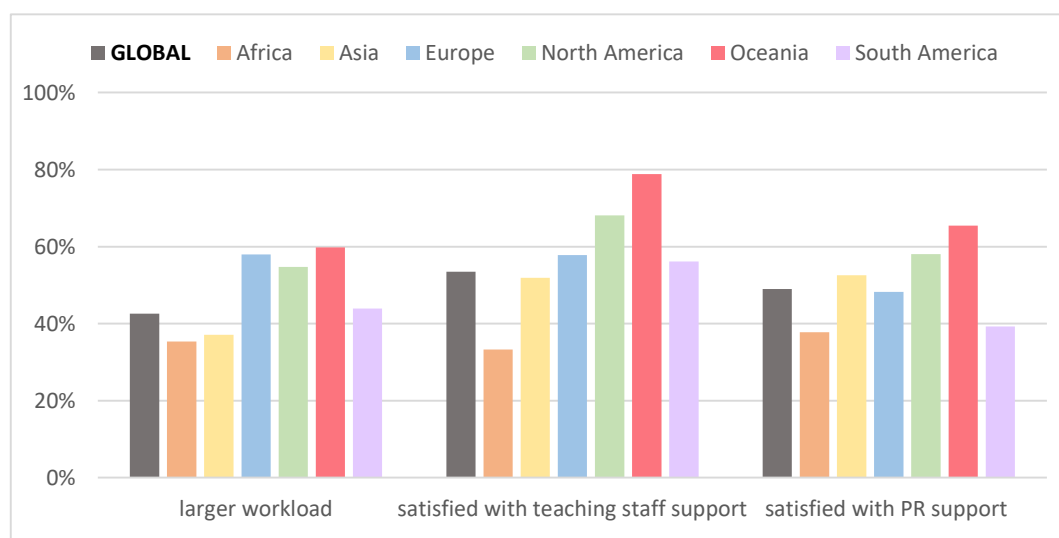
Figure 1. Change of study workload (% of students with larger or significantly larger workload) and student satisfaction with teaching staff and PR support (% of satisfied or very satisfied students) during the COVID-19 pandemic.

Table 2. Relationships between sociodemographic and geographic characteristics and aspects/elements of student's life (From onsite to online lectures and Academic work).

Sociodemographic and geographic characteristics / *Aspects/Elements*	Gender *Male/Female*	Citizenship *Yes/No*	Status *Full-/Part-time*	Level of study *First/Second/Third*	Field of study *Arts/Social/Applied/Natural*	Scholarship *Yes/No*	Ability to pay *Yes/No*	Lost job *Yes/No*	Continent *AF/AS/EU/NA/OC/SA*
FROM ONSITE TO ONLINE LECTURES									
Satisfaction with forms of online lectures									
Video conferences	Female*** (0.13)	No** (0.16)		Second*** (0.3)	Social*** (0.17)		Yes*** (0.26)	No*** (0.27)	OC > EU > NA > SA > AS > AF***
Recorded videos	Female*** (0.12)			Second*** (0.25)	Natural** (0.14)		Yes*** (0.22)	No*** (0.27)	OC > EU > NA > SA > AS > AF***
Presentations to students	Female** (0.08)	No* (0.15)		Second*** (0.18)	Social** (0.10)			No*** (0.28)	OC > AS > EU > SA > AF > NA***
Adaptation and performance in new teaching environment									
Difficult to focus			Full*** (0.20)	First*** (0.36)		Yes*** (0.18)	No*** (0.12)	Yes*** (0.24)	OC > SA > NA > AF > EU > AS***
Adaptation to new learning experience				Second*** (0.35)	Social*** (0.17)	No* (0.08)	Yes*** (0.23)	No*** (0.27)	EU > OC > AS > NA > SA > AF***
Improved performance				Second*** (0.19)	Social*** (0.18)		Yes*** (0.12)	No* (0.16)	EU > AS > OC > SA > NA > AF***
ACADEMIC WORK Teaching support and study workload									
Timely response	Female*** (0.08)			Second*** (0.17)	Social*** (0.14)		Yes*** (0.16)	No*** (0.22)	OC > EU > SA > NA > AS > AF***
Open to suggestions				Second*** (0.14)	Social*** (0.14)		Yes*** (0.17)	No*** (0.19)	OC > SA > EU > NA > AS > AF***
Information on exams	Female** (0.09)				Social*** (0.25)	Yes*** (0.13)	Yes*** (0.14)	No*** (0.30)	OC > NA > EU > SA > AS > AF***
Extent of study workload	Female*** (0.10)			First*** (0.18)	Arts*** (0.10)	Yes*** (0.05)			NA > OC > EU > SA > AF > AS***
Satisfaction with support of teaching and support staff									
Teaching staff	Female*** (0.10)			Second*** (0.17)	Social*** (0.21)		Yes*** (0.21)	No*** (0.22)	OC > NA > EU > SA > AS > AF***
PR (websites, social media information)	Female*** (0.15)				Social*** (0.16)		Yes*** (0.15)		OC > EU > NA > SA > AS > AF***
Tutors	Female* (0.08)				Social* (0.11)		Yes*** (0.20)	No*** (0.27)	OC > SA > EU > NA > AS > AF***

Note: Differences between top and bottom groups are in parentheses. Continent codes: AF-Africa; AS-Asia; EU-Europe; NA-North America; OC-Oceania; SA-South America. Significance: *p<0.05; **p<0.01; ***p<0.001. Statistically non-significant differences are not reported.

3.1.3. Academic Life

As far as the students' academic life is concerned, we were interested in (1) the availability of different kinds of home infrastructure needed for efficient study, and (2) the self-report of students' computer skills. Both challenges were mentioned also by Kamarianos et al. [25], Sahu [44], and Baticulon et al. [55]. When examining the potential impact of the COVID-19 outbreak on the education of students, in our study, on a global level, the share of students with frequent access to the specific equipment was highest for office supplies, e.g. notebooks, pens (80.4%) and computers (75.2%). The computers as the most frequently available electronic equipment were chosen by students from Oceania in the share of 96.0%, followed by North American (93.6%) and European students (86.2%). On the other hand, the students didn't have a regular access to printers (33.0%) and study materials (51.8%). African students reported about the lowest availability of printers, (14.9%), followed by Asian (26.2%) and South American students (37.6%). A good internet connection, which is essential for online learning, was reported by 59.9% students (only 29.2% from Africa (e.g. Mozambique (14.4%) and Kenya (17.8%)), followed by 58.2% from Asia and 58.5% from South America, 68.3% from Europe, 70.0% from Oceania and 70.5% from North America). The best European country-level results (e.g. Hungary (82.5%)) are similar to the findings of Tormey et al. [21], who reported about 18% of students with connectivity problems. Wang and Zhao [40] also reported about the risk of losing educational opportunities for students in remote and rural areas. The impact of sociodemographic factors on the availability of different kinds of home equipment was in general the same as for the majority of aspects/elements, as explained in 3.1. (see Table 3).

In the next step, students were asked about the confidence in their computer skills. On average they were most confident in skills of using online communication platforms, e.g. e-mail, messaging, etc. (4.06), followed by the skills of browsing online information (3.97) and skills of sharing digital content (3.86). As assessed by the respondents, the least developed skills were those, connected with applying advanced settings to some software and programmes (3.37) and using online teaching platforms, e.g. BigBlueButton, Moodle, GoToMeeting (3.53). This calls for an intense preparation for potential next waves in the second half of the year 2020 and later in the context of equipping the students with skills for using those online platforms, as proposed also by Owusu-Fordjour [15] and Nenko et al. [50]. When comparing the confidence in these skills (using online teaching platforms) between the continents, the lowest levels were expectedly found for Africa (3.05) and the highest for North America (4.14) and Oceania (4.38). The impact of sociodemographic factors on the self-reported computer skills was in general the same as for the majority of aspects/elements, as explained in 3.1. (see Table 3), except in the case of gender, where, not surprisingly, male students assessed their confidence in computer skills higher than female students.

3.1.4. Social Life

Loss of usual daily routine as well as reduced social and physical contact with others (incl. social distancing measures) are in many studies the causes of numerous negative emotions, such as frustration, boredom, anxiety, confusion, anger, etc. [7,14,28,33,89]. The COVID-19 pandemic and subsequent physical closure of higher education institutions put the majority of students into the situation they were not used to. During the closure they lived in the environments with different circumstances and different options to run their social life as similar to the 'normal' one as possible. Some of them were at a higher risk of social isolation and a consequent development of mental health disorders, e.g. those, who lived by themselves during the closure [33]. In our survey the students were asked about the frequency of their online communication with specific people during the COVID-19 pandemic. On a global level students communicated online at least once a day with (1) close family members (52.0%) – Asian and European students prevailed, (2) someone they live with, e.g. roommate (47.8%), as reported mainly by students from Oceania and North America, or (3) they used social networks (45.8%) – mainly from South and North America. The least frequent were the online communications with administrative staff at the university (2.8%) and voluntary organizations (3.7%), in both cases the lowest shares were detected in both Americas.

Table 3. Relationships between sociodemographic and geographic characteristics and aspects/elements of student's life (Academic life).

Sociodemographic and geographic characteristics / *Aspects/Elements*	Gender *Male/ Female*	Citizenship *Yes/No*	Status *Full-/ Part-time*	Level of study *First/ Second/ Third*	Field of study *Arts/Social/ Applied/Natural*	Scholarship *Yes/No*	Ability to pay *Yes/No*	Lost job *Yes/No*	Continent *AF/AS/EU/ NA/OC/SA*
ACADEMIC LIFE									
Access to infrastructure for studying at home									
Computer [a]	Female* (3)	No** (6)	Full*** (5)	Second*** (15)	Social*** (7)	Yes*** (3)	Yes*** (14)	No*** (9)	OC > EU > NA > SA > AS > AF***
Required software and programmes [a]			Full*** (7)	Second*** (11)			Yes*** (18)	No*** (12)	OC > EU > NA > SA > AS > AF***
Good internet connection [a]		No* (7)		Second*** (11)	Social* (7)		Yes*** (18)	No*** (15)	EU > OC > NA > AS > SA > AF***
Confidence in computer skills									
Browsing online information	Male*** (0.12)		Full*** (0.19)	Second*** (0.34)	Social** (0.09)		Yes*** (0.22)	No*** (0.30)	OC > EU > NA > SA > AF > AS***
Sharing digital content	Male*** (0.15)		Full*** (0.13)	Second*** (0.26)			Yes*** (0.23)	No*** (0.28)	OC > EU > NA > SA > AF > AS***
Using online teaching platforms	Male*** (0.11)	No*** (0.23)	Full** (0.13)	Second* (0.18)	Social*** (0.17)	Yes*** (0.11)	Yes*** (0.32)	No*** (0.27)	OC > EU > NA > SA > AS > AF***
Using online collaboration platforms		No* (0.14)	Full*** (0.14)	Second*** (0.29)	Social*** (0.17)		Yes*** (0.29)	No*** (0.29)	OC > EU > NA > SA > AS > AF***

Note: Differences between top and bottom groups are in parentheses ([a] difference is measured in percentage points). Continent codes: AF-Africa; AS-Asia; EU-Europe; NA-North America; OC-Oceania; SA-South America. Significance: *p<0.05; **p<0.01; ***p<0.001. Statistically non-significant differences are not reported.

Students would first turn to the following social groups when talking about the COVID-19 crisis: close family member (45%), someone he/she lives with (e.g. roommate) (29%), more distant family member (6%), close friend (5%) etc. The impact of sociodemographic factors on the self-assessment of social life during the higher education institutions' closure was in general the same as for the majority of other aspects/elements included in the survey - as explained in 3.1. (see Table 4) - except in the case of level of study, where first level (undergraduate) students more frequently contacted close friends and used social networks for online communication compared to second level (postgraduate) students. As the social support is of key importance for mental health of higher education students, it should be efficiently offered and carefully maintained during the isolation and/or quarantine [7,33,89].

3.1.5. Change of Habits

The strong human-to-human transmission power of COVID-19 affected daily routines of students all over the world [90]. On one hand, it additionally encouraged some (especially hygienic) behaviors, which is in line with previous studies [30]. The most encouraged habits of respondents of our survey (share of students changing selected habits was more than 70%) were wearing a mask outside (86.7%) (with a leading position of South America (e.g. Brazil and Chile), Asia (e.g. Afghanistan) and Europe (e.g. Italy)), washing hands (79.9%) (in Africa) and avoiding crowds and large gatherings (78.2%) (predominantly in Oceania and North America). All of these habits have become an important part of the daily routine of people, including students, around the world [91]. The only exception is Oceania, where a widespread use of face masks was not a feature of the New Zealand`s COVID-19 elimination strategy [92] (see Figure 2). Other habits in terms of avoiding public transport, cancelling travelling, working from home, avoiding touching a face and stocking up on essentials were also highly encouraged (50%-70% change) as a result of restrictions on travel and activity participation in many countries [31]. Finally, the lowest shares of students (below 30%) changing the selected habits was observed for online grocery shopping (22.9%) and filling prescriptions (17.5%), coinciding with that the most of the young people were already used to making online purchases before the COVID-19 pandemic [93]. On the other hand, the extraordinary circumstances caused by the COVID-19 pandemic also discouraged certain habits. The most discouraged habits, observed in the highest shares of students changing selected habits, were leaving home unnecessarily (73.7%) (predominantly in South America (e.g. Brazil), followed by Oceania and Africa), shaking hands (73.5%) (in North America) and visiting family members or friends (73.3%), which was pointed out in Asia (see Figure 2 and Aristovnik et al. [82]). These were followed by contacting close persons (40.1%), recreation or workout (39.8%) and offering help to people (17.0%). As regards sociodemographic factors, gender and status affected students' behavior in a similar way as explained in 3.1 (see Table 4). Interestingly, the significant increase in wearing a mask outside and washing hands can be observed for students who were not able to pay the overall costs of their study prior to the pandemic. Moreover, for students who had a job, the increase in washing hands was significantly higher, while in shaking hands it was significantly lower.

Table 4. Relationships between sociodemographic and geographic characteristics and aspects/elements of student's life (Social life and Change of habits).

Sociodemographic and geographic characteristics	Gender	Citizenship	Status	Level of study	Field of study	Scholarship	Ability to pay	Lost job	Continent
Aspects/Elements	*Male/ Female*	*Yes/No*	*Full-/ Part-time*	*First/ Second/ Third*	*Arts/Social/ Applied/Natural*	*Yes/No*	*Yes/No*	*Yes/No*	*AF/AS/EU/ NA/OC/SA*
SOCIAL LIFE									
Online communication with social groups									
Close family member [a]			Full*** (6)	Second*** (11)			Yes*** (5)		EU > OC > AS > AF > NA > SA***
Someone I live with (e.g. roommate) [a]	Female*** (10)	No* (6)			Social* (7)		Yes*** (5)	No** (6)	OC > EU > SA > NA > AF > AS***
Close friend [a]	Female*** (6)		Full*** (10)	First*** (14)			Yes* ()3		EU > OC > NA > AF > AS > SA***
Social networks [a]	Female*** (5)	Yes*** (7)		First*** (11)		Yes*** (5)	Yes*** (4)		SA > NA > EU > AS > AF > OC***
CHANGE OF HABITS									
Change in habits in daily life									
Wearing a mask outside [a]	Female*** (7)		Full** (4)				No*** (3)		SA > AS > NA > EU > AF > OC***
Washing hands [a]	Female* (4)						No** (4)	No** (9)	
Leaving home unnecessarily [a]	Female*** (7)		Full* (4)						OC > SA > NA > AF > EU > AS***
Shaking hands [a]								No* (6)	SA > OC > NA > AF > EU > AS***

Note: Differences between top and bottom groups are in parentheses ([a] difference is measured in percentage points). Continent codes: AF-Africa; AS-Asia; EU-Europe; NA-North America; OC-Oceania; SA-South America. Significance: *p<0.05; **p<0.01; ***p<0.001. Statistically non-significant differences are not reported.
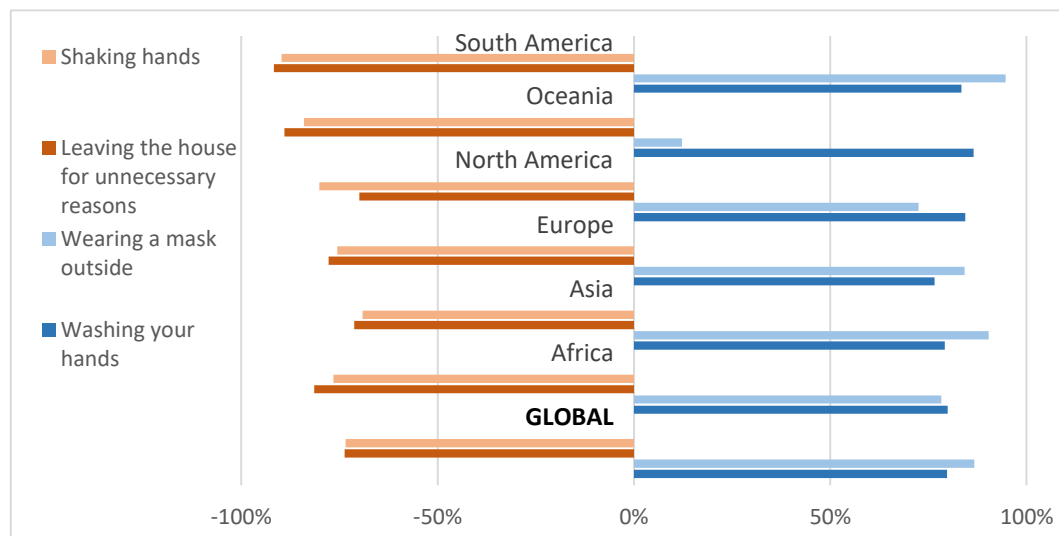
Figure 2. Students' most changed daily habits during COVID-19 pandemic (% of students who changed their habits often or always).

3.1.6. Emotional Life

The COVID-19 pandemic heavily influenced emotional wellbeing and, consequently, mental health of people around the globe [14,30,40,94] – either directly, connected with health issues, or indirectly, in relation with its economic and social consequences. This is true also for students, although they are in average not the most endangered group of population [7,29] as far as the physical health aspect of the COVID-19 pandemic is concerned. However, many of them felt an unbearable psychological pressure, especially due to the effects of the pandemic on daily life, economic effects and delays in academic activities [7]. In our study, the frequency of the positive emotions felt by the students since the outbreak of COVID-19 was as follows: hopeful (39.4%), joyful (29.7%), proud (26.5%) and relieved (17.9%). The negative emotions, felt by the students, were boredom (45.2%), anxiety (39.8%), frustration (39.1%), anger (25.9%), hopelessness (18.8%) and shame (10.0%). The highest level of anxiety were noticed in South America (65.7%) and Oceania (64.4%), followed by North America (55.8%) and Europe (48.7%). Least anxious were students from Africa (38.1%) and Asia (32.7%). A similar order of continents was found for frustration as the second most devastating emotion. On the other hand, when analyzing positive emotions, North America appeared to be the continent with most joyful students (34.5%) and Asia with most hopeful students (42.2%) (see Figure 3). Further findings demonstrate that different sociodemographic factors influenced the emotional wellbeing (top four emotions) differently than described in subsection 3.1. (see Table 5). Male students were feeling more hopeful, first level students were feeling more bored and students of arts and humanities were feeling more anxious and frustrated. Similar negative emotions have been noticed also by those students, who were not able to pay their overall costs of study before the COVID-19 pandemic. A relatively high level of negative emotions and a relatively low level of positive emotions indicates that the pandemic itself and the measures, taken by the governments (e.g. closure of public life, travel bans etc.), will have a specific, both short- and long-term impact on education and mental health of students [7,33,39]. The accompanying effects of COVID-19 will continue influencing students' emotional wellbeing profoundly; meanwhile, emotional wellbeing serves a crucial role in combating the epidemic [95]. This implies that government, health professionals, higher education institutions, students' organizations and NGOs should collaborate in the process of designing timely and efficient psychological and financial support services for students.

Table 5. Relationships between sociodemographic and geographic characteristics and aspects/elements of student's life (Emotional life and Personal circumstances).

Sociodemographic and geographic characteristics	Gender	Citizenship	Status	Level of study	Field of study	Scholarship	Ability to pay	Lost job	Continent
Aspects/Elements	*Male/ Female*	*Yes/No*	*Full-/ Part-time*	*First/ Second/ Third*	*Arts/Social/ Applied/Natural*	*Yes/No*	*Yes/No*	*Yes/No*	*AF/AS/EU/ NA/OC/SA*
EMOTIONAL LIFE									
Felt emotions									
Bored [a]			Full*** (11)	First*** (11)			No*** (4)	Yes*** ()9	
Anxious [a]	Female*** (16)				Arts *** (11)	Yes*** (7)	No*** (4)	Yes*** (8)	OC > NA > SA > EU > AF > AS***
Hopeful [a]	Male*** (4)						Yes* (3)	No*** (10)	
Frustrated [a]	Female*** (11)		Full*** (10)		Arts** (9)	Yes*** (5)	No** (3)	Yes*** (9)	OC > NA > SA > EU > AF > AS***
PERSONAL CIRCUMSTANCES									
Felt worries									
Professional career in the future [a]	Female*** (4)					Yes** (3)	No*** (11)	Yes*** (9)	NA > SA > AF > AS > EU > OC***
Studying issues [a]	Female*** (9)		Full*** (6)				No*** (5)		EU > AF > OC > NA > SA > AS***
Personal finances [a]			Part*** (6)				No*** (21)	Yes*** (14)	AF > SA > NA > AS > EU > OC***
Future education [a]	Female*** (6)			First*** (11)			No*** (9)	Yes*** (10)	NA > SA > AF > AS > EU > OC***

Note: Differences between top and bottom groups are in parentheses ([a] difference is measured in percentage points). Continent codes: AF-Africa; AS-Asia; EU-Europe; NA-North America; OC-Oceania; SA-South America. Significance: *p<0.05; **p<0.01; ***p<0.001. Statistically non-significant differences are not reported.
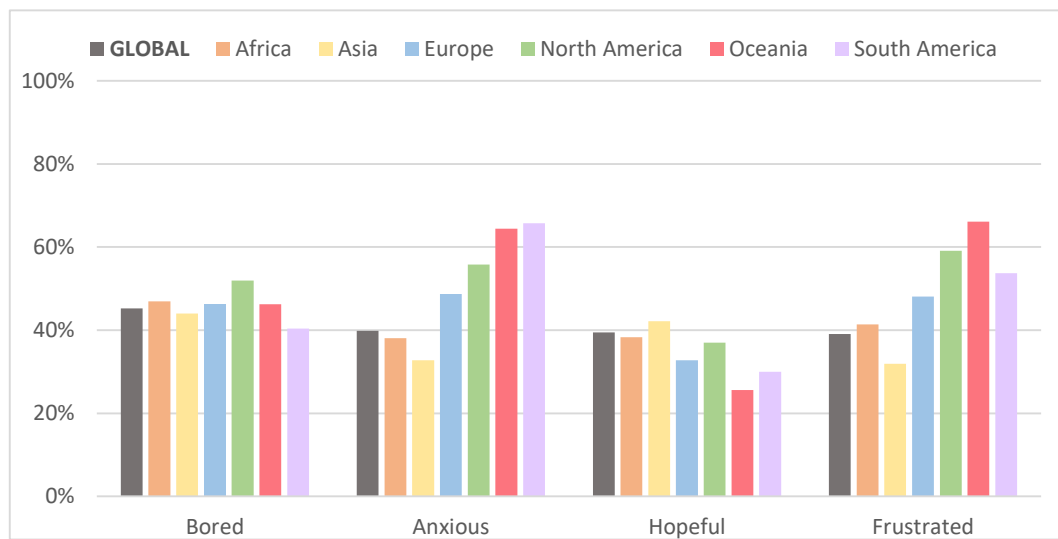
Figure 3. Most frequently expressed students` emotions during the COVID-19 pandemic
(% of students who felt emotion often or always).

3.1.7. Personal Circumstances

The COVID-19 pandemic caused tectonic changes in the lives of many groups of population, thus also of higher education students [44]. The world has been facing a great crisis due to the pandemic spread of the novel coronavirus [6,30,40] and, as expected on the basis of previous epidemics [9,96], students have specific worries (concerns) about their short- and long-term future, too [97]. The results of our study revealed that, during the lockdown, students were (on a global level) 'most of the time' or 'all of the time' worrying about their professional career in the future (42.6%) and studying issues, e.g. lectures, seminars, practical work (40.2%). They were least concerned about traveling abroad (22.1%) and personal physical health (21.6%) as the latest is expected for that group of population. The most worried appeared to be South American students who received the highest shares in five of ten worries, e.g. worrying about future education (49.1%), family and relationship (47.0%), studying issues, e.g. lectures, seminars, practical work (46.6%), personal mental health (43.2%) and COVID-19 or similar pandemic crisis in the future (42.6%). African students were the most worried among all respondents regarding three of ten worries, i.e. professional career in the future (55.7%), personal finances (50.8%) and traveling abroad (30.1%). European students were most concerned among all regarding leisure activities, e.g. sports and cultural activities, parties, hanging out with friends, etc. (32.1%). Students from Asia, North America and Oceania didn't express the maximum level of any kind of worry. Selected sociodemographic factors influenced the personal circumstances, i.e. worries in different ways (see Table 5). Female students were more concerned about professional career, studying issues and future education than their male colleagues, part-time students were more worried about personal finances and full-time students more about studying issues. Undergraduate students worried more about future education and those, who were not able to pay their overall study costs before the COVID-19 pandemic, worried more about all kinds of personal circumstances (worries). Those who lost a job due to the pandemic, worried more about a professional career in the future, personal finances and future education. The abovementioned worries (see also Cao et al. [7], Elmer et al. [33], Sahu [44], and Odriozola-González et al. [49]) underscore the urgent need to understand these challenges and worries in order to design the proper support measures for students [95] as soon, as efficient, as holistic, as systematic and as sustainable as possible.
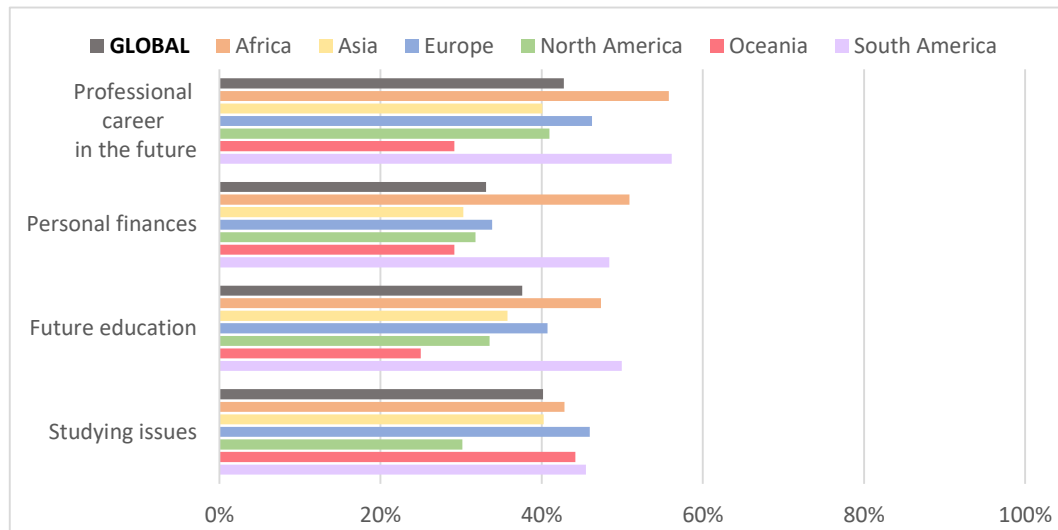
Figure 4. Students' most frequently expressed personal worries during the COVID-19 pandemic (% of worried students most of the time or all of the time).

3.1.8. Role of Institutions

As for exploring the role of different institutions (i.e. government, universities, banks and hospitals), we asked students how satisfied they were with their responses in the time of COVID-19. While the impact of different sociodemographic factors on satisfaction with institutions' role are generally the same as in the case of most other aspects/elements (see Table 6), students were in general by far most satisfied with the role of hospitals as two-thirds of all respondents are satisfied (or very satisfied) with their response, especially in Sri Lanka with even 94.6% (see Figure 5 and Aristovnik et al. [82]). In fact, satisfaction with hospitals is found as leading one on all continents, except in Oceania (i.e. New Zealand), where satisfaction with government prevails with 90.7%. It is obvious that as globally healthcare providers are working harder than ever to keep citizens safe and for that reason, a starting point for providers to rebuild the nation's (incl. students) satisfaction and trust in healthcare [98]. Universities came in second with 47.2% of students showing satisfaction with their response. As Oceania topped satisfaction with the universities` response (with 60%), followed by a tie between North America and Europe (with around 53%), Africa significantly lags behind with only 29.2%. Interestingly, students in Africa are generally more satisfied how banks responded to the crisis than with universities and governments. On the other hand, students in South America showed extremely low levels of satisfaction with the government (12.1%; Ecuador and Chile even with less than 8%) and banks (16.8%; Chile with only 9.0%). Indeed, global student satisfaction with governments and banks is generally relatively low with only 41.1% and 37.1% satisfied (or very satisfied), respectively. That's not surprising as most citizens (incl. students), in general, don't trust their governments and banks (see Eurofound [8]), even though both institutions have responded by offering extra support to both citizens and businesses in the time of COVID-19 [44].
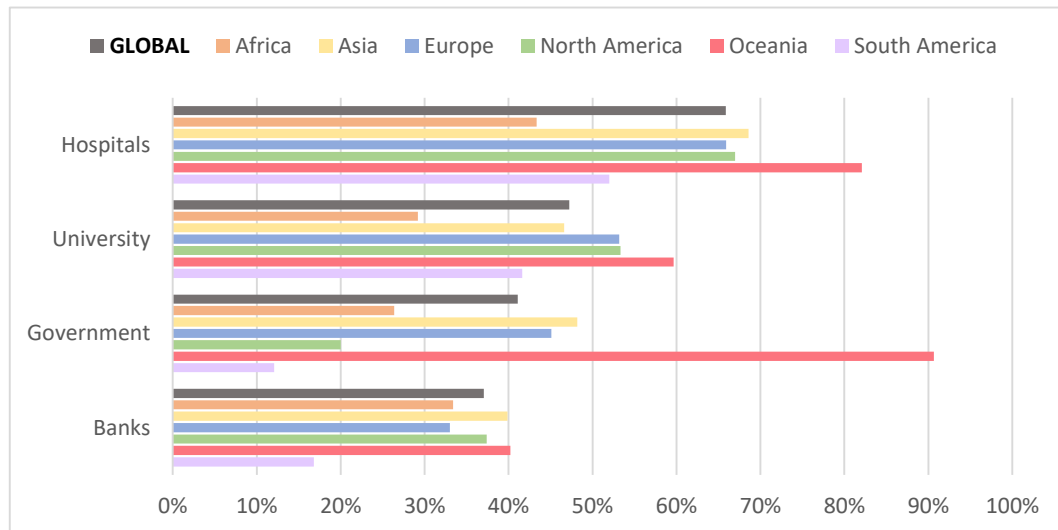
Figure 5. Student satisfaction with the role of selected institutions during the COVID-19 pandemic (% of satisfied or very satisfied students).

3.1.9. Measures of Institutions

As a response to the COVID-19 pandemic, many countries around the world have implemented different emergency policy measures (see Nicola et al. [99]). The first wave of measures was firstly aimed at protecting public health, while the second wave was intended to mitigate socio-economic consequences of the COVID-19 crisis. On a global level, students emphasized the emergency support for the vulnerable population (in South America and Europe) and childcare for workers (predominantly in South America and Africa as the most important, while students from Asia and Oceania did not perceive these measures as important (see Hashikawa et al. [100]). Moreover, the measure of deferred student loan payments was also relatively high in terms of students' perception of the importance. This was related predominantly to students from South America (Chile) and North America (the United States). Furthermore, other measures of institutions, mostly related to deferred or reduced payments and financial assistance were also perceived as crucial during the COVID-19 pandemic. Measures related to taxes (see CIAT/IOTA/OECD [101]) (delayed payment and filing deadline) were the most important in South America and Europe, while at least important were in North America and Oceania. In terms of housing, freezing rents was the most highlighted in Europe (Spain), while financial assistance and deferred mortgage or related payments in South America (Chile). This is in line with the fact that some countries, especially Spain and South American countries, had significantly adjusted their housing policy as a response to COVID-19 [102]. Finally, the measure of free transport was perceived as at least important. Some of the sociodemographic factors affect the students' perception on the importance selected measures in response to COVID-19 differently as explained in 3.1 (see Table 6). Namely, international students pointed out the importance of financial assistance for renters significantly more than their counterparts, while status and level of study are not significant determinants when it comes to measures of institutions. Moreover, students who were not able to pay the overall cost of their study put forward the importance of all selected measures. Interestingly, losing a job is not identified as a significant determinant.

Table 6. Relationships between sociodemographic and geographic characteristics and aspects/elements of student's life (Role of institutions and Measures of institutions).

Sociodemographic and geographic characteristics / *Aspects/Elements*	Gender *Male/Female*	Citizenship *Yes/No*	Status *Full-/Part-time*	Level of study *First/Second/Third*	Field of study *Arts/Social/Applied/Natural*	Scholarship *Yes/No*	Ability to pay *Yes/No*	Lost job *Yes/No*	Continent *AF/AS/EU/NA/OC/SA*
ROLE OF INSTITUTIONS									
Satisfaction with institutions									
Government	Female*** (0.17)	No*** (0.39)	Full*** (0.18)	Second*** (0.30)	Social *** (0.31)		Yes*** (0.17)	No*** (0.37)	OC > EU > AS > AF > NA > SA***
University				Second*** (0.15)	Social*** (0.24)	Yes*** (0.11)	Yes*** (0.23)	No*** (0.28)	OC > EU > SA > NA > AS > AF***
Banks	Female*** (0.11)	No*** (0.19)	Full** (0.12)	Second*** (0.14)	Social*** (0.17)		Yes*** (0.15)	No*** (0.25)	OC > AS > EU > AF > NA > SA***
Hospitals	Female*** (0.10)		Full*** (0.24)	Second** (0.17)	Social*** (0.21)		Yes*** (0.18)	No*** (0.20)	OC > EU > AS > AF > NA > SA***
MEASURES OF INSTITUTIONS									
Importance of measures by institutions									
Emergency supports for vulnerable population	Female*** (0.14)				Arts*** (0.22)	Yes*** (0.11)	No*** (0.20)		SA > NA > AF > EU > AS > OC***
Childcare for essential workers	Female*** (0.15)				Arts* (0.15)	Yes* (0.08)	No*** (0.18)		SA > AF > NA > EU > OC > AS***
Financial assistance for renters	Female*** (0.13)	No*** (0.19)			Arts*** (0.26)	Yes*** (0.10)	No*** (0.31)		OC > SA > AF > EU > NA > AS***
Deferred monthly payments	Female*** (0.13)				Arts*** (0.15)	Yes*** (0.13)	No*** (0.21)		SA > NA > AF > EU > AS > OC***

Note: Differences between top and bottom groups are in parentheses. Continent codes: AF-Africa; AS-Asia; EU-Europe; NA-North America; OC-Oceania; SA-South America. Significance: *p<0.05; **p<0.01; ***p<0.001. Statistically non-significant differences are not reported.

3.1.10. Personal Reflections

In the final part of the extensive questionnaire we asked students to write down some general views/words of their reflections on the COVID-19 pandemic. As shown from the word cloud visualization (see Figure 6), the most commonly used terms were 'people', 'covid', 'life, 'time' and 'pandemic' (the size of each word represents its frequency). We can also see, that the feedbacks from the students were negative overall (e.g. 'problem', 'hard', 'worried', 'dangerous', 'death', 'fear'), however, they were also quite hopeful (e.g. 'normal', 'hope', 'future', 'positive'). Students also exposed the importance of places (e.g. 'home', 'work', 'country'), institutions (e.g. 'government', 'university'), social groups (e.g. 'family', 'friend', 'parent') and social activities (e.g. 'social', 'distancing', 'studying', 'learning'). In relation to academic life, they also highlighted terms 'student', 'online', 'class', 'school' and 'education'. Not surprisingly, they used few COVID-19 closely related words, such as 'virus', 'health', 'mask', 'lockdown' and 'vaccine'. These findings are generally in a line with some previous empirical surveys (see Wang and Zhao [40], Khattar et al. [103]).

Figure 6. Word cloud of students' reflections on the COVID-19 pandemic.

3.2. Regression Results

Ordinal logistic regression was used to empirically verify the influence of selected factors of student's life as well as the sociodemographic and geographic factors on students' satisfaction with the role of university during the COVID-19 pandemic (see Tables 2 - 6). Before parameter estimation, two key assumptions of ordinal logistic regression were checked, namely the assumption of proportional odds and the issue of multicollinearity. The test of the proportional odds assumption was significant (p<0.001), meaning that the regression slopes do differ significantly across levels of the dependent variable [104]. However, this test has been described as anti-conservative, meaning that nearly always leads to the rejection of the proportional odds assumption [105], especially when the number of explanatory variables is large [106] or the sample size is large [107,108]. Moreover, multicollinearity was tested by examining correlations between explanatory variables (see Tables 2 - 6 and Figure A1 in the Appendix A). The simple correlation between the explanatory variables did not indicate any strong linear relationship, suggesting that there was no issue of multicollinearity in the data [104]. The severity of multicollinearity was additionally tested by multicollinearity diagnostics with variance inflation factor (VIF) ranging between 1.0 and 1.7, which is considerably below the threshold of 10, confirming the absence of multicollinearity [109]. Due to the listwise deletion of missing values in ordinal logistic regression, 7,948 valid full students' responses were considered in the analysis. Assuming that data was missing at random, we proceed with the parameter estimation. The statistics on the goodness of fit for the proposed empirical model proved to be adequate as suggested by Nagelkerke R^2 value of 0.386 [110]. The results of ordinal logistic regression are presented in Table 7.

Table 7. Ordinal logistic regression for factors influencing students' satisfaction with the role of university during the COVID-19 pandemic.

Dependent variable Satisfaction with university [a]	B	SE	Wald	Sig.	OR
Recorded videos [a]	0.176***	0.021	70.826	0.000	1.193
Information on exams [a]	0.252***	0.020	160.362	0.000	1.287
Teaching staff [a]	0.662***	0.026	639.421	0.000	1.939
PR (websites, social media information) [a]	0.492***	0.025	402.468	0.000	1.636
Bored [a]	-0.060**	0.019	10.132	0.001	0.941
Hopeful [a]	0.231***	0.021	125.165	0.000	1.260
Studying issues [a]	-0.045*	0.019	5.764	0.016	0.956
Gender [b]	0.074	0.045	2.725	0.099	1.077
Citizenship [c]	-0.019	0.091	0.045	0.832	0.981
Status [d]	0.016	0.070	0.052	0.819	1.016
Master's degree [e]	0.034	0.064	0.273	0.601	1.034
Social sciences [e]	0.196***	0.045	19.282	0.000	1.217
Scholarship [e]	0.168***	0.046	13.224	0.000	1.183
Ability to pay [e]	0.190***	0.043	19.653	0.000	1.209
Africa [e]	0.144	0.117	1.517	0.218	1.155
Asia [e]	0.046	0.073	0.393	0.531	1.047
Europe [e]	0.149*	0.065	5.360	0.021	1.161
North America [e]	-0.094	0.086	1.215	0.270	0.910
Oceania [e]	-0.314	0.251	1.557	0.212	0.731

Note: B-regression coefficient; SE-standard error; OR-odds ratio. Measurement: [a] 5-point Likert scale ranging from 1 (lowest value) to 5 (highest value); [b] 1-Male, 0-Female, [c] 1-Domestic, 0-Foreign; [d] 1-Full-time, 0-Part-time; [e] 1-Yes, 0-No. Significance: *p<0.05; **p<0.01; ***p<0.001.

The results confirm that satisfaction with *recorded videos* as one of the most exposed forms of online lectures has a positive effect on students' satisfaction with the role of university during the COVID-19 pandemic (B=0.176; OR=1.193; p<0.001). More specifically, a one unit (scale) increase in students' satisfaction with recorded videos leads to a 0.176 increase in the log-odds of being in a higher level of overall satisfaction with university, while the other predictor variables in the model are held constant. Equivalently, a one unit increase in satisfaction with recorded videos would increase the probability of overall satisfaction with the university by 19.3%, while keeping other variables in the model constant. Positive and significant influence can be observed also for satisfaction with teaching support in terms of providing sufficient and adequate *information on exams* or the procedure of examination in the times of crisis (B=0.252; OR=1.287; p<0.001), since one unit increase in students' satisfaction with the information on exams would lead to a 28.7% increase in probability of being in a higher category of overall satisfaction with university, while keeping the other predictor variables in the model constant.

During the COVID-19 pandemic, teaching and support staff have played a key role in maintaining students' satisfaction with the university, as established with the highest positive and highly significant coefficients for satisfaction with *teaching staff* (B=0.662; OR=1.939; p<0.001) and *PR (websites, social media information)* (B=0.492; OR=1.636; p<0.001). This implies that an increase of satisfaction with the lecturers and public relations by one unit (while the other predictor variables in the model are held constant) increases the probability of being in a higher level by 93.9% and 63.3%, respectively.

Moreover, emotional life and selected personal circumstances have also been identified as important drivers of students' satisfaction with the role of university during the COVID-19 pandemic. Namely, *boredom* has a negative impact (B=-0.060; OR=0.941; p=0.001), while *hopefulness* (B=0.231; OR=1.260; p<0.000) is identified as a positive driver of students' overall satisfaction with university. Additionally, concerns about *studying issues* (lectures, seminars and practical work) were found to have a negative and significant effect on students' satisfaction with the role of university during the COVID-19 pandemic (B=-0.045; OR=0.956; p=0.016).

As regards sociodemographic factors, the regression coefficients for *gender*, *citizenship*, *status* and *level of study* were not statistically significant, implying that these predictors are not important determinants of students' satisfaction with the role of university during the COVID-19 pandemic.

However, field of study has been proven to be an important determinant of students' satisfaction with university as the results suggest that students from *social sciences* (p<0.001) have a 21.7% greater chance to attain a better overall satisfaction with university compared to their counterparts, keeping other variables constant in the model. Moreover, the financial perspective was also proven as a crucial driver of students' satisfaction with university. As suggested by the results, students receiving a *scholarship* (B=0.168; OR=1.183; p<0.001) and having higher *ability to pay* (B=0.190; OR=1.209; p<0.001) have a greater chance to reach a higher level of overall satisfaction with university compared to students with financial problems.

Finally, the geographical perspective was also found as important in explaining the variation in the overall satisfaction of students with university, especially in the case of Europe for which positive and significant coefficient was found (B=0.149; OR=1.161; p=0.021). More specifically, students from *Europe* may have 16.1% higher chances to attain a better overall satisfaction with university compared to students from other continents, keeping other variables constant in the model.

4. Discussion

While the world was facing the outbreak of COVID-19 pandemic, higher education institutions were crucially affected at their core: the students. For them, the period is undoubtedly unprecedented and very stressful as onsite classes were moved online, semesters were postponed, examinations adjusted etc. Accordingly, there is an urgent need for in-depth studies about the impacts of the pandemic crisis on student's life worldwide. After performing an extensive overview of the state-of-the-art literature, we can conclude that our paper presents the first large scale global survey among students from different study perspectives since the COVID-19 outbreak. In our study, which was conducted between 5 May and 15 June 2020, we attempted to illustrate what student life looked like during the COVID-19 pandemic from academic, social, emotional, financial and other perspectives. In this respect, the presented study offers a number of important and unique detailed insights into student's life during the lockdown period.

First, the students' academic work and academic life aspects were studied. Due to the physical closure of higher education institutions the majority of teaching and learning processes went online, i.e. 86.7% of all respondents claimed that the onsite classes were cancelled and substituted with online lectures in a form of real-time video conferences, sending presentations to students, video recordings and written communication (forums and chats). The students were most satisfied with real-time video conferences, video recordings and written communication with Oceania and Europe as global frontrunners while developing countries (from Asia and Africa) significantly lagged behind. The study of Kamarianos et al. [25] also confirmed that in a given situation, being a student (Generation Z), thus digitally much more literate than previous generations, helped a lot to overcome the difficulties of the transition from onsite to online learning. There was not much time to prepare in order to reorganize the teaching and learning processes - this transition had to be quick and efficient [44]. The results of our survey further demonstrates that on a global level, students were quite satisfied with the organization of all three segments of pedagogical process - lectures, tutorials/seminars and mentorships. When comparing the workload before the transition from onsite to online, a bit less than a half of respondents reported that, in a new learning environment, their workload was larger or significantly larger - the largest increases in the workload were reported in Oceania and Europe and the smallest in Asia and Africa - both most probably due to the underdeveloped internet network and lack of computer skills [15,44,47,64,84,88]. However, we cannot assign all negative consequences to the development level of digital infrastructure and skills in specific parts of the world, since studying isolated online at home can bring about many challenges, e.g. lack of motivation and a need for higher self-discipline and self-initiative, which means that one has to adapt his/her studying habits efficiently in order to minimize the stress and the feeling of work overload [36,46,87]. Besides being satisfied with the support of teaching staff, the students, regardless of the continent, were also satisfied with the university's information from websites and social media which indicates the importance of efficient communication from higher education management.

As regards availability of infrastructure needed for efficient study at home, three quarters of respondents had computers, where, not surprisingly, the students from advanced countries prevailed (e.g. Oceania, North America and Europe). It is alarming that almost half of the respondents didn't have a quiet place to study and a third of them didn't have regular access to printers, where the African, Asian and South American students reported the lowest results. A good internet connection as a key element for efficient online learning (see also Owusu-Fordjour et al. [15], Adnan and Anwar [46], Baloran [47], Anifowoshe et al. [64], Ali [83], and Kapasia et al. [84]) was available to only 60% of respondents (29% in Africa, and even the best ranked continent, i.e. Oceania, showed 71%). Students were also asked about their confidence in computer skills, needed for efficient online study. They expressed confidence in skills of using online communication platforms, browsing online information and sharing digital content. But they were not confident in skills of applying advanced settings to some software and programmes, as well as using online teaching platforms (BigBlueButton, Moodle, Blackboard, GoToMeeting, etc.). The latest calls for an introduction of intensive training before the start of forthcoming semesters in both hemispheres. These results further confirm that there are large differences in the availability of digital equipment and the development of computer skills between students from the developing and developed parts of the world [15,64,88,111], and that even in the most advanced continents (in our case in Europe and Oceania) students do not have equal opportunities to study online efficiently because of different living conditions, domestic duties and other factors (see also UN [118]). In the above described segments of student's academic work and life, sociodemographic factors appeared as important predictors of satisfaction with and perception of specific segments. In general, as in the case of other student's life aspects, female, full-time students, studying at the second level, studying social sciences, having a scholarship, without financial problems and not losing a students' job due to the COVID-19 pandemic appeared to be more satisfied and assessed the studied elements in a more positive way. Indeed, empirical findings confirm that the undergraduate students and students with financial problems (particularly from Africa and Asia) find it harder to cope with the pandemic's consequences on their academic work and lives.

The abovementioned quick and radical changes in teaching and learning processes brought about significant consequences for students' mental health, i.e. feeling specific emotions and worries. When analyzing the emotions, felt by the students, they were frequently feeling bored, anxious and frustrated, but also hopeful and joyful. The highest levels of anxiety were noticed in South America (Brazil) and Oceania. As reported by Pather et al. [112], a higher level of anxiety of students from southern hemisphere, e.g. from New Zealand and Australia (same in South America, e.g. Argentina, Brazil), could be attributed to the fact that the beginning of the pandemic coincided with the beginning of the academic year 2020, whereas the academic year on the northern hemisphere was nearing the end, i.e. the students from the southern hemisphere were probably more worried about the curriculum delivery and assessment for the entire study year, not only its finish. A similar ranking of continents as for anxiety was found for frustration as the second most devastating emotion. On the other hand, when analyzing positive emotions, North America appeared to be the continent with most joyful students and Asia with most hopeful students. In order to protect student's mental as effectively as possible [7,33,39,95], governments, health professionals, higher education institutions, students' organizations and NGOs should collaborate intensively in the processes of designing timely and efficient psychological and financial support services for students.

When studying at home, many of them being not only under a lockdown, but also in isolation or even in a quarantine, students were (on a global level) 'most of the time' or 'all of the time' worrying about their professional career in the future and studying issues, e.g. lectures, seminars, practical work. They were least concerned about traveling abroad and personal physical health, which is expected for that group of population. The most concerned appeared to be South American and African students, while students from Oceania and Europe seemed to lag behind (they are more concerned about studying issues and leisure activities). The findings suggest that there are many challenges lying ahead the current generations of students [7,42,44,49]. This means that the support measures taken by the responsible stakeholders have to be implemented as soon as possible, being

as systematic, as holistic and as sustainable as possible in order to enable physically, psychologically and economically safe future of young generations.

Students' mental health during the physical closure of public life heavily depended on a level of change in usual daily routine and a social support they were receiving during that challenging period of time [28,89,90]. During the months of closure students lived in very diverse environments and they had to run their social life in a different way than they were used to. The results of the survey revealed that students worldwide communicated online at least once a day with close family members (mainly Asian and European students), someone they live with, e.g. roommate (mainly students from Oceania and North America), or they used social networks (mainly students from South and North America). By maintaining their social contacts students helped others and themselves keeping their mental health in the unprecedented period of the first wave of the COVID-19 pandemic [7,89].

Besides the changes in social life students had to modify some other habits and daily routines, especially those, connected with the risks of spreading the virus [30,31,47,90,91]. In our study they reported about starting to wear a mask outside (87%) (mainly in South America, Asia and Europe), washing hands (80%) (mainly in Africa) and avoiding crowds and large gatherings (78%) (predominantly in Oceania and North America). They also had to avoid public transport, cancel travel plans [28], work from home, avoid touching a face and started stocking up on essentials. As digital natives they didn't change much their habits regarding online shopping [93]. Students also reported about not leaving home unnecessarily (mainly in South America, Oceania and Africa), not shaking hands (mainly in North America) and not visiting family members or friends (in Asia). They also contacted close persons, did their workout and offered help to people (see also Pan [30]). Last but not least, besides many negative consequences, the pandemic brought also some opportunities for students in their future work and behaviors e.g. acquiring digital skills faster [113], having time to eat healthier, having time for doing sports, opportunity to do something good for people needing help in the family or in neighborhood, and last but not least shopping and travelling less [44] and therefore saving our planet from pollution [114].

When coping with the challenging situation students built their opinion about the role of different institutions, linked with solving unprecedented situations (e.g. government, universities, banks and hospitals). They reported that they were most satisfied with the role of hospitals, except in Oceania, where (in New Zealand) the role of government prevailed probably also due its COVID-19 elimination strategy [92]. The importance of health workers and satisfaction with their work in the time of COVID-19 was also stressed by Nole [98]. Furthermore, students were satisfied also with the response of universities (mainly in Oceania, North America and Europe – with more than 53%, whereas Africa received only 29%). African students were even more satisfied with the responses of banks compared to the responses of universities and governments. On a global level, a low students' satisfaction with governments (not in a line with findings of Pan [30] and Baloran [47] and banks reflects that young generations do not trust them although they were and are still providing some measures, dedicated to alleviate the severe consequences of the COVID-19 pandemic [44]. In fact, according to Aksoy et al. [115] the current epidemic can result in the further erosion of satisfaction and trust in political leaders and institutions, and may leave behind a long-lasting political scar on the current young generation. The selected sociodemographic factors influenced the satisfaction with institutions in the same way as it was described as a general observation.

The governments, banks and universities introduced different support measures for their citizens (see Cao et al. [7], Eurofound [8], and Yeo and Kim [116]), thus and also for students in order to minimize their distress, specifically in socio-economic aspects of their lives, i.e. offering free public transport, freezing rents, deferring students' loan payments etc. Students from all over the world reported about the importance of measures, such as the emergency support for the vulnerable population (e.g. in South America and Europe), childcare for workers (e.g. in South America and Africa), deferring student loan payments (e.g. in South and North America), deferring or reducing payments and financial assistance. Interestingly, free public transport was perceived least important, most probably, as people (incl. students) were asked to stay home during the first weeks of the pandemic outbreak. Female students, arts students, students with scholarships and those with lower

living standard assessed the mentioned measures as more important than other sociodemographic groups. Logically, the international students emphasized the importance of financial assistance for renters. When summarizing the above findings as a basis for decision-making about the work in the forthcoming semester, it is important for the universities' authorities that the majority of students had a good opinion on the work done by their universities, as discovered also by Huckins et al. [42], Goel et al. [111], and Misirlis et al. [117].

There is no doubt that the COVID-19 pandemic has tested the academic systems worldwide and that universities had to rapidly change traditional forms of education to exclusive online education [12]. Ordinal logistic regression results demonstrate that the students' satisfaction with the role of universities during COVID-19 has been significantly influenced by different academic, mental and sociodemographic factors. Student who were more satisfied with the new form of education (e.g. recorded videos as form of online lectures), with teaching support (e.g. by providing sufficient and adequate information on exams or the procedure of examination in times of crisis) and university public relations (e.g. by providing regular updates and information on websites and social media), show greater satisfaction with the role of their university during the pandemic (see Sahu [44]). In addition, the mental aspect had also an impact as less bored, more hopeful and students with less concern about studying issues demonstrated greater satisfaction with the university measures (see Händel et al. [36]). Not surprisingly, social science students, students with better financial conditions (receiving scholarships and have higher ability to pay costs) and students from Europe appeared to be more satisfied with the way their university coped with the pandemic situation.

According to the presented results of the global study, the COVID-19 crisis apparently strongly impacted male students, part-time students, undergraduate students, applied sciences students, and students with lower living standard (those not able to pay their costs, without a scholarship and those who had lost their job due to the pandemic). The geographical differences in the results are alarming especially for Africa and Asia [15,64,83,84] and can be understood as an important signal for international, national and higher education authorities to appropriately respond with adequate policy recommendations on different aspects of student's life in order to minimize the gap in students' opportunities between the different parts of the world. Our findings confirm the concerns of international institutions, such as the United Nations [118], which are emphasizing the importance of efficient delivery of educational programs in order to avoid digital, social, economic and gender inequalities. Policy makers on all levels should provide investments in digital literacy and infrastructure, and education institutions should provide flexible delivery methods, digital platforms and modernized curricula user-friendly to both students and teachers. All authorities, involved in the higher education systems and wellbeing of students as an extremely important segment of population, should prepare a set of proactive measures in the higher education arena in order to ensure the proper support to students and their healthy development in these ever-changing circumstances presented by the pandemic.

Several limitations of the present study should also be noted. First, the majority of aspects in the questionnaire was in the form of students' self-report. This kind of a process is usually complex and requires both a recall and an insight, where a recall bias and social desirability bias may be caused by the self-reported property of the research [90,96]. It is reasonable to assume that some students might under/overestimate their satisfaction with and perception of the selected elements/aspects of their lives during the COVID-19 pandemic. Second, from some countries/continents the responses were low (e.g. New Zealand/Oceania) or quite limited (e.g. the U.S and Canada/North America) as one or few countries from one continent made up most of the sample, while there were no participants from other countries. As a result, these findings may be to some extent biased, therefore some caution should be taken when generalizing the results to those countries/continents that were not included in the sample. Third, the study was carried out at different stages of the COVID-19 pandemic in specific countries/continents - it was more or less advanced in some regions than in others, with different sizes of magnitude. Finally, as data collection was mainly implemented in May 2020 when the pandemic declaration was still in force in most of the countries included in the sample, access to the survey participants was relatively limited.

Notwithstanding the above limitations, the findings of our global survey are of paramount importance as there have been, so far, only few comparative studies performed analyzing the impacts of the COVID-19 pandemic on different aspects on student's life. Therefore, present study importantly fills this gap and also demonstrates the avenues for future research, such as (1) focusing further empirical analysis on each studied aspect/element of student's life separately and more in detail from different (comparative) perspectives at regional, national and/or institutional levels, and (2) extending a similar survey to teaching staff and other employees at higher education institutions by performing a global study on the impact of the COVID-19 pandemic on their professional and private lives.

5. Conclusions

In a period of just a few months, the COVID-19 pandemic, caused by the novel coronavirus, has radically transformed the lives of masses of people around the globe, including higher education students. In this respect, this comprehensive global study provides systematic meaningful insights into students' satisfaction and perception of different aspects of their life during the COVID-19 pandemic crisis, including their opinions about the near and far future. We found that teaching staff and universities' public relations offered students the most important support at university during the pandemic. On the other hand, lack of computer skills and the perception of a relatively higher workload prevented students from perceiving higher performance when adapting to the 'new normal' with education from a distance. During the lockdown students primarily raised concern about their future professional career and studying issues, and were mainly bored, anxious and frustrated. They also changed some of their hygienic behaviors, such as regularly wearing masks and washing hands, and daily routine habits, like leaving home and shaking hands. While the role of hospitals and also universities appeared to be positive, governments and banks did not justify students' expectations during the pandemic.

Sociodemographic (and geographic) factors also played an important role in students' perception of different aspect of academic work/life as empirical results suggest that the COVID-19 pandemic have, in general, more strongly affected males, part-time students, undergraduate students, applied sciences students, students with lower living standards and students from less developed regions (in Africa and Asia). Furthermore, in order to illuminate the factors that influence students' satisfaction with the role of university during the pandemic ordinal logistic regression was applied. The results demonstrate that more hopeful and less bored students, students who were more satisfied with their academic work/life, social science students, students with better living standard (with scholarship and/or ability to pay overall costs of study) and those who studied in Europe showed greater satisfaction with the role and measures of university during the COVID-19 crisis. These findings importantly address public and higher education authorities to closely collaborate (together with other stakeholders) and urgently pay special attention to the vulnerable student groups when resolving diverse, mostly negative, consequences of prolonged COVID-19 measures worldwide.

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Appendix A
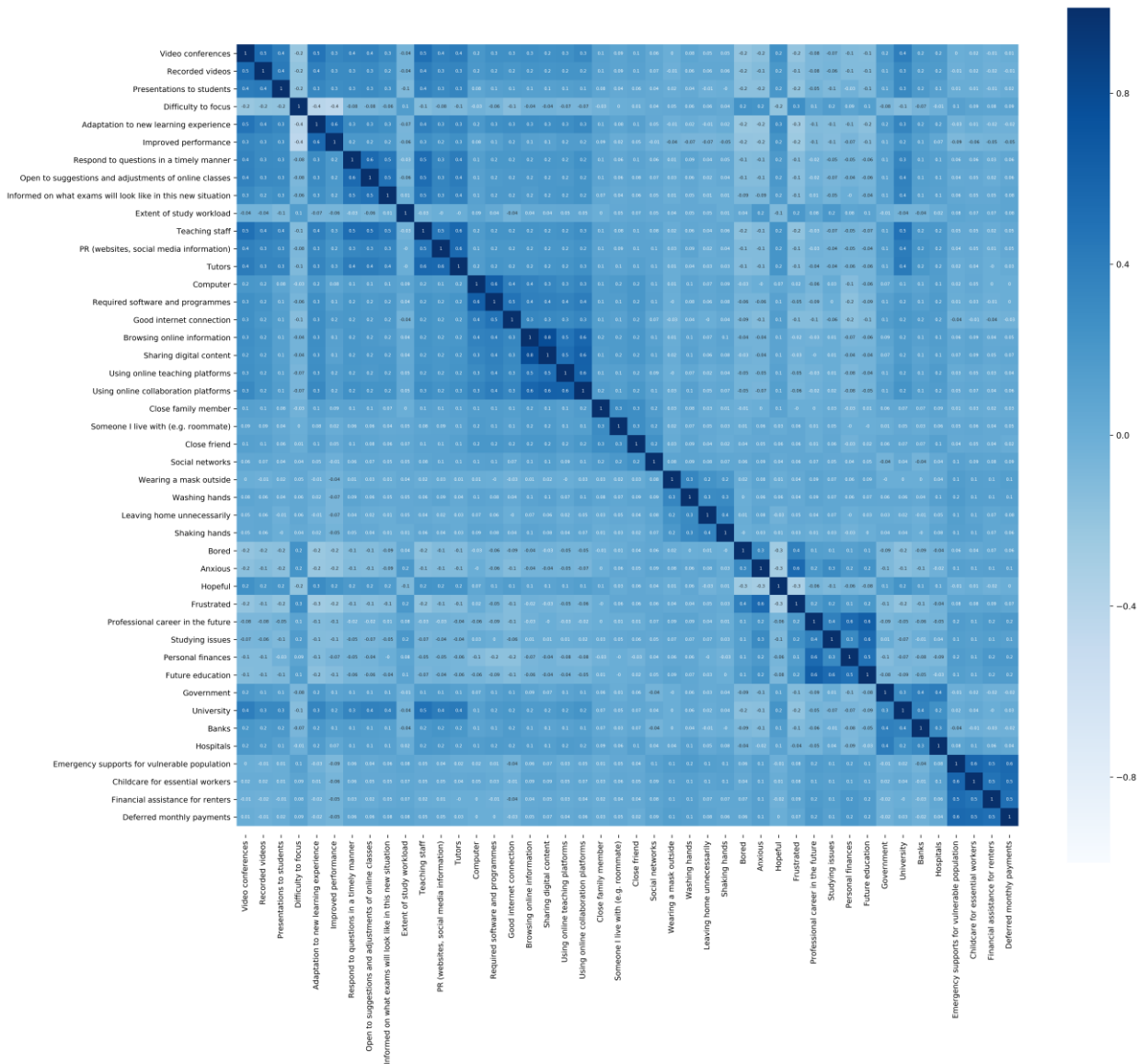
Figure A1. Spearman correlation heatmap. All correlation coefficients having absolute value of 0.03 or above are statically significant at 0.05 level (after Bonferroni p-value correction).

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