Higher Education – Related Problems During Covid-19 Pandemic

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Abstract:

Purpose: The article aims to analyze the opportunities and threats stemming from remote learning, to assess the impact of the use of modern technologies on the quality of the education process, as well as to study the level of students' satisfaction with distance learning.

Design/Methodology/Approach: The deduction method was used to assess the observations made in connection with the introduction of restrictions related to higher education in individual countries worldwide, while the induction method was used to formulate conclusions based on the relevant information collected. The empirical observation method was used to diagnose the main problems resulting from remote education and was also relied upon to examine the potential use of modern technologies to improve the quality of the process. Data was collected based on a survey concerned with the participation of logistics students in classes conducted remotely.

Findings: The surveys conducted aimed at assessing the organization and conducting classes in the remote mode, based on modern educational methods.

The research conducted allows us to perform a comprehensive evaluation of the quality of remote education of logistics students and determine its impact on acquiring knowledge and practical skills. The research provides information concerning the impact that modern training technologies have on the level of students' training and the expansion of their professional competence and experience.

Practical Implications: The present article will make it possible to assess the functioning of higher education institutions in the pandemic and show opportunities and threats for distance education and perspectives for the future functioning of higher education.

Originality/Value: The article presents an analysis of opportunities and threats and examples of good practices and recommendations, which can be followed if classroom learning continues to be suspended.

Keywords: Remote teaching, modern teaching technologies, surveys.

JEL codes: I21, I23, C12.

Paper type: Research article.

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1. Introduction

The crisis caused by the pandemic has influenced every sector of the world economy. It has also become a major challenge to higher education institutions in countries under lockdown. The teaching process, which was mostly classroom-based, had to go online. These difficulties have affected not only teaching but also research and organizational activities. The necessity to cancel traditional classes due to the COVID-19 pandemic entailed reorganizing universities and starting online teaching immediately.

In the beginning, both students and university teachers had to adapt to the world's new situation. They were facing technical problems and challenges caused by insufficient knowledge. Not all of them knew how to organize a videoconference, set up an account, solve problems with webcams or share different types of files, presentations, or recordings without infringing copyrights or the right to personal data protection (GDPR). Teachers were forced to reorganize their classes, prepare teaching materials in a new form, and get to know new online teaching software (e.g., MS Teams, Zoom, or e-learning platforms) to improve communication with students. Remote education often does meet expectations (e.g., because it is no longer necessary to commute, it is possible to record the presented content, and working at home gives students more freedom), but in some cases, it negatively affects the quality of education because nothing can replace practical classes, e.g., laboratory exercises or design classes which require specialist equipment or software.

According to the Rector of the Warsaw University of Technology, this teaching model works well at technical universities and universities with a classic profile. The pandemic hit medical, pedagogical, sports, and art universities the hardest because they often cannot teach certain subjects online.

Another problem faced by higher education institutions is the internationalization of universities, both in Poland and worldwide. In the coming years, it will be impossible to maintain the internationalization of teaching and learning before the pandemic. University teachers often give up on mobility because of closed borders, suspended air traffic, and, most importantly, concern for their own health and the health of their loved ones. This problem affects the whole world. It is estimated that many higher education institutions may have financial liquidity problems due to the loss of revenue from fees paid by international students. According to research conducted at 200 universities worldwide, published in Times Higher Education, 12% of them are planning to dismiss employees and lecturers in the next six months. The world's situation suggests that the future is uncertain for beginner researchers, which could be a threat in the coming years.

This article presents statistical analysis and a compatibility test for a survey conducted among university teachers and Logistics students at the Faculty of

Security, Logistics, and Management of the Military University of Technology in the summer semester of the academic year 2019/20. Questions were formed based on a survey questionnaire in which both students and lecturers could point out what works well in remote education and what should be improved or changed, how to implement new solutions in their system of work gradually, how to correct and adjust the curriculum, as well as the methods of grading students and obtaining credits for specific classes.

The approaching academic year 2020/21 is highly uncertain because nobody can know what teaching mode will be adopted. On the other hand, it is certain that for every person, distance learning is a test of the ability to listen and communicate their needs, as well as a chance to learn how to compromise. A review of the situation and teaching practices in selected countries shows different faces of current problems and their common features. In the next months, such information may prove useful for Polish universities to develop operating strategies that correspond to the current situation.

2. Restrictions in Specific Countries

2.1 Europe

For a few weeks, the world has focused on the COVID-19 pandemic, which has affected everything and everybody. Closed preschools, schools, universities, and work from home have become our everyday reality. Suddenly, people had to adjust to a rapid change in their lives. Most European countries implemented restrictions to limit contact between people. Only two countries (Sweden and Iceland) refused to close primary schools and junior high schools but closed high schools and higher education institutions. According to data collected by UNESCO, over 1.3 million students at all educational levels have been affected by lockdowns in 142 countries.

DAAD, a German association of universities and student bodies, surveyed German higher education institutions, most of which did not start teaching students in the summer semester until the end of April 2020. 47% of German universities shifted to online learning, whereas 45% adopted a hybrid education model (classroom and distance learning). In the summer semester, international students could not start nor continue studying at about 75% of universities due to travel restrictions (it is estimated that about 80 thousand students have left Germany because of the pandemic).

Similar to other countries, Germany was forced to digitize the higher education sector overnight. However, it was impossible to achieve certain objectives on online platforms. The main problems are practical classes and exams. Specialist laboratory exercises had to be conducted traditionally. Institutions of higher education offered remote courses (certified courses and M.A. studies) even before the pandemic, but they were not very popular.

However, in the time of the COVID-19 pandemic, they may turn out to be the salvation of higher education and bring many benefits in the future. It is still unsure what the winter semester of the academic year 2020/21 will look like when it comes to German universities.

On 5 March 2020, the University of Patras in Greece was closed due to the first cases of COVID-19. One week later, a local lockdown was extended to the whole country. The government introduced legislative changes to enable universities to make the shift to online learning. These changes were necessary because, under the Greek constitution, remote learning could only be provided by the Hellenic Open University (Karalis and Raikou, 2020). Thanks to these changes, almost all public universities quickly shifted to distance education. The majority of students were satisfied with the shift to online learning and emphasized easier access to education (e.g., thanks to modern technology) and better communication with teachers.

Negative consequences included the limitation of social interactions in university life and the lack of communication and cooperation. Moreover, technical problems arose during online classes. In a study conducted by Karalis and Raikou, who compared two different teaching modes (distance and face-to-face teaching), students have noted that they acquire new skills through more convenient and interesting thanks to online education participation in classes (they no longer need to commute). On the other hand, according to research by Panhellenic Medical Association, during the lockdown in Greece, students were more depressed, had more suicidal thoughts, and their stress levels increased.

French institutions of higher education were closed under the president's decision of 16 March 2020. Students participated in classes via the RENATER network (National telecommunications network for Technology, Education and Research), Microsoft Teams, Zoom, and the FUN platform. Universities such as the University of Pau and Pays de l'Adour (UPPA), Savoie Mont Blanc University (USMB), University of Picardy Jules Verne (UPJV), and University of Bordeaux (UB) opened their own crisis centers. 20-30% of students attending French universities were regarded as "vulnerable," and a considerable part of them stopped attending classes.

Universities offered technical support, and if the need arose, they also provided computers and Internet connection to students. The next months will be of key importance to universities' future functioning because, so far, we do not know how much the crisis will affect their budgets. French universities are waiting for the approaching academic year to decide whether they will have to continue distance education and how many new students will be admitted. Moreover, similarly to other European universities, they have a serious problem with international students.

In the United Kingdom, similar to other countries around the world, classes were moved online. As early as in May 2020, the authorities of the University of Cambridge announced that they were cancelling all lectures until the middle of

2021. Students will continue to participate in online classes. Higher education in the United Kingdom may face a serious financial crisis, e.g., due to a slump in student fees and a potential loss of up to 75% of international students and 20% of students from the UK in the next academic year. Forecasts suggest that most universities may become insolvent (except Oxford and Cambridge) (London Economics, 2020; Brackley, 2020).

British universities rely heavily on international students (the biggest growth was observed among students from China in 2019, their number reached 90 thousand). The British Council carried out a survey that shows that up to 50% of candidates for post-graduate studies are planning to postpone their arrival, whereas 20% plan to change their destination to a different country. Due to expected financial losses, British universities are implementing or are planning to implement measures such as suspending employment, dismissing employees, cancelling courses and entire study programs, or even closing down unprofitable faculties. It is estimated that the COVID-19 pandemic has already cost British universities about 790 million pounds (Burki, 2020).

On 17 March, the Swedish government recommended that gymnasiekolor (secondary schools) and universities should shift to distance education and try to modify their operating principles in such a way as to limit the spread of the virus among the Swedish population. A different policy was implemented for children under 15 years of age. Educational facilities for them remained open. Sweden was one of the countries that refused to introduce a policy of bans. It only gave its citizens guidelines on how they should behave amid the pandemic. Before the pandemic outbreak, many higher education institutions had already used digital platforms and tools, making it much easier for them to shift to distance education. By guidelines issued by the Public Health Agency of Sweden, on 31 August, students will resume in-class education, provided that the number of cases does not go up, and guidelines are not amended. At the beginning of the autumn semester, it is planned to combine distance education and in-class learning.

2.2 China

Since the beginning of 2020, numerous Chinese universities have started to shift from traditional classroom-based education to online learning. Due to the COVID-19 pandemic in China and governmental requirements concerning "non-stop teaching and learning," most Chinese universities have started online education. In a short time, lecturers started teaching online classes, and students were obliged to participate. Chinese students and lecturers got involved in online education, and this method of teaching has become the new standard, despite initial discomfort and difficulties caused by isolation. Chinese universities have started an online education reform to create an open educational network based on IT and network technologies. With the rapid development of massive open online courses, the number of such

courses offered by Chinese universities has exceeded 500, and almost 3 million people have participated (Bao, 2020).

The COVID-19 pandemic outbreak was unexpected and forced Peking University, the forerunner of distance education, to launch online programs that include 2613 undergraduate courses and 1824 post-graduate courses. To provide normal education to 44,700 students who stayed at home or in dormitories, these courses had to have a specific timetable, teaching materials (audio and video), and a technical support team. This form of teaching was challenging and difficult for both lecturers and students. Most teachers had to face problems related to their lack of online teaching experience and no support from educational technology teams. Apart from Chinese university teachers' challenges, research shows that over 60% of Chinese college students do not have specific career goals and are not actively involved in acquiring knowledge when they have online classes (Bao, 2020).

Moreover, as shown by an analysis of students' answers in social media, large-scale online learning challenges stemmed from technical obstacles and the lack of self-discipline, appropriate teaching materials, and good working conditions remote work.

2.3 India

The coronavirus has severely hit higher education in India. 1000 institutions of higher education were closed, and over 37 million students returned to their homes. Similar to the situation in China, Indian universities had to switch to distance learning overnight. In the beginning, it caused major problems related to technical support and problems of social nature. Indian universities also struggle with recruitment, which is based on secondary school leaving exams.

Nevertheless, it was assumed that even though schools were closed, school leaving exams would still occur, especially because out of over 14 million of this year's high school graduates, at least 5 million want to go to university. Since traditional recruitment methods, e.g., visits to the university, are out of the question, schools are looking for new ways of reaching potential students, such as phone calls, social media, and recruitment based on online activities. The new academic year, which starts in September, is currently being prepared. It is important to determine to what extent next year's education will be provided online because not all study programs are equally suitable for distance learning.

India ranks second after China as the source of international students for universities around the world. In 2019, over 142 thousand Indians studied in the USA, 52 thousand in Australia, 32 thousand in Canada, and 16 thousand in the United Kingdom. According to QS research, 57% of Indian students claimed that the pandemic's outbreak had made them change their plans to study abroad, whereas 54% of them postponed such plans until the next academic year.

India is still open to international students, but a drop in their number is expected, especially because no signs indicate that the epidemic could soon end in this country. Research shows that up to 50% of foreigners will postpone applying to Indian universities until January 2021.

2.4 Australia

In 2019, over 720 thousand foreigners studied in Australia. However, a sudden loss of international students (until 1 March 2020, 56% of students from China left Australia) put Australian universities in a bad situation. The International Education Association of Australia announced that the annual income would decrease by 8 million Australian dollars if Chinese students could not start the first semester of the academic year 2020/21 in Australia. There are many indications that Australian universities will lose financial liquidity without international students, and some may go bankrupt. Apart from the immediate consequences of the pandemic crisis, there is a risk that researchers will have to be dismissed due to the financial crisis, which will negatively affect educational opportunities.

2.5 New Zealand

Higher education is one of the most important economic sectors in New Zealand. International students have contributed almost 5 billion dollars to it, supporting over 45 thousand jobs. However, data collected by New Zealand Immigration suggest that the COVID-19 pandemic slowed down recruitment, and the number of international students declined sharply in the first two months of the epidemic.

It seemed that universities' elementary activities were going on as usual, but the "observe and wait" approach of their authorities was passive, making some employees and students concerned about the lack of decisive actions. University authorities were keeping an eye on things to postpone the inevitable shift to distance learning. From the second half of March 2020, university staff was responsible for adjusting research and teaching infrastructure to distance education, improving qualifications and skills related to the use of IT technologies, and preparing new materials to shift from traditional direct contact to online education (Pather *et al.,* 2020).

2.6 North and South America

The first COVID-19 cases in North America were reported at the end of January 2020 in the United States and Canada. More cases in this continent were observed at the end of February when the virus reached Mexico and Brazil. Then, in the first half of March, the virus spread throughout the Americas (Worldometer, 2020. The growth rate of new cases brought about restrictions at schools and universities (Crawford *et al.,* 2020). The first restrictions in this field were introduced at the end of February in the United States, where a recommendation was issued to cancel

traditional classes in educational facilities (UNESCO, 2020). Due to the administrative division of this country and a significant degree of internal autonomy enjoyed by individual states, which also applies to some legal matters, higher education institutions were closed locally, and local authorities took decisions in this matter. In the middle of March, more countries in this region introduced restrictions on the functioning of universities. Canada closed universities in 10 provinces, and at the end of March, authorities decided to suspend the activity of schools all over the country completely. At the same time, identical restrictions were introduced in almost all countries in North and South America.

Higher education institutions remained open in only two countries, i.e., Nicaragua, which had almost 4,000 COVID-19 cases, and Greenland, where 14 people were infected. Moreover, due to a slight increase in Uruguay cases, higher education institutions were opened locally (in a part of the country) in the second half of April. In contrast, at the end of June, all universities in this country were opened. As a result of the COVID-19 pandemic, problems such as canceled classes and distance education have affected over 40 million students in the Americas (UNESCO, 2020).

3. Questionnaire Survey for Employees and Students of the Military University of Technology

The questionnaire survey aimed to analyze opportunities and threats resulting from the implementation of distance education for Logistics students at the Military University of Technology, assess the impact of modern technologies on the quality of the teaching process, and check the students' level of satisfaction with remote classes. The survey was conducted among students and employees, and its results were analyzed in detail. Employees were asked 19 single-choice and multiple-choice questions, whereas students answered 36 questionnaire questions.

3.1 Results of the Questionnaire Survey for Employees

The questionnaire survey was conducted among 27 employees. 77.8% of them were men, and 22.2% were women. Their average age was about 50. The main group of respondents was assistant professors (55.6%), assistant lecturers accounted for 29.6% of respondents, whereas 14.8% were professors. 63% of respondents occupy teaching positions, 33.3% research and teaching positions, and 3.7% research positions.

In the first part of the survey, respondents answered general questions, e.g., their attitude towards remote classes, their views on student attendance, and the tools they often use. 71.4% of respondents answered that e-learning is the best solution in the time of the pandemic. At the same time, they noted that if the situation went back to normal, in-class learning should definitely be brought back. Moreover, employees said that the tools they used the most often were MS Teams (82.1%) and email

(89.3%). Tools that make it possible to stream classes were used the least often. Moreover, employees estimated the average attendance level at 71.4%.

The next part of the survey was devoted to the effectiveness and quality of distance education, depending on the used IT tool. The first step was to check whether the scores of individual applications were compatible with the normal distribution. To do that, the authors used the Shapiro–Wilk test. The calculated value of the test statistic and the corresponding p-value indicates that it is necessary to reject the null hypothesis in favor of the alternative hypothesis, stating that the observations are not compatible with the normal distribution. Then the authors calculated average scores of individual IT tools (Table 1) and checked whether the differences between them are statistically significant.

Table 1. *Average Scores of Individual IT Tools*

IT tool	Average score
email	2.93
instant messenger	3.14
Moodle	3.14
MS Teams	3.79
webinars	3.00
videoconferences	3.42
YouTube	2.88

Source: *Own elaboration.*

To do that, the authors used the non-parametric Kruskal–Wallis test with the null hypothesis that all observations come from one population (Kozłowski, Borucka and Świderski, 2020). The calculated p-value is 0.034, which means that for the adopted confidence level $\alpha=0.05$, the null hypothesis should be rejected in favour of the alternative hypothesis, stating that there are significant differences between average scores of individual IT tools assessed by lecturers and that the choice of a specific application has an impact on the quality of teaching.

To determine the significance of differences in specific IT solutions scores, the authors made multiple comparisons of average ranks for all samples. This analysis has shown that the best-graded tool, which ensures a high quality of teaching, is MS Teams, with an average score of 3.79 (on a five-point scale). The second tool, which, in the opinion of respondents, has a significant impact on ensuring the effectiveness of teaching was videoconference (with an average score of 3.42). The survey has shown no statistically important differences between the remaining applications (Figure 1).

Figure 1. *Graph of Average Scores of Selected IT Tools Supporting Distance Education*
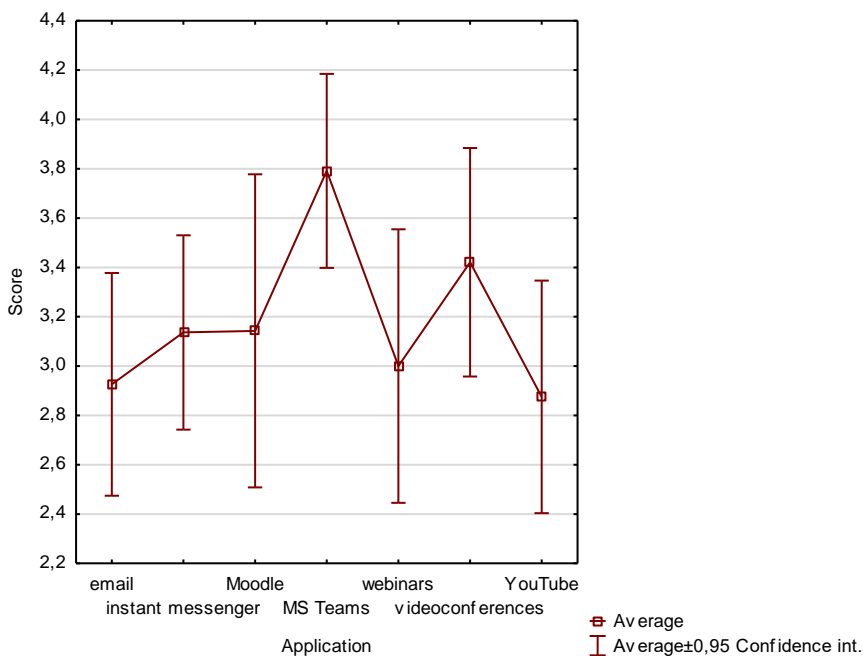
Source: Own elaboration.

The next step was to analyze the survey results on how employees assess traditional and online lectures. The contingency table with the respondents' answers shows that such lectures are usually assessed as good, as evidenced by 59.26% of answers (Table 2).

Table 2. *Contingency Table with Grades of Traditional and Online Lectures*

Type of class	Grade very good	Grade good	Grade hard to say	Grade bad	Row In total
remote lectures	3	15	7	2	27
% of the row	11.11%	55.56%	25.93%	7.41%	
classroom lectures	3	17	3	4	27
% of the row	11.11%	62.96%	11.11%	14.81%	
Total	6	32	10	6	54
% total	11.11%	59.26%	18.52%	11.11%	100.00%

Source: Own elaboration.

To check the significance of differences in the percentage share of specific answers depending on the type of classes, the authors performed a χ^2 test. The null hypothesis in the above-mentioned test is that the tested variables (i.e., grades are given to individual forms of teaching) are independent. The test statistic's calculated

value is 2.39, and the corresponding level of probability is p=0.49, which suggests significant differences between the answers given by employees.

The answer "hard to say" was treated as no data and excluded from further analysis, whereas descriptive answers were changed to corresponding numerical values. The number of answers' interaction plot shows that more employees gave classroom lectures grade 3 (good) than online lectures. Moreover, in the same situation, there were more grades 2 (bad). It was used to check whether specific forms of lectures significantly influenced how lecturers assessed them. Since the tested variable was not distributed normally, the Mann–Whitney U test was used in the analysis. It is a nonparametric equivalent of the Student's t-test for independent samples, making it possible to compare the median value for individual answer samples. The null hypothesis in the above test indicates that the samples come from one population. The test statistic's calculated value was 0.43, and the corresponding level of probability was p=0.66, which suggests that the null hypothesis should not be rejected. It means that no significant differences in the assessment of in-class and remote lectures were observed in the employees' group. The average score of traditional lectures was 3.05, whereas, in remote classes, it was 2.96, which means they were assessed as good.

In the next stage of analysis, practical classes were tested similarly. The contingency table below shows that good was the most common grade (64.82%). The χ^2 tests showed that the null hypothesis should not be rejected (probability level of p=0.16), so there are significant differences between grades depending on the form of classes.

Table 3. *Contingency Table with Grades of Practical Classes Conducted in the Classroom and Remotely*

Type of class	Grade very good	Grade good	Grade hard to say	Grade bad	Row In total
remote practical classes	3	19	1	4	27
% of the row	11.11%	70.37%	3.70%	14.81%	
practical classroom instruction	9	16	1	1	27
% of the row	33.33%	59.26%	3.70%	3.70%	
Total	12	35	2	5	54
% total	22.22%	64.81%	3.70%	9.26%	100.00%

Source: *Own elaboration.*

In order to check whether there are significant differences in grades given to classes depending on their form, "hard to say" answers were treated as no data and excluded from further analysis. In contrast, qualitative variables were turned into quantitative variables in accordance with a relevant scale. The interaction plot with the number of individual answers shows that most answers concerning online classes are good, whereas traditional classes are more often assessed as very good.

Since respondents' values of answers were not distributed normally, the Mann–Whitney U test was once again used in the analysis to check the statistical significance of differences in grades given to traditional and remote practical classes. The calculated value of the test statistic was -2.21. In contrast, the corresponding probability value was p=0.02, which means that there are statistically significant differences between the medians of scores for the above-mentioned classes. The average score of traditional practical classes was 3.30, whereas, in remote practical classes, it was 2.95. The above indicates that the employees assessed the quality of online practical classes as lower than traditional education.

3.2 Results of the Questionnaire Survey for Students

The questionnaire survey was conducted among a group of students, 66.7% of women and 33.3% of men. 63% of respondents were B.A. students, and 37% were M.A. students, with 55.6% of full-time students and 44.4% of part-time students. The vast majority of students declared that they study and work (59.3%) and live in a city with over 500 thousand inhabitants (48.1%).

In the first part, students were asked general questions on how they assess their faculty's reaction to the outbreak of the pandemic, as well as the availability of teachers and education-related help provided by them when in-class learning was suspended. Moreover, they were asked about their attitude towards e-learning. Students' average score to the reaction of their faculty to the new epidemiological situation was around 6.10. When classes were suspended, the availability of employees scored 7.25 on average, whereas help provided by teachers was 6.89 on average (on a ten-point scale). The achieved results show that university authorities' reaction, the availability of teachers, and help provided by them were all at a good level. The majority of students (60.8% of answers) saw the introduction of e-learning as appropriate in the pandemic times. Still, it noted that when epidemiological risk subsides, in-class learning should be resumed. Moreover, 32.1% of respondents pointed out that distance learning was a perfect complement of in-class learning.

The authors then analyzed the scores of individual IT tools used in remote education regarding their efficiency in achieving the desired learning outcomes and quality. The calculated average scores were presented in the table below.

Since individual IT tools were not distributed normally (which is confirmed by the Shapiro–Wilk test), the authors used the Kruskal–Wallis test to check the statistical significance of differences in assessing the quality and efficiency of specific IT tools. The calculated p-value is 0.00, which means that an alternative hypothesis should be accepted and that the choice of application impacts the quality of classes. To determine the significance of differences in specific IT solutions scores, the authors made multiple comparisons of average ranks for all samples. The analysis has shown that the top-rated tools include MS Teams, whose average score was 4.30

(on a five-point scale), and the instant messenger with an average score of 4.29. The quality and effectiveness of email in the teaching process was assessed as the lowest (Figure 2).

Table 4. *Average Scores of IT Tools*

| IT tool	Average
email	3.19
instant messenger	4.29
Moodle	2.78
MS Teams	4.30
webinars	3.63
videoconferences	3.78
YouTube	3.28

Source: *Authors' calculations.*

Figure 2. *Graph of Average Scores of Selected IT Tools Supporting Distance Education*
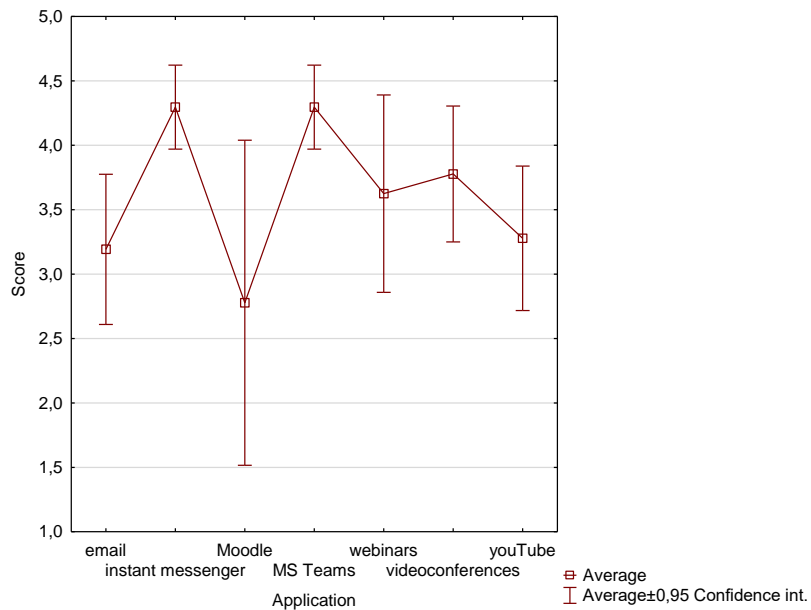
Source: *Own elaboration.*

The next step was to analyze the students' assessment of the quality of traditional and remote lectures. A ten-point scale was used for this purpose. The resulting interaction plot with the number of answers suggests that students gave higher grades to online lectures more often.

Figure 3. *Interaction Plot of the Number of Scores for Lectures*

Interaction plot: Type of classes x Scores
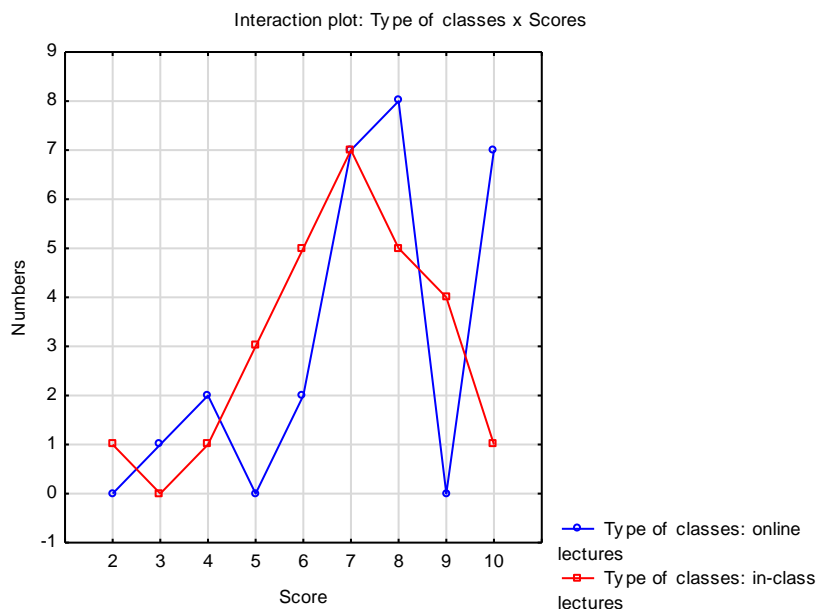
Source: Own elaboration.

The χ^2 test showed that there were no significant differences between the number of specific answers depending on the form of classes. The calculated probability value of p=0.04 shows that the groups are not independent. Then the authors checked the compatibility of answers in two groups with normal distribution. To do that, they once again used the Shapiro–Wilk test, in which the calculated p values suggested that it was necessary to reject the null hypothesis, stating that the distribution is compatible with the normal distribution.

Therefore, grades for the two types of classes were compared using the Mann–Whitney U test. The calculated value of the test statistic was 1.58, whereas the corresponding level of probability was p=0.11, which means that we should not reject the null hypothesis, stating that there are no statistically significant differences in the assessment of the quality and effectiveness of lectures depending on their form. Nevertheless, the calculated values of average scores suggest that online lectures were assessed slightly better (with an average score of 7.62) than traditional lectures (6.78).

A similar method was used to examine the results of the survey concerning practical classes. The interaction plot of the number of answers shows that higher scores were often given to classes which took place at the university.

Figure 4. *Interaction Plot of the Number of Scores Awarded to Practical Classes*

Interaction plot: Type of classes x Score

Type of classes: online practical classes
Type of classes: traditional practical classes
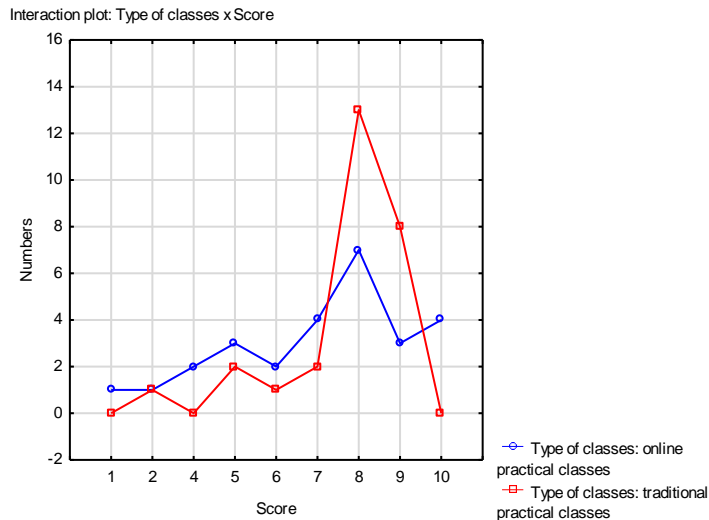
Source: Own elaboration.

It is also confirmed by the χ^2 test. The calculated probability value of p=0.13 indicates that the groups of scores are independent. Since answers in individual groups were not distributed normally (which is confirmed by the Shapiro–Wilk test), the significance of differences was compared using the Mann–Whitney U test. The calculated value of the test statistic is -1.14, whereas the corresponding value of probability is p=0.25. Due to the above, we should not reject the null hypothesis, stating that the samples come from one population, so there are no statistically significant differences between them. Traditional practical classes have a slightly better score (the average was 7.70) than online classes (7.00).

The questionnaire survey shows that there were no significant differences in the assessment of quality and effectiveness of traditional and online classes in the student group.

The last step was to compare how students and employees assessed the quality of individual IT tools. To do that, the authors used the Wilcoxon signed-rank test to compare these two dependent groups. The null hypothesis in the above-mentioned test is that there are no significant differences in the tested variable (in the analyzed case, assessing individual applications by students and employees). The results of the analysis were presented in the Table 5 below.

When it comes to email and the Moodle e-learning platform, we should not reject the null hypothesis, which states that there are no statistically significant differences in assessing these tools by students and employees. Regarding the remaining applications, we should accept the alternative hypothesis, stating that there are statistically significant differences in assessing specific IT tools by students and

employees. However, it needs to be noted that despite significant differences, the best-graded tool in both groups is MS Teams.

Table 5. *Results of the Wilcoxon signed-rank test*

	Application	p
Assessment by teachers & Assessment by students	email	0.07
	instant messenger	0.00
	Moodle	0.16
	MS Teams	0.00
	webinars	0.00
	videoconferences	0.02
	YouTube	0.01

Source: *Own elaboration.*

4. Examples of Good Practices and Recommendations

In many countries and organizations, the spread of COVID-19 has triggered different reactions aimed at limiting losses caused by the pandemic. The report Measuring COVID-19's impact on higher education, published on 15 April in ICEF Monitor, shows us how the higher education sector will face serious problems.

The current situation has forced universities to share their experiences to improve skills and tools used in educational work in crisis conditions brought about by the pandemic. The authors present selected examples of good practices related to Poland's learning strategies and around the world (Perspektywy - Report, 2020).

4.1 USA

Immediately after the lockdown, American universities have taken crisis response actions. The 2-trillion-dollar aid package adopted in the USA in March to counteract the pandemic's consequences included USD 14 billion for higher education. Many famous universities made some of their courses available online for free. When classes started to be cancelled by more and more universities, it became obvious that teachers and students will have to go online. In the beginning, well-known e-learning platforms, such as Coursera, invited universities to use their technology for free. It was because even the best universities were not ready to provide mass online learning.

Platforms dealing with online training courses, such as MOOC or Class Central, advertise their services by offering about 450 free courses provided by the world's best universities. This initiative is promoted by the Ivy League, which includes the eight most prestigious universities in the USA: Brown, Harvard, Cornell, Princeton, Dartmouth, Yale, Columbia, and Pennsylvania.

4.2 United Kingdom

On 10 April 2020, Universities UK (UUK) proposed to launch an aid package similar to the American one to help British universities. The UK estimates that the pandemic's financial consequences for British universities have already reached 790 million pounds, including lost revenue for accommodation, boarding, and conferences, as well as additional expenses incurred to support students learning online.

4.3 China

An analysis of actions taken in China at Peking University covers 6 instructional strategies, most of which could be implemented at other universities. These strategies are as follows (Bao, 2020):

- making emergency preparedness plans for unexpected computer system failures (caused e.g. by overload) and other unexpected issues – teachers have to prepare 1-2 emergency plans,
- dividing the teaching content into smaller units (up to 20-25 minutes) to help students focus on online classes; as is generally known, attention during online meetings is significantly lower,
- focusing on voice modulation rather than transmitting knowledge through body language because voice often has to replace facial expressions, gestures and movement,
- strengthening the students' active learning ability outside of class and meetings with teachers,
- effectively combining offline self-learning (reading course literature and key materials) and online self-learning (discussions and clarifying doubts),
- providing intensive support to teachers who often do not have experience with complicated communication platforms (IT departments and other teachers should help them when they prepare classes and when tutoring is in progress).

5. Best Practices at Polish Universities

AGH University of Science and Technology has prepared and implemented new provisions to ensure that students are safe and can continue studying. At the beginning of March, the majority of international students stayed on campus. The university kept in touch with every international student via email and over the phone. AGH University helped students prolong their visas, get plane tickets, and arrange transport, e.g., to Warsaw. It also provided financial aid and helped students obtain sanitary products. Moreover, the university kept in touch with its partner universities, whose students were on an exchange in Cracow.

Kozminski University also took steps to help its students and lecturers. Classes were conducted on an online platform, one for the whole university. The entire academic

community was involved in these actions. There was also a bottom-up initiative on Facebook called "We support." Thanks to it, students supported each other, e.g., by doing the shopping or helping with other everyday activities. It was important for the university to make sure that students did not feel lonely and abandoned. This is why they received psychological support.

Similarly, to the above-mentioned universities, the Lodz University of Technology had to shift to distance education quickly. Seminars, practical classes, and projects were moved to a digital platform. It turned out that a practical exam from laboratory exercises can also be taken online. Students received precise instructions, results, and videos for every exercise. Their task was to analyze a given phenomenon. What deserves particular attention are universities' experiences and activities from Lublin Province, taken in cooperation with local authorities and other institutions. Virtual open days, webinars for candidates in English. Russian and Ukrainian, online educational fairs, psychological support, etc., were offered by every university from Lublin Province.

Moreover, they took actions that went beyond education. Scientists from the Lublin University of Technology and the Medical University of Lublin have completed a prototype ventilator, responding to healthcare workers' calls. Moreover, students from the Medical University of Lublin have launched POMOCwKRYZYSIE (HELPinCRISIS), a mental health helpline to support anyone going through an emotional crisis caused by the COVID-19 pandemic. 80 students in their last year of university, majoring in medicine, medical analytics, and pharmacy, were involved in the above-mentioned project. Psychology students from the Catholic University of Lublin have launched a psychological counselling project. "Pomoc młodych" ("Youth's Help") is an initiative mainly for younger people who need to talk with someone. Lecturers from the Institute of Psychology at the Catholic University of Lublin had started providing psychological help earlier and were then joined by students. Over 100 psychology students got involved in the action.

5.1 Recommendations for Teaching Students During the Pandemic

All the above-mentioned actions show the great potential of the academic community. These good practices and their application bring many benefits to universities and their employees and students and their families. It is worth following good examples, which prove to be useful, especially in emergencies. The described good practices and teaching strategies in selected countries lead us to present recommendations for teaching students during the COVID-19 pandemic (Perspektywy – Report, 2020):

1. Providing psychological support for students who are isolated and participate in distance learning.
2. Attaching a high degree of importance to the organization of online classes, which has a direct impact on the level of education.

3. Effectively providing instructional and education-related information online – online information has no clearly defined expressive function, as a result of which information which for various reasons failed to reach the student (due to technical problems or the lack of concentration) is often deemed to have been successfully communicated.
4. Providing adequate professional, technical and functional support to students by lecturers and assistant lecturers.
5. Remaining strongly focused on classes to increase the scope of transmitted knowledge/skills and the in-depth educational process.
6. Having an emergency plan in case of unexpected failures of online educational platforms.
7. Offering free online courses and free access to technology.

6. Conclusions

The higher education system is opening an important new chapter because nobody knows what the world will look like after the pandemic. A sudden restructuring of universities has made the traditional method of teaching go online. Educational facilities worldwide will have to take steps to improve distance education because the current situation can continue until a vaccine is developed. It is predicted that university teaching, research, and administration will undergo a fundamental change. It is hard to predict how COVID-19 will affect universities in the long run, but one thing is sure: we can already observe a reduction in student mobility around the world.

Research shows that despite the students' temporary satisfaction with distance education, not every student has the required computer equipment and a stable Internet connection, which causes social exclusion and numerous barriers to distance education. Since it is impossible to verify the outcomes of teaching students directly, we cannot determine students' skills and competencies, which may negatively affect their future careers. Regardless of how long the COVID-19 pandemic will last, the current situation has forced universities to keep improving the quality of distance education, which does not enable students to develop their practical skills due to limited access to specialist equipment software. If the pandemic continues for a longer period of time, it is highly probable that distance education will oust the traditional form of teaching and become the norm.

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