

Original scientific paper

Received: May, 11.2021.

Revised: July, 24.2021.

Accepted: August, 04.2021.

UDK:

316.644:[37.018.43:004(437.6)"2020/2021"

378.147(437.6)"2020/2021"

doi: [10.23947/2334-8496-2021-9-2-203-226](https://doi.org/10.23947/2334-8496-2021-9-2-203-226)



Education in Online Environment from Students' and Teachers' Perspective

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Abstract: The pandemic related to COVID-19 has affected education particularly in terms of the massive shift towards online teaching and study. Students and teachers had to face new challenges they had not met before. The aim of the paper is to research how both, students and teachers perceive the online educational process, to identify advantages and disadvantages of online teaching, as well as to analyze and evaluate the quality of online teaching in comparison with the attendance form of education from both students' and teachers' perspective. In order to fulfill this purpose, we carried out two separate questionnaire surveys (among students and teachers at the Faculty of Economic Informatics at the University of Economics in Bratislava). Based on conclusions resulting from our research, we can affirm that both students and teachers prefer the attendance form of education rather than online teaching, students mainly because of need of socialization, personal contact with teachers and classmates, better and faster communication with teachers, and active class discussion. The attendance form of education eliminates technology related problems, such as outages of the Internet, electricity, missing technology equipment, and this form of education is performed on higher quality level in comparison with online education. Among the most frequently limitations of online education mentioned by teachers were anonymity of students, complexity of preparation of study materials, and cheating during exams and tests. There are also some advantages the online education offers, such as time savings, more effective, creative and flexible modern way of teaching, and recording lectures.

Keywords: COVID-19, online teaching, outbreak, education, assessment, quality.

Introduction

The COVID-19 pandemic that first appeared in 2019 in Wuhan ([Abdulmir and Hafidh, 2020](#); [Ait Addi et al., 2020](#); [Aljofan and Gaipov, 2020](#)) had a negative impact on all subjects of economic and social life. The first wave of pandemic showed its power in the spring 2020, when many countries, including the Slovak Republic, adopted strict restriction measures in order to limit the spread of pandemics. Services, schools, borders were closed, movement of persons was limited, and the economic and social life was attenuated. Primary and secondary schools, and universities remained closed; teaching has moved from attendance form to an online format ([García-Peñalvo et al., 2020](#)). The same situation was in the Slovak Republic, where all schools including universities, remained closed. The University of Economics in Bratislava (hereafter referred to as "UEBA"), as well as other universities in the Slovak Republic, started the online education in the summer term of the academic year 2019/2020 in order to protect health and prevent the spread of the virus. In March 2020, The Statement of the University of Economics in Bratislava after the Crisis Staff meeting to the current situation related to the Corona Virus (2020) (hereafter referred to as "Statement of the UEBA") was issued, which interrupted the education for the first, second and third stage of full-time and part-time study. Then the Measures of the Rector of the UEBA No. 3 on the current situation (hereafter referred to as "measures of the Rector No. 3"), the Updated measures of the Rector of the University of Economics in Bratislava No. 4 on the current situation related to Coronavirus – March 12, 2020 (hereafter referred to as "updated measures of the Rector No. 4"), and the Updated measures of the

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Rector of the University of Economics in Bratislava No. 5 on the current situation related to Coronavirus – March 24, 2020 (hereafter referred to as “updated measures of the Rector No. 5”) were issued gradually, which interrupted the education for the first, second and third stage of full-time and part-time study until May 30, 2020 (included). While according to the Statement of UEBA, measures of the Rector No. 3, and updated measures of the Rector No. 4, the education was interrupted and the teaching process took the form of self-study or other relevant methods, the updated measures of the Rector No. 5 issued on March 24, 2020, stipulated the interruption of the attendance form of education, and specified that the educational process will be conducted online using online learning platforms (e. g. Moodle, Microsoft Teams, Google Hangouts Meets) followed by self-study.

According to [Usak, et al. \(2020\)](#) COVID-19 has become a new playmaker in science education. The pandemic related to COVID-19 forced universities to switch their entire instructional apparatus to one of online delivery overnight. Universities have adopted various measures in order to limit the spread of virus. [Liguori and Winkler \(2020\)](#) state that universities first implemented protocols for enhanced cleaning across campuses, disseminated messaging to remind, and encouraged behaviors such as frequently washing one's hands, not touching one's face, while also advising students, faculty, and staff to stay home if they feel ill. Then universities took steps and shifted their approach to more drastic measures by cancelling public events, career fairs, conferences, and speaker events. The UEBA's management body took similar steps in order to prevent health of students and employees. The schedule of the academic year 2019/2020 had been amended. Consultations of study departments and of the teaching staff had been canceled. Students were encouraged to communicate with these departments and teachers solely by email or by telephone. The meetings of all self-governing bodies and advisory bodies at the UEBA and its faculties (such as academic senates, scientific councils, colleges, and disciplinary commissions), state examinations, dissertation defense, habilitation and inaugural proceedings were canceled as well. According to the updated measures of the Rector No. 5, all these activities were recommended to hold exclusively online.

Thus, COVID-19 affected education communities particularly in terms of the massive shift towards online learning ([Ratten, 2020](#)). According to UNESCO, on April 1, 2020, schools and higher education institutions were closed in 185 countries, affecting 1 542 412 000 learners; on May 7, 2020, schools and higher education institutions were still closed in 177 countries, affecting 1 268 164 088 learners ([Marinoni, Van't Land and Jensen, 2020](#)).

The switch from the attendance form of education into the online form was difficult for both teachers and students. It was absolutely a new situation, which they had to deal with. Everyone was stretched beyond their comfort zone by the switch to online-only: faculty, students, administrative staff, support staff, and university management ([Sangster, Stoner and Flood, 2020](#)). The primary goal of teachers was to ensure quality teaching at the same level as during the traditional attendance form of teaching. Our paper examines the quality of the educational process in the online environment in comparison with the attendance form of education. As the teacher is ([Purković and Kovačević, 2020](#)) an important factor in the quality of teaching who can best assess what may have an impact on students in a particular teaching, a general perception could not be applied to every student and in every environment. The switch to online education was not easy for all schools in various countries all over the world. According to [Marinoni, Van't Land and Jensen \(2020\)](#) only 29% of African schools and higher education institutions were able to quickly move teaching and learning online, compared to 85% of schools and higher education institutions in Europe. Almost one quarter of African higher education institutions cancelled teaching completely. [Sahu \(2020\)](#) states that main challenges universities across the world have been facing due to the COVID-19 outbreak were: shifting from face-to-face to online classes; assessment and evaluation; international students; travel restrictions; mental health; support services from the universities. Faculty members got training to use online learning platforms either as the only delivery mode or as an add-on to face-to-face teaching ([Lim, 2020](#)). Many universities ([Dill et al., 2020](#)) did not have enough infrastructure or resources to facilitate online teaching with immediate effect. The current study examines the perception of shifting to online teaching from students' and teachers' perspective at the Faculty of Economic Informatics at the University of Economics in Bratislava. [Reimers and Schleicher \(2020\)](#) investigated what the government or network of schools had done to support the ongoing academic instruction of students in various countries around the world. A large percentage indicated “nothing”, followed by providing encouragement to schools to use online resources. Some schools had been able to rely on online platforms to continue instruction and in some countries, governments were relying on educational television to broadcast content. According to [Allen, Rowan and Singh \(2020\)](#) in many schools, the move to the online space was presenting considerable hardship as teachers struggle to adapt to what might well be the “new normal” for quite a period of time. Despite the fact that information and communication technologies education in

various forms has become an obligatory part of the curriculum (Eger et al., 2020), there are still students who do not have access to adequate technologies needed for online study in the world, including Slovakia. Furthermore, computers and other IT equipment at home were and during the online education still are in heavy demand from parents, children, and other relatives who have to work online from home. The transition to the online mode has raised questions for the universities, faculties about their capability to deal with the existing technology, and working from home has been a difficult task for the faculty (Dill et al., 2020; Sahu, 2020).

Another great challenges in online teaching were assessment and evaluation that is why the current paper examines the impact of the online education on the examination and evaluation process, too. According to Sahu (2020) the transition from face-to-face teaching to online delivery has a serious impact on assessments and evaluation. Timmis et al. (2016) argue that although technology has been used earlier to support teaching and learning, the assessment aspect was often under-developed. Applying assessments online especially at those courses designed for face-to-face learning was a challenging task. Teachers had to change the assessment types to fit the online mode. According to Watson and Sottile (2010) it is difficult to monitor how students are taking in online and to ensure that students are not cheating during online tests. Lim (2020) draws attention to the fact that students were afraid that the outbreak would affect their exam performance. That is why it is necessary to provide them with clear directions regarding the procedures for administrating exams, assignments, and projects. Bothwell (2020) suggests that faculty members should frame a flexible assessment guideline to keep in mind that students are not at a disadvantage. If any student was not able to attend a course online due to illness or any disturbance, universities should have remained as flexible as possible to ensure that he or she would not get any negative impacts in terms of grading (Sahu, 2020).

Another problem connected with online education is social distancing. Our paper partially focuses on impact of online education on students' feelings and behaviors. Reimers and Schleicher (2020) explained in their paper why the necessary social isolation measures would disrupt school based education for several months in most countries around the world. Absent an intentional and effective strategy to protect opportunity to learn during this period, this disruption will cause severe learning losses for students. In the context of the COVID-19 pandemic (Galea, Merchant and Lurie, 2020) it appears likely that there will be substantial increases in anxiety and depression, substance use, loneliness, and domestic violence. Browning et al. (2021) researched the psychological impacts from COVID-19 among university students in seven states in the USA. Their research demonstrates, there is a broad array of impacts from COVID-19 on students' feelings and behaviors. The most common changes in how students felt compared to before the pandemic were increased lack of motivation, anxiety, stress and isolation. Smaller numbers of students reported positive changes from the COVID-19 pandemic, such as optimism, productivity, adaptation, and empathy. There are many other authors Schleicher (2020), Bloom, Reid and Cassady (2020), Rose (2020) who investigated the impact of COVID-19 on teaching process and education. Sahu (2020) considers this time as the right time for faculty, students, and administrators to learn from this critical situation and to overcome challenges the online teaching brings. Students are young and energetic, and they are capable of learning through the online platform. University authorities should encourage students and faculty to stay connected through the online or any social media platform and move forward together during this extremely difficult time. The safety and well-being of students and staff members should be the highest priority. Stress caused by rapid increase of infected cases, uncertainty and anxiety about what is going to happen may lead (Kafka, 2020) to unfavorable effects on the learning and psychological health of students. Students consider the online form of education impersonal. Universities and faculties should place an emphasis on mental health support by updating the health guidelines and providing the online guidance and lectures to offer strategies for managing stress when coping with the pandemic. Students should be provided with proper psychological support well in time (Al-Rabiaah et al., 2020).

In the summer term 2019/2020 Wagner and Křehnáčová (2020) conducted a survey at the Faculty of Finance and Accounting at the Prague University of Economics and Business in the Czech Republic within the Management Accounting Course in which they analyzed the efficiency of learning approaches comparing "traditional" classroom approach and e-learning approach. In the winter term 2020/2021 Brezina Jr. and Režná (2020) analyzed the impact of COVID-19 on the teaching process at two Slovak faculties, at the Faculty of Economics Informatics at the University of Economics in Bratislava, and at the Faculty of Economics and Entrepreneurship at the Pan-European University in Bratislava.

Based on our two questionnaire surveys, the main aim of our research is to find out how both students and teachers perceive the online educational process, what are the advantages and disadvantages of online teaching, as well as to analyze and evaluate the quality of online teaching and quality of assessment (examination) methods in the online environment in comparison with the attendance form from both

students' and teachers' perspective. In this context, we have formulated these research questions (RQ):

RQ1: How do the students perceive the educational process and the assessment process in the online environment in comparison with the attendance form of education?

RQ2: Do the students evaluate the quality of educational process in the winter term 2020/2021 (hereafter referred to as "WT 20/21") at higher level in comparison with the educational process in the summer term 2019/2020 (hereafter referred to as "ST 19/20"), in general? If yes, is this evaluation influenced by gender and the year of study of students? What is the probability that student of a certain gender and year of study evaluates the quality of educational process in the WT 20/21 at better quality level than in the ST 19/20?

RQ3: How do the teachers perceive the sudden shift to the online education, and the complexity of preparation for the online educational and assessment process?

RQ4: What are the advantages and disadvantages of the online education from students' and teachers' perspective?

Materials and Methods

Instrument

Due to the sudden shift to online teaching, the university's students have been studying online from their homes for three terms yet (the ST 19/20, the WT 20/21, and the summer term 2020/2021). Some of them have not seen the school, yet. Following this new situation in educational process we researched via two separate questionnaire surveys (one for students, and one for teachers) how this change in the educational process had been perceived by students and teachers at the Faculty of Economic Informatics (hereafter referred to as "FEI") at the UEBA.

From February 27, 2021 to March 9, 2021, two questionnaire surveys were distributed to all students and teachers at the FEI via UEBA's information system. The questionnaire survey for students was organized in four sections. The first section covered questions related to the sociodemographic characteristics of the respondents (gender, level of study, year of study). The second section was related to questions about educational and assessment processes in the online environment. The third section was related to expression of students' preferences about the attendance form and the online form of education. The fourth section covered additional questions of an informative nature. The questionnaire consisted of closed questions (some of them were multiple choice questions; some of them with the possibility to add "other" answer), and of open-ended questions where students could express their feelings, and opinions (Table 1).

Table 1
Questions in the Second, Third and Fourth Section in the Students' Questionnaire

Section	Questions	Open ended question	Closed question (*multiple choice question)
2.	A: What platforms did the teachers use in the educational process in the ST 19/20 after shifting to the online environment?		X*
2.	B: What forms of assessment did the teachers use in the evaluation process in the ST 19/20?		X*
2.	C: What platforms did the teachers use in the educational process in the WT 20/21?		X*
2.	D: What forms of assessment did the teachers use in the evaluation process in the WT 20/21?		X*
2.	E: Was the education in the WT 20/21 managed better than the education in the ST 19/20?		X
2.	F: Was the assessment process in the WT 20/21 managed better in comparison with the ST 19/20?		X
3.	G: What form of educational process do you prefer?		X
3.	H: If you prefer the attendance form of education, state why.	X	
3.	I: If you prefer the online form of education, state why.	X	
3.	J: What form of examination process do you prefer?		X
3.	K: If you prefer the classical way of examination process during the attendance form of education, state why.	X	
3.	L: If you prefer the online examination during online education, state why.	X	
4.	M: Did the teachers record the lectures and provide them to students?		X*
4.	N: Would you appreciate the teachers to record the lectures and provide them to students?		X
4.	O: Would you prefer in-person or online form of state exams?		X

Source: Own processing on own questionnaire survey

The questionnaire survey for teachers was organized in three sections. The first section covered questions related to the sociodemographic characteristics of the respondents (gender, age). The second section was related to questions about managing the educational process in the online environment. The third section covered questions related to the evaluation of online teaching, analysis of limitations, disadvantages, or advantages of online education and assessment process. The questionnaire has consisted of closed questions (some of them were multiple choice questions; some of them with the possibility to add "other" answer), and of open-ended questions where teachers could express their feelings, and opinions (Table 2).

Table 2
Questions in the Second and Third Section in the Teachers' Questionnaire

Section	Questions	Open ended question	Closed question (*multiple choice question)
2.	A: How did you manage the shift to online environment? Was it challenging for you?		X
2.	B: What platforms did you use in the educational process in the ST 19/20 after switch to online environment?		X*
2.	C: How did you manage the online educational process in the WT 20/21 in comparison with the ST 19/20?		X
2.	D: What platforms did you use in the educational process in the WT 20/21?		X*
2.	E: How do you perceive the participation of students in lectures during online education?		X
2.	F: Which form of education do you consider more demanding for the preparation?		X
3.	G: What are the difficulties, limitations, and problems of online education you have met?		X*
3.	H: How do you perceive the preparation for examination process in the online environment in comparison with the attendance form?		X
3.	I: What are the difficulties, limitations, and problems of online examination process you have met?		X
3.	J: Does the education in the online environment have any advantages?		X
3.	K: If you think that the education in the online environment has some advantages, state them.	X	

Source: Own processing on own questionnaire survey

Sample

The study sample consisted of students and teachers from the FEI. The questionnaire surveys were attended by 375 students (that represents 41.03% of the total number of the FEI students) and 41 teachers (that represents 60.29% of all teachers at the FEI). The first-year students of the bachelor study were omitted from the questionnaire survey due to the fact that in the academic year 2019/2020 they had not been students of the FEI. More detailed information about sociodemographic characteristics of both samples are shown in Table 3 (students) and in Table 4 (teachers).

Table 3
Students Sample Characteristics

(*cell percentages)					
(**row percentages)					
Year of study					
(***)column percentages)					
Gender	2 nd year of study	3 rd year of study	4 th year of study	5 th year of study	Total
Level of study	Bachelor Study		Master Study		
Male	30 (*8%)	36 (*9.6%)	36 (*9.6%)	18 (*4.8%)	120 (*32.0%)
	(**25%)	(**30%)	(**30%)	(**15%)	
Female	(***29.4%)	(***32.4%)	(***40%)	(***25%)	255 (*68.0%)
	72 (*19.2%)	75 (*20%)	54 (*14.4%)	54 (*14.4%)	
Total	(**28.2%)	(**29.4%)	(**21.2%)	(**21.2%)	375 (100%)
	(***70.6%)	(***67.6%)	(***60%)	(***75%)	
	102 (*27.2%)	111 (*29.6%)	90 (*24.0%)	72 (*19.2%)	

Source: Own processing in SAS Enterprise Guide based on own questionnaire survey

Table 4
Teachers Sample Characteristics

(*cell percentages)				
(**row percentages)				
Age				
(***)column percentages)				
Gender	Up to 45 years	46 to 60 years	Over 60 years	Total
Male	7 (*17.1%)	5 (*12.2%)	2 (*4.9%)	14 (*34.1%)
	(**50%) (**29.2%)	(**35.7%) (**50%)	(**14.3%) (**28.6%)	
Female	17 (*41.4%) (**63%)	5 (*12.2%)	5 (*12.2%)	27 (*65.9%)
	(***70.8%)	(**18.5%) (**50%)	(**18.5%) (**71.4%)	
Total	24 (*58.5%)	10 (*24.4%)	7 (*17.1%)	41 (100%)

Source: Own processing in SAS Enterprise Guide based on own questionnaire survey

Due to the fact that the FEI students are in contact with teachers from six UEBA's faculties during their study, and the FEI teachers teach at all UEBA's faculties situated in Bratislava, the sample of respondents is relevant for our research. Considering the percentage of respondents participating in our research, and the facts mentioned above, the data obtained from this sample of students and teachers can be considered a valid basis for generalization of the research results.

The Statistical Analysis

After collecting data from all questionnaire surveys and eliminating incomplete answers, we performed their computer processing and analysis. We applied, among other things, logistic regression (Allison, 2012) in our analysis, and within it, analysis of marginal means also known as Least Squares Means (LS-Means), look in (Cai, 2014) or (Lenth, 2016). In comparison with classical means (arithmetic means), LS-Means are based on general linear models (Searle and Gruber, 2017; Graham, 2008), or on generalized linear models (Agresti, 2015), whose special case is the logistic regression model. Software SAS Enterprise Guide and programming language SAS have been used for analysis of marginal means. LSMEANS, CONTRAST, and ESTIMATE Statements (Chen, 2008; Šoltés et al., 2019) have been used, through which multiple comparisons (Lee and Lee, 2018), interval estimates, and predictions of probability have been applied. All results were interpreted qualitatively.

Results and Discussions

Online Teaching from the Students' Perspective

The switch to online education was sudden and unexpected. No one was prepared for this new situation, neither the students, nor the teachers. Despite the fact that at the beginning of interruption of the educational process, the Measures of the Rector recommended performing self-study, teachers tried to stay in contact with students. Regarding Table 1 question "A" the respondents expressed that teachers had used various forms of contacting students, from sending study materials via e-mail (192 respondents), Moodle (174 respondents) or other various communication platforms such as Microsoft Teams (345 respondents), Zoom (34 respondents), Google Meet (15 respondents), Skype (4 respondents), etc. Some teachers had not contacted students at all. In open ended questions (Table 1 question "H" and "I"), students expressed among other facts that they had perceived the educational process in the ST 19/20 stressful and chaotic. Pointed comments were made mostly about the difficulties with installation of various platforms on one's own computers (students usually have 5 to 7 subjects in one term that are taught by various teachers using various communication platforms), with understanding them and after all, with concentration on educational process performed by teachers who were not very skilled in using them.

Regarding Table 1 question "B", 296 respondents stated that the examination process in the ST 19/20 was performed in the form of written test through MS Teams, in the form of online written test through Moodle (245 respondents), through submission of completed assignments by e-mail (225 respondents), through oral examination via Microsoft Teams (hereafter referred to as "MS Teams"), Zoom, Google Meet or other online platforms (97 respondents). Here we can also see a wide variety of assessment forms within each subject students had to pass through.

As the pandemic situation gradually improved at the end of the ST 19/20, and the level of restriction measures was decreased, the state examinations at the FEI were held in person.

The preparation for teaching process in the WT 20/21 was regulated centrally at the university level. The winter term of the academic year 2020/2021 was planned in advance with the possibility of both forms of education – the attendance form and the online form. In case of online teaching, UEBA' authorities specified only two communication platforms, namely MS Teams and Moodle, for the educational process. Trainings and webinars organized before the beginning of the winter term contributed much to broaden knowledge and better practical skills of teachers with use and functionality of MS Teams. Due to the uniform form of online education based on MS Teams and Moodle, the diversity of communication platforms was not so broad. Regarding Table 1 question "C" students in questionnaire stated that teachers had used MS Teams (370 respondents), Moodle (147 respondents) in the educational process in the WT 20/21, and these two platforms were supplemented by sending materials via e-mail. Lectures and seminars took place through MS Teams according to a prescribed schedule. Similar results are presented in the research paper of [Brezina Jr. and Režná \(2020\)](#) where up to 98.6% of respondents stated MS Teams as the most using platform in the educational process. According to students' expressions in open-ended questions "H" and "I" (Table 1) the educational process in the WT 20/21 was clearer, more comprehensible, less challenging on technical matters. The assessment process in the WT 20/21 was also recommended to realize through MS Teams and Moodle, and according to respondents' answers (Table 1 question "D"), it had been.

Figure 1 shows students' responses to the question: "Was the education in the WT 20/21 managed better than the education in the ST 19/20?" (Table 1 question "E"). We have expected these results due to the fact that teachers took part in webinars and trainings related to MS Teams before beginning of the WT 20/21, and because of the fact that only two communication platforms had been recommended for online education in the WT 20/21 (MS Teams and Moodle).

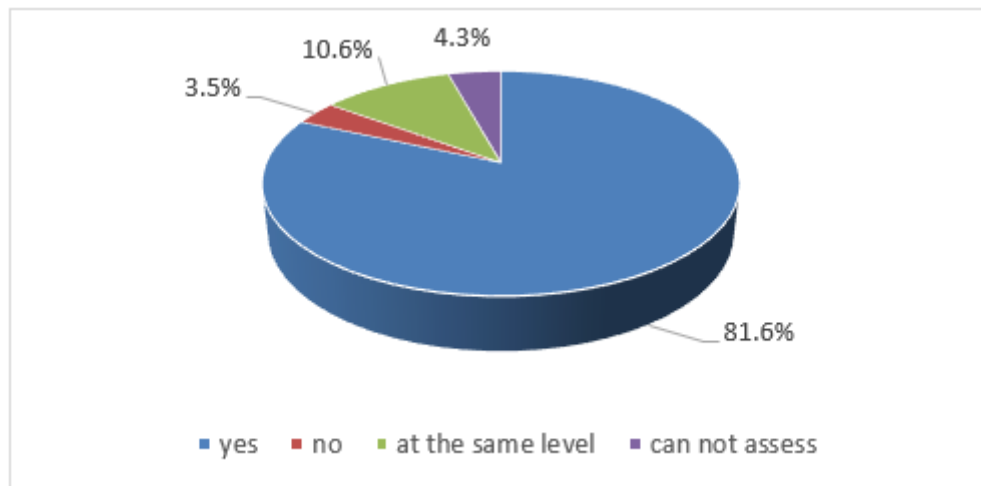


Figure 1. The response of students to the question: Was the education in the WT 20/21 managed better than the education in the ST 19/20?

Source: Own questionnaire survey

Performing a more detailed analysis of the educational process evaluation in the WT 20/21 in comparison with the ST 19/20 depending on gender, we have come to conclusions in Table 5.

Table 5

Evaluation of educational process' quality in the WT 20/21 in comparison with the ST 19/20 depending on gender

(*cell percentages)					
(**row percentages)					
Evaluation of educational process					
(***(column percentages)					
Gender	Yes, the education in the winter term was at higher level	The education was at the same level	Cannot assess	No, the education in the winter term was not at higher level	Total
Male	82 (*21.9%) (**68.33%) (***26.8%)	20 (*5.32%) (**16.67%) (***50%)	11 (*2.93%) (**9.17%) (***68.8%)	7(*1.9%) (**5.83%) (***53.8%)	120 (*32%)
Female	224 (*59.7%) (**87.85%) (***73.2%)	20 (*5.32%) (**7.84%) (***50%)	5 (*1.33%) (**1.96%) (***31.2%)	6 (*1.6%) (**2.35%) (***46.2%)	255 (*68%)
Total	306 (*81.6%)	40 (*10.6%)	16 (*4.3%)	13 (*3.5%)	375 (100%)

Source: Own processing in SAS Enterprise Guide based on own questionnaire survey

Table 6

Assessment of the association between gender and evaluation of quality of educational process in the WT 20/21 and in the ST 19/20

Statistic	DF	Value	Prob
Chi-Square	3	22.5441	<.0001
Likelihood Ratio Chi-Square	3	21.1660	<.0001
Phi Coefficient		0.2452	
Contingency Coefficient		0.2381	
Cramer's V		0.2452	

Source: Own processing in SAS Enterprise Guide based on own questionnaire survey

Results of Chi-square tests presented in Table 6 revealed that the evaluation of the quality of educational process in the winter term in 2020/2021 in comparison with the ST 19/20 is significantly different (p -value < 0.0001) by males and females. Females (87.85%) were more likely convinced than males (68.33%) that education in the winter term had been at higher quality level compared to the ST 19/20. Males (16.67%) more often evaluated the education in the WT 20/21 at the same level as in the ST 19/20 compared to females (7.84%).

As Table 5 and Table 6 show, the quality of educational process in the WT 20/21 in comparison with the ST 19/20 has been significantly different evaluated by males and females. We subjected this evaluation to a more wide-ranging analysis using the binomial logistic regression and marginal means analysis (also known as Least Squares Means – LS-Means). For these analysis' purposes respondents (students) were divided into two groups, namely group of students considering educational process in the WT 20/21 to be at the higher level, and those who did not (this group included students who answered that the educational process in the WT 20/21 was at the same level as the educational process in the ST 19/20, and students who answered that the education in the winter term was not at higher level). Based on the model of logistic regression and applied LS-Means analysis at the significant level 0.05 it has been confirmed that this evaluation is significantly different among males and females (Figure 2 on the left). In addition, we observed that regarding the years of study we can consider students' ratings to be the same on average (Figure 2 on the right).

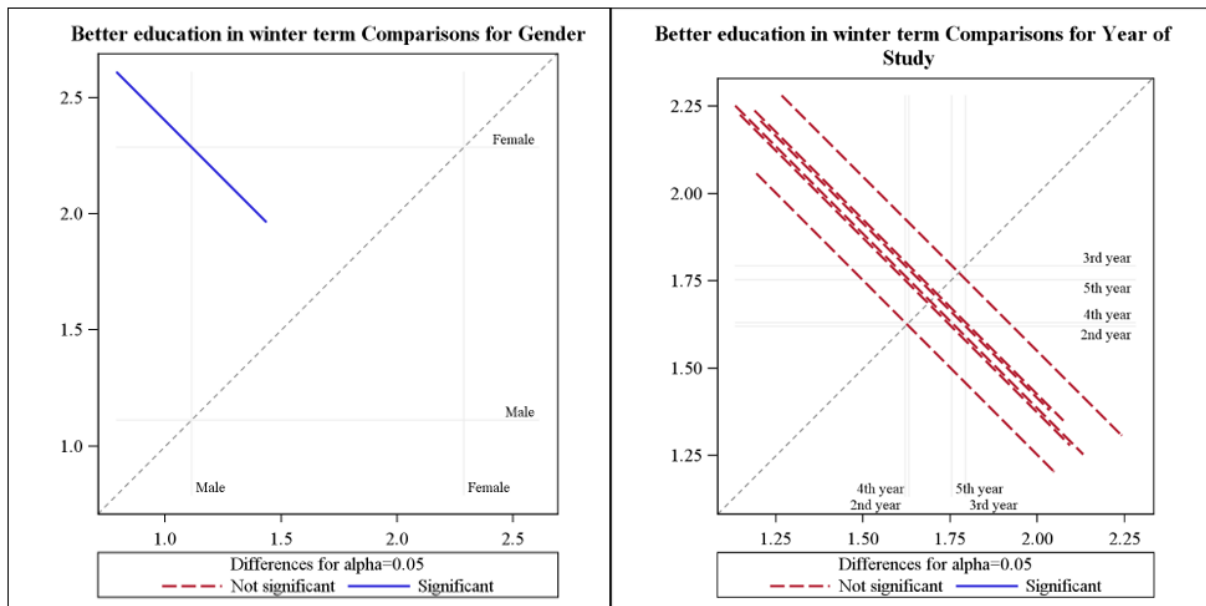


Figure 2. Comparison of LS Means of logits for gender factor and factor of year of study

Source: Own processing in SAS Enterprise Guide based on own questionnaire survey

Our analysis has revealed a significant interaction between gender and year of study. Point and 95% interval estimates of LS-Means of logits are shown in Figure 3.



Figure 3. Point and interval estimates of LS-Means of logits for interaction of gender and year of study factors

Source: Own processing in SAS Enterprise Guide based on own questionnaire survey

As Figure 3 shows, quality of educational process in the WT 20/21 was the most often evaluated “better than in the ST 19/20” by females in the 5th year of study, females in the 4th year of study (master level) and by females in the 2nd year of study (bachelor level). We observed the greatest disparities between females and males at master level of study (4th and 5th year of study). The results of statistical tests in Table 7 show, that females in the 2nd, 4th, and 5th year of study evaluated the educational process during the WT 20/21 at higher quality in comparison with the ST 19/20 at significant level 0.05 significantly more often than males in the 2nd, 4th, and 5th year of study. This finding is confirmed by positive differences in LS-Means (column “Estimate”) and p-values (column “Pr > |z|”) that are lower than the significant level 0.05. There are significant differences among all nine pairs stated in Table 7 resulting from the frequency of more positive evaluation of educational process in the WT 20/21 in comparison with the ST 19/20. Let’s note that among no other pairs there have not been confirmed any other statistically significant differences at the significant level 0.05.

Table 7

Tests of differences between LS-Means of logits for selected pairs of students’ categories determined by gender and year of study

Differences of year of study*Gender Least Squares Means							
Year of study	Gender	Year of study	Gender	Estimate	Standard Error	z Value	Pr > z
5th year	female	5th year	male	2.1203	0.7767	2.73	0.0063
		4th year	male	2.0149	0.7172	2.81	0.0050
		2nd year	male	1.8018	0.7237	2.49	0.0128
4th year	female	5th year	male	1.7707	0.7220	2.45	0.0142
		4th year	male	1.6653	0.6576	2.53	0.0113
		2nd year	male	1.4523	0.6646	2.19	0.0289
2nd year	female	5th year	male	1.5353	0.6389	2.40	0.0163
		4th year	male	1.4300	0.5651	2.53	0.0114
		2nd year	male	1.2169	0.5733	2.12	0.0338

Source: Own processing in SAS Enterprise Guide based on own questionnaire survey

Whilst, in Figure 2, Figure 3 and Table 7 we have analyzed logits

$$Estimated = \ln \left(\frac{\hat{\pi}_i}{1 - \hat{\pi}_i} \right)$$

that are estimated directly by logistic regression, in Table 4 we calculated Odds ratios

$$Exponentiated = \frac{\hat{\pi}_i}{1 - \hat{\pi}_i}$$

and from them according to

$$\hat{\pi}_i = \frac{Exponentiated}{1 + Exponentiated}$$

we estimated probabilities. These are probabilities that various groups of students evaluate educational process in the WT 20/21 at higher quality level than in the ST 19/20.

In Table 8 and Figure 4, there are calculated point and interval estimates of these probabilities for the categories of students that arose based on dividing students according to gender and year of study.

Table 8

Estimates of logits (Estimates), Odds ratios (Exponentiated), and probabilities (Probability) for particular groups of students

Student	Estimate	Standard Error	Pr > z	Exponentiated	Probability	Probability	
						Lower	Upper
Male 2nd year	1.0116	0.4129	0.0143	2.7500	0.7333	0.5504	0.8607
Female 2nd year	2.2285	0.3978	<.0001	9.2857	0.9028	0.8098	0.9529
Male 3rd year	1.9459	0.5345	0.0003	7.0000	0.8750	0.7106	0.9523
Female 3rd year	1.6422	0.3154	<.0001	5.1667	0.8378	0.7358	0.9055
Male 4th year	0.7985	0.4014	0.0467	2.2222	0.6897	0.5029	0.8299
Female 4th year	2.4639	0.5208	<.0001	11.7500	0.9216	0.8089	0.9702
Male 5th year	0.6931	0.5000	0.1657	2.0000	0.6667	0.4288	0.8420
Female 5th year	2.8134	0.5944	<.0001	16.6667	0.9434	0.8387	0.9816

Source: Own processing in SAS Enterprise Guide based on own questionnaire survey

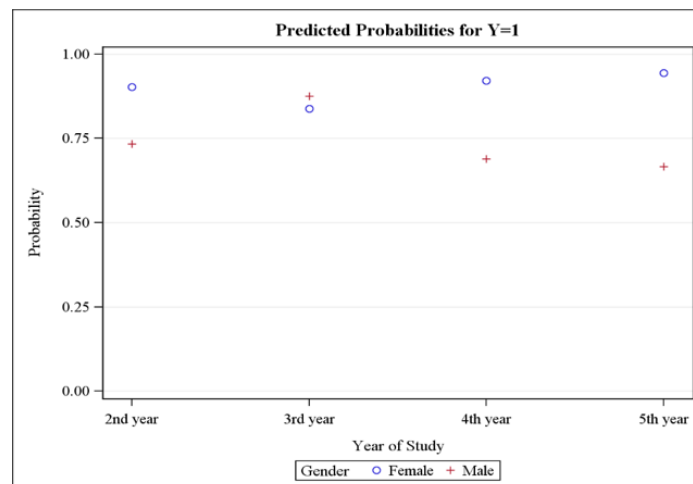


Figure 4. Predicted probabilities that student evaluates quality of educational process in the WT 20/21 at higher quality level than in the ST 19/20

Source. Own processing in SAS Enterprise Guide based on own questionnaire survey

Resulting from the logistic regression model, in Table 8 and in Figure 4, there are estimated probabilities for various groups of students based on the fact that the student evaluates the quality of educational process in the WT 20/21 at higher quality level than in the ST 19/20. As previous results have indicated, this probability is the highest among females in the 5th year of study, 4th year of study, and 2nd year of study where point estimated is higher than 90% (exactly 94.34%, 92.16%, and 90.28%). On the other hand, we have estimated the lowest probabilities among males in the 5th, 4th, and 2nd year of study, where there are the probabilities lower than 75% (exactly 66.67%, 68.97%, and 73.33%). As our previous results confirmed, females in these three grades have significantly upper probability than males. In case of respondents in the 3rd year of study there is a comparable probability among males and females regarding better evaluation of the quality of educational process in the WT 20/21 and is approximately at 85%. Interval estimates of probabilities as well as interval estimates of logits (Figure 3) revealed that all groups of students evaluated the quality of educational process at better quality level in the WT 20/21, at confidence level 0.05 (p-values in column Pr > |z| in Table 8). The only exceptions are males in the 5th year of study (p-values = 0.1657), where the lower limit of confidence limit for this probability is under 50%, exactly 42.88%.

Performing a more detailed analysis of the educational process evaluation in the WT 20/21 in comparison with the ST 19/20 depending on the study level, we also observed significant differences between study levels based on the bivariate Chi-square at significance level 0.1 (p-value = 0.0638). Bachelor study students (83.10%) are more likely convinced than master study students (79.63%) that the educational process in the WT 20/21 was at higher quality level in comparison with the ST 19/20. On the other hand, 2.35% of bachelor students and 4.94% of master students think that the educational process in the WT 20/21 was not at higher level in comparison with the ST 19/20; 12.20% of bachelor students and 8.64% of master students admit that both educational processes were at the same level; and 2.35% of bachelor students and 6.79% of master students were not able to assess this situation.

Regarding Table 1 question "F", up to 62.6% of respondents stated that the assessment (examination) process in the WT 20/21 had been managed better in comparison with the assessment process in the ST 19/20, up to 26.6% of respondents think it was at the same level, up to 6.5% of respondents cannot assess, and 4.3% of respondents think that it was not better managed.

In another part of questionnaire survey, we tried to find out what form of education students prefer (Table 1 question "G"). Results are shown in Figure 5.

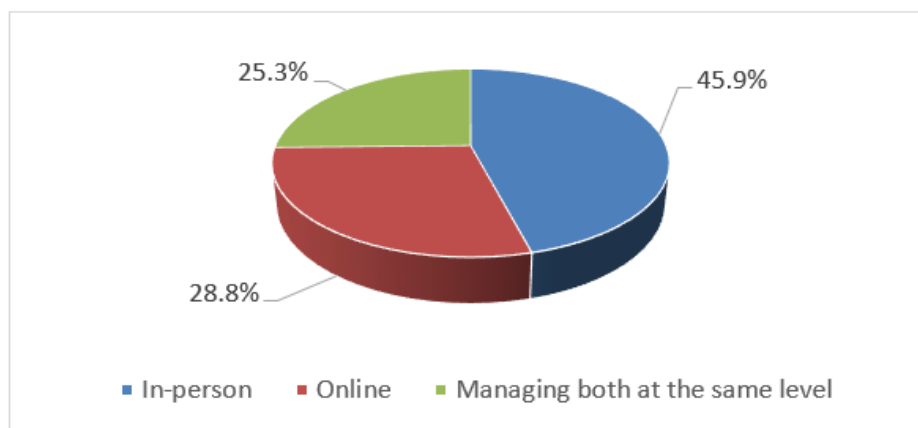


Figure 5. Preferred form of education by students

Source: Own questionnaire survey

Our research results are similar to Brezina Jr. and Režná (2020). According to their paper up to 40.3% of students prefer the attendance form, and 24.4% of students prefer the online form of education.

Based on the analysis of preferred form of education depending on the gender presented in Table 9, and on the analysis of the preferred form of education depending on the study level presented in Table 10, we found a statistically significant correlation at significance level 0.1 (p-value = 0.0605) between preferred form of education and study levels (Table 11). Statistically significant correlation was not obtained between gender and the preferred form of education.

Table 9
Preferred form of education depending on gender

(*cell percentages)				
(**row percentages)				
Form of Educational Process				
(***(column percentages)				
Gender	Attendance form	Online form	Both forms at the same level	Total
Male	53(*14.2%)	40(*10.7%)	27 (*7.2%)	120
	(**44.17%) (***(30.8%)	(**33.33%) (***(37%)	(**22.5%) (***(28.4%)	
Female	119(*31.7%)	68(*18.1%)	68(*18.1%)	255
	(**46.66%) (***(69.2%)	(**26.67%) (***(63%)	(**26.67%) (***(71.6%)	
Total	172 (*45.9%)	108 (*28.8%)	95 (*25.3%)	375
				(100%)

Source: Own processing in SAS Enterprise Guide based on own questionnaire survey

Table 10
Preferred form of education depending on study level

(*cell percentages)				
(**row percentages)				
Form of Educational Process				
(***(column percentages)				
Study level	Attendance form	Online form	Both forms at the same level	Total
1 st level of study	96 (*25.6%)	54 (*14.4%)	63 (*16.8%)	213
	(**45.07%) (***(55.8%)	(**25.35%) (***(50%)	(**29.58%) (***(66.3%)	
2 nd level of study	76 (*20.3%)	54 (*14.4%)	32 (*8.5%)	162
	(**46.91%) (***(44.2%)	(**33.33%) (***(50%)	(**19.76%) (***(33.7%)	
Total	172 (*45.9%)	108 (*28.8%)	95 (*25.3%)	375
				(100%)

Source: Own processing in SAS Enterprise Guide based on own questionnaire survey

Table 11
Assessment of the association between preferred form of education and level of study

Statistic	DF	Value	Prob
Chi-Square	2	5.6091	0.0605
Likelihood Ratio Chi-Square	2	5.6767	0.0585
Phi Coefficient		0.1223	
Contingency Coefficient		0.1214	
Cramer's V		0.1223	

Source: Own processing in SAS Enterprise Guide based on own questionnaire survey

The open-ended question in the questionnaire (Table 1 question "H") revealed mainly the following

students' preferences for the attendance form of education:

- Direct personal contact with teachers; better and faster communication with teachers; active class discussion; a more personal approach; better interaction between teacher and students;
- The satisfaction of need for socialization; direct personal contacts with classmates; better cooperation with classmates;
- Elimination of the technology related problems, problems with software licenses;
- Better concentration in school, where there are not as many distractions as at home;
- Higher quality of education; faster feedback; non-verbal communication;
- Unlimited access to study literature;
- Out-of-school activities, and so called "student life", etc.

Almost 92% of respondents preferring the attendance form of education stated missing personal contacts and socialization as the main disadvantages of online education. These students missed the direct contact with teachers, and possibility of establishing informal relationships. According to them, the attendance form of education is better for their mental health. Students are less stressed when there are schoolmates they can contact in case of misunderstanding of the curriculum. If students do not understand something, they feel better when they find out that there are other students who also do not understand, so they can communicate and help each other. Students also prefer the attendance form of education because of the time management. The daily routine is divided between study and leisure time.

The main problems, the teachers and students had to face in online world, were and still are (Daniel, 2020; Reimers and Schleicher, 2020; Sangster, Stoner and Flood, 2020; Thomas and Rogers, 2020) the access to the digital world, the missing quiet place to study in students' homes, shortage of suitable information technologies for learning or teaching, Internet access issues, including affordability, the lack of time for teachers' preparation on this new form of teaching (the change from attendance form to online format was sudden and many teachers had to improvise), staff preparation and training (in using of technology in teaching), the problems with availability of literature for students (as the school libraries were closed), etc. Children and students from homes with fewer resources and less opportunity for parental support were and still are disadvantaged in comparison with children of well-off parents, who often live in bigger houses with their own bedroom, supported by two parents, with better access to technology, books and other learning resources (Thomas and Rogers, 2020). Missing technology equipment was often stated disadvantage of the online education in our research, too. For example, not every student has two monitors, one to follow the teacher's lectures and the second one, needed for practicing the software which is explained by the teacher. According to our research results, the attendance form of education eliminates technology related problems of online education, such as outages of the Internet, electricity, delay in image and sound during the presentation. This is supported by Brezina Jr. and Režná (2020), in whose paper up to 68.4% respondents expressed problems with weak Internet connection. Students stated that during the online education, there are also problems with installing licenses for programs, in which students learn to work during their study, as the licenses are provided on university computers, but they cannot be installed on private computers.

Students prefer the attendance form of education because of the fact they are more concentrated in the school rather than at home. Home is for them a place for relax and having rest. During the online education the students suffer from the lack of study literature, because the libraries are closed in the times of lockdown. Another reason given by students who prefer the attendance form of education is time stress during the examination conducted online. Many teachers shorten too much online examination time in order to avoid cheating. Several students commented that online examination encourages students to cheat and therefore they do not prepare for the examination to the extent they would prepare in case of in-person examination. The students preferring attendance form of education expressed worries about how would employers assess graduates studying mainly online. A similar stance is taken by Sahu (2020) who states that there is concern that the COVID-19 pandemic may have a serious impact on the careers of university graduates studying mainly online. Further, the graduates are going to face the severe challenges of the global recession caused by the COVID-19 crisis. Finally, students prefer the attendance form because of out-of-school activities, and so called "student life", parties, cultural and sporting events, which cannot take place in the times of pandemic.

On the contrary, the students preferring the online education emphasized especially these reasons in open-ended question (Table 1 question "I"):

- Time savings (due to the fact that they do not have to commute to school which sometimes takes 2-3 hours every day); better time-management; more leisure time;
- Possibility to attend classes even in case of illness;
- Higher attendance at lectures since everything is organized from the comfort of home;

- The comfort of home study, better concentration at home;
- More attractive lectures.

Time savings (as the main advantage of online form of education stated by almost 96% of respondents preferring online study) in turn leads to more free time for further study, elaboration of seminar papers, final theses, working experiences, or leisure time activities. Students admitted they participate more often in lectures during online education. The reason is very simple, if a student has on a given day just one lecture, he / she does not commute to school during the attendance form of education as he / she considers it as waste of time. Up to 50% of respondents expressed that several teachers had recorded lectures and provided them to students (Table 1 question "M"). Up to 93% of respondents would appreciate the recording of lectures and seminars and providing records by all teachers to students (Table 1 question "N"). The same results were achieved by [Wagner and Křehnáčová \(2020\)](#) who also stated that students fully appreciate the recording of lectures. Many students preferring online form of education appreciated a more flexible and modern form of teaching during the online education and greater willingness of teachers to explain the studied issues.

Regarding Table 1 question "J", up to 22.3% of respondents prefer the traditional form of assessment provided at attendance form of education, and 27.6% of respondents prefer the way of assessment performed during online education. Up to 50.1% of respondents manage both forms of assessment at the same level.

The students preferring traditional form of assessment during the attendance form of education emphasized especially following reasons in open-ended question in the questionnaire (Table 1 question "K"):

- Less stress caused by technical and Internet connections matters;
- More time for examination (short time limits at online assessment);
- More independent and unbiased assessment;
- Better concentration in school environment than at home;
- Better time-management (student first answers question he / she knows the best and then works on other questions);
- Less risk of cheating;

Students without an Internet facility suffer a clear disadvantage while participating in the evaluation process, which would adversely affect their grades.

The students preferring examination taken in online education stated mainly following reasons in open-ended question (Table 1 question "L"):

- Less stress than in the school, home environment contributes much more to comfort;
- Time savings (students do not have to commute to school to pass the exam, they do not have to wake up early in the morning, and they are more relaxed when doing the exam);
- More concentration at home than in the school;
- Modern way of assessment;

Despite the fact that many students prefer the online form of learning including online examination, up to 2/3 of students in final academic years (bachelor, master) would prefer in-person form of state diploma examinations (Table 1 question "O").

The collected answers to open-ended questions "H", "I", "K", and "L" (Table 1) revealed that the online education had a significant impact on students' behavior and psychological health. Students experienced mainly negative impacts of COVID-19. Among the most mentioned changes were lack of motivation, anxiety, stress, social distancing, sadness, isolation, hopelessness, loneliness, and frustration. Similar findings were reported by other studies exploring the impact of COVID-19 on students ([Huckins et al., 2020](#); [Aristovnik et al., 2020](#); [Cao et al., 2020](#); [Elmer, Mephram, and Stadtfeld, 2020](#); [Kamarianos et al., 2020](#); [Browning et al., 2021](#)). Some students expressed their frustration in the way that they do not want to live anymore. They are missing schoolmates, friendships, face-to-face meeting. Meetings provided only online are not satisfactory enough for them. Not only family members, but even universities' representatives can help students with these problems. We agree with [Browning et al. \(2021\)](#) who suggest that universities can develop platforms that facilitate safe student social interaction. It is necessary to realize that physical distancing does not mean social distancing. There are many platforms students can communicate with each other (MS Teams can be used not only for teaching purposes, but also for online meetings with schoolmates; Zoom, Facebook, WhatsApp, Messenger, etc.). FEI's representatives in cooperation with the Student's parliament prepared various online entertaining activities, online meetings, quizzes, and videos focused on students during "corona times". The aim of these activities was to get students to know they are not alone and that the faculty and its members are here for them, whenever they will need.

Online Teaching from the Teachers' Perspective

The aim of the second questionnaire survey was to investigate the teachers' perception of the online education. Regarding Table 2 question "A", up to 19.5% of teachers' respondents considered the shift to online teaching as a new challenge. Up to half of respondents (48.8%) admitted that there were some problems at the beginning of online teaching, but finally they successfully managed the teaching process. Up to 31.7% of respondents managed the shift to online teaching without any problems. Table 12 presents the evaluation of shifting to online teaching depending on gender; Table 13 presents the evaluation of shifting to online teaching depending on age of respondents. In teachers' survey all correlations are statistically insignificant, moreover Chi-square is not correct, as we have a small sample.

Table 12
The success of shift to online education depending on gender

Gender	Difficulty of shift to online teaching			Total
	It was challenging	Some problems at the beginning, but finally success	No problems	
Male	2 (*4.9%) (**14.2%) (**25%)	6 (*14.6%) (**42.9%) (**30%)	6 (*14.6%) (**42.9%) (**46.2%)	14 (*34.1%)
Female	6 (*14.6%) (**22.2%) (**75%)	14 (*34.2%) (**51.9%) (**70%)	7 (*17.1%) (**25.9%) (**53.8%)	27 (*65.9%)
Total	8 (*19.5%)	20 (*48.8%)	13 (*31.7%)	41 (100%)

Source: Own processing in SAS Enterprise Guide based on own questionnaire survey

Table 13
The success of shift to online education depending on age

Age	Difficulty of shift to online teaching			Total
	It was challenging	Some problems at the beginning, but finally success	No problems	
Up to 45 years	5 (*12.2%) (**20.8%) (**62.5%)	11 (*26.8%) (**45.8%) (**55%)	8 (*19.5%) (**33.4%) (**61.5%)	24 (*58.5%)
46 to 60 years	1 (*2.4%) (**10%) (**12.5%)	5 (12.2%) (**50%) (**25%)	4 (*9.8%) (**40%) (**30.8%)	10 (*24.4%)
over 60 years	2 (4.9%) (**28.6%) (**25%)	4 (*9.8%) (**57.1%) (**20%)	1 (*2.4%) (**14.3%) (**7.7%)	7 (*17.1%)
Total	8 (*19.5%)	20 (*48.8%)	13 (*31.7%)	41 (100%)

Source: Own processing in SAS Enterprise Guide based on own questionnaire survey

Regarding the fact that the shift to online education in the ST 19/20 was sudden and caught teachers unprepared, we researched in what form the teachers had realized the education in the ST 19/20 (Table 2 question "B"). The teachers' responsibility and their effort to offer high quality education despite absolutely new non-standard situation and conditions caused that teachers had used various forms of communication with students:

- Sending materials to students via e-mail and checking of completed assignments;

- MS Teams platform;
- Moodle;
- Google Meet platform;
- Skype;
- Messenger;
- Zoom platform, etc.

Many teachers combined more platforms for communication with students at the same time in the ST 19/20, e.g. MS Teams and Moodle combined with sending materials via e-mails.

The preparation for the WT 20/21 was absolutely different. Regarding Table 2 question "C", up to 48.8% of teachers' respondents stated that the organization of teaching was simpler and less demanding for them in comparison with conditions in the ST 19/20. Up to 26.8% of respondents thought that organization of teaching in the WT 20/21 had been at the same level of difficulty as in the ST 19/20. It was much easier for teachers to prepare for the educational process as there were recommended only two platforms for teaching process in the WT 20/21 (MS Teams and Moodle). Teachers had used them (Table 2 question "D") in combination with e-mail communication with students. Trainings organized for teachers improved their skills for online educational process and contributed much to the improvement of teaching process. The online teaching also contributed to a higher participation of students in lectures, which was confirmed by up to 63.4% of teachers' respondents (Table 2 question "E"). This is supported by [Wagner and Křehnáčová \(2020\)](#) who investigated that the participation rate of students in virtual classes was the same or even higher compared to traditional classes.

In Figure 6 we can see the teachers' answers to the question "Which form of education do you consider more demanding for the preparation?" (Table 2 question "F"). The same results have been achieved by [Wagner and Křehnáčová \(2020\)](#) who observed that teachers spent much more time on preparation for the classes performed in online environment.

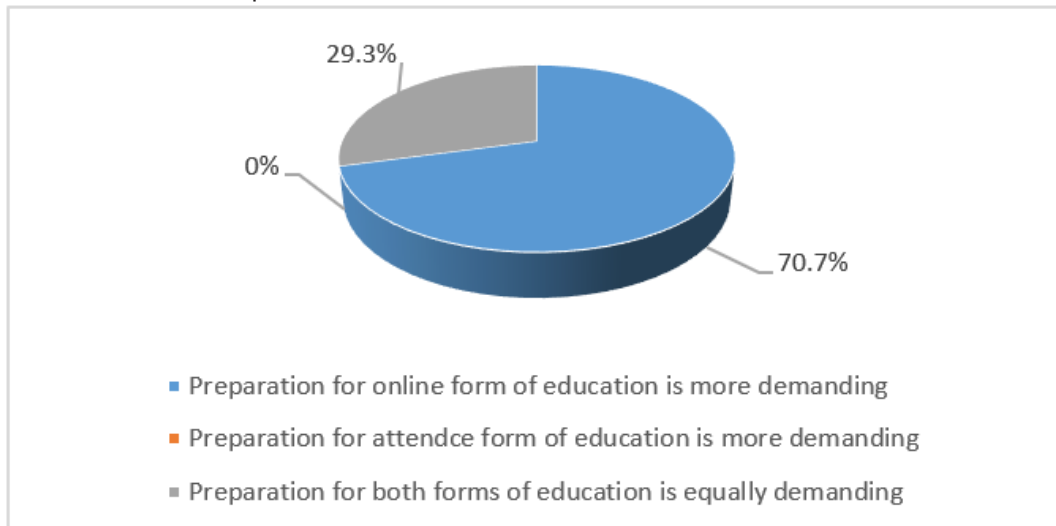


Figure 6. The response of teachers to the question: Which form of education do you consider more demanding for the preparation?

Source: Own questionnaire survey

Up to 85.7% of male respondents and 63% of female respondents considered the preparation for online education more demanding in comparison with preparation for attendance form of education. Up to 66.7% of respondents in the age category up to 45 years, 70% of respondents in the age category from 46 to 60 years, and 85.7% of respondents in the age category over 60 years considered the preparation for online education more demanding in comparison with preparation for attendance form of education. We achieved the similar results in examining the complexity of the preparing and providing of assessment process (organization of exams, the choice of suitable assessment method, etc.). Similar results were obtained in the evaluation of preparation for examination process (Table 2 question "H"), where up to 80.5% of respondents (85.7% of male respondents and 77.8% of female respondents) considered the preparation for examination process in the online environment more demanding (Table 14).

Table 14
Difficulty of preparation for examination process depending on gender

Gender	Difficulty of Examination Organization			Total
	Complexity of examination during online education is more demanding	Complexity of examination is on the same level of difficulty	Complexity of examination during attendance form of education is more demanding	
Male	12 (*29.3%) (**85.7%) (**36.4%)	2 (*4.9%) (**14.3%) (**25%)	0	14(*34.1%)
Female	21 (*51.2%) (**77.8%) (**63.6%)	6 (*14.6%) (**22.2%) (**75%)	0	27(*65.9%)
Total	33 (*80.5%)	8 (*19.5%)	0	41 (100%)

Source: Own processing in SAS Enterprise Guide based on own questionnaire survey

Regarding Table 2 question “G”, the most frequently mentioned problems, difficulties, and limitations the teachers had to face in the online teaching were (Figure 7):

- Anonymity of students;
- Lack of interaction and direct contact with students;
- Preparation of study materials;
- Problems with Internet connections; and
- Mastering the technical support itself.

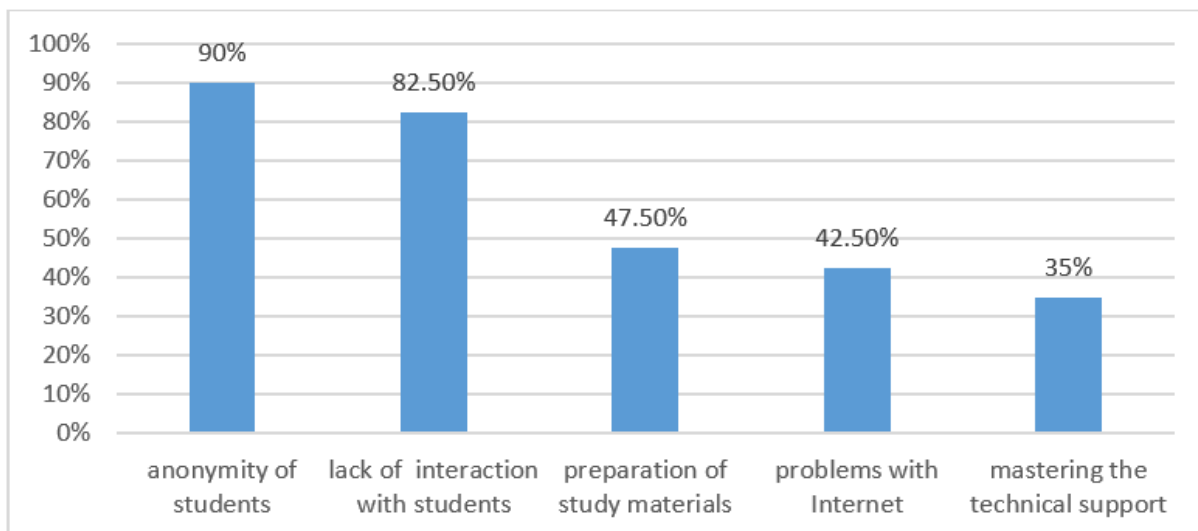


Figure 7. Limitations of the online form of education from the teachers' perspective.
 Source: Own questionnaire survey

Although up to 63.4% of teachers stated a higher participation of students in lectures, up to 90% of teachers' respondents considered the anonymity of students as the most frequent problem of online education, as it is very difficult to find out, if all students, who joined the lecture are really participating in the lecture and perceive explained issues. Up to 82.5% of teachers' respondents missed the direct interaction with students. Teachers argued that the communication with students had been impersonal at online teaching. It was mostly caused by the fact that students refused to turn on their cameras. Despite the fact we live in modern times with highly developed technologies, there are still parts of Slovakia with missing Internet connections, or with weak Internet signal. The problems with outages of the Internet, electricity, technical equipment stated almost 42.5% of teachers' respondents. Up to 35% of teachers stated among limitations of online education missing technical equipment, mastering the technical support, which include

understanding of the teaching platform, understanding the possibilities the platform offers, etc.

Regarding Table 2 question "I", the anonymity of students was the most frequently mentioned limitation (Figure 8) also in the online examination (85% of respondents). It was difficult to identify the person who actually took the test. Another problem was the choice of a suitable form of knowledge testing (55% of respondents); time-consuming preparation of examination form (52.5% of respondents); connection problems (22.5% respondents), and other technology related problems (20% of respondents).

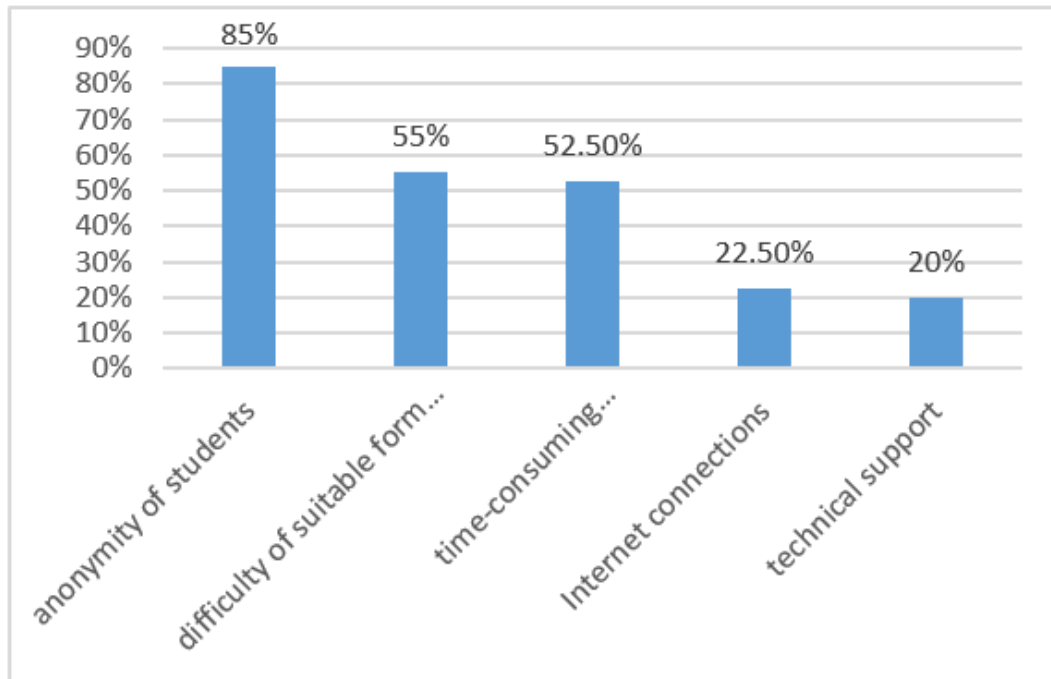


Figure 8. Limitations of the assessment process during the online education from the teachers' perspective.

Source: Own questionnaire survey

Despite the significant limitations and disadvantages of the online teaching, up to 68% of teachers' respondents admitted that online teaching has also some advantages (Table 2 question "J"), which include especially (Table 2 question "K") time savings (due to the fact that teachers do not have to commute to work every day); a modern way of teaching, which is more effective, creative and flexible; higher participation of students in lectures; the opportunity to record lectures and provide them to students (students can replay the recorded lecture at any time); full concentration on teaching (elimination of disruptive effects at lectures); accent on self-activity of students; providing education in the comfort of one's own home; new possibilities of effective assessment and automatic evaluation of tests; the transparency of this form of teaching – the possibility of downloading attendance sheets with time stamps; the system of assigning and submitting assignments with the possibility of timing. Some teachers stated that the online form of education does not have any advantages, only platforms used at online teaching have positives, to which belong possibility to perform lecture even in case of business trip of a teacher (without the need to be represented by another teacher).

SWOT analysis of online teaching

On the basis of two questionnaire surveys, where positives and negatives, advantages and disadvantages of educational forms were identified, we developed SWOT analysis of the online form of education regarding to its strengths, weaknesses, opportunities and threats (Table 15).

Table 15
SWOT Analysis of the online form of education

	Helpful to achieving the objective	Harmful to achieving the objective
Internal origin	Strengths	Weaknesses
	<ul style="list-style-type: none"> • Works/study from home comfort • Time saving • More concentration on study at home • Higher participation of students at lectures • Recording of lectures, seminars, and their providing to students • Lower study costs • Digital skills improvement • New modern education methods 	<ul style="list-style-type: none"> • Missing socialization and contact with school-mates • Missing interaction and direct contact with teachers, personal approach • Technical problems (internet and electricity outages) • Software licenses, programs used in educational process • Insufficient digital skills of teachers • More stressful assessment (time-limits) • Anonymity of participants • Cheating at exams • False participation at lectures
External origin	Opportunities	Threats
	<ul style="list-style-type: none"> • Modern way of assessment • Assessment oriented on practice • Ecological aspect (paper savings) • Opportunity to work alongside the study (thanks to time savings) 	<ul style="list-style-type: none"> • Inadequate study for exams (opportunity to cheat) • Health problems (back pain, problems with eyes) • Question of employers' attitude to graduates who studied mainly online • Availability of study literature (closed libraries) • Missing "student's life"

Source: Own research

Conclusions

In the paper we have focused on the students' and teachers' perception of the educational and examination processes in the online environment. Due to a sudden switch to the online environment in the ST 19/20, students and teachers had to face new challenges they had not met before.

Regarding the RQ1, our research proved that the online education in the ST 19/20 was considered by students stressful, chaotic and frustrating. Teachers used a wide scale of teaching platforms according to their preferences what led to huge onrush on students who did not feel comfortable and satisfied with the online teaching. On the other hand, the online educational process in the WT 20/21 was better perceived because teachers used only two recommended communication platforms, and the educational process was performed according to a prescribed schedule. After three terms in online environment, only 29% of students prefer the online education, whilst up to 46% of students prefer the attendance form of education. Both groups of students expressed their arguments for the preferred form of education.

Regarding the RQ2, we can conclude that students (81.6%) evaluated the quality of educational process in the WT 20/21 at higher level in comparison with the educational process in the ST 19/20. This evaluation resulted partially from the RQ1. Females were more likely convinced than males that education in the WT 20/21 had been at higher quality level compared to the ST 19/20. Our analysis revealed a significant interaction between gender and year of study. The quality of online education in the WT 20/21 was the most often evaluated "better than in the ST 19/20" by females in the 5th, 4th, and 2nd year of study at significant level 0.05.

Regarding the RQ3, we have investigated that teachers perceived the shift to online environment very challenging. Up to 70.7% of teachers considered the preparation for online education more demanding in comparison with the preparation for attendance form of education, and up to 79.5% of respondents (85.7% of males, 77.8% of females) considered the organization of examination in the online environment more demanding.

Regarding the RQ4, the online education is connected with many limitations, problems, and challenges. The first and main problem is the access to the digital world, shortage of suitable information technologies for learning or teaching, Internet connection, etc. Missing socialization, personal contacts with teachers and classmates are other disadvantages of online education. The students preferring online education emphasized as advantages of online education mainly time-savings related to the fact they do not have to commute to school every day, possibility to participate in lectures even in case of illness, comfort of home study, etc. Up to 68% of teachers' respondents think that online teaching has also some advantages, such as time savings, more effective, creative and flexible modern way of teaching; the opportunity to record lectures and provide them to students; full concentration on teaching. Many advantages of online education can be used in the attendance form of teaching in the future.

Our research was realized among students and teachers at the Faculty of Economic Informatics which is one of the UEBA's faculties. Due to the fact that the FEI students are in contact with teachers from all UEBA's faculties during their study, and the FEI teachers teach at all UEBA's faculties situated in Bratislava, the results of our research could be generalized to all UEBA's students and teachers, even to students and teachers of all universities of economic curriculum throughout the Slovakia. Due to the fact that each university has its own peculiarities and the sample of students and teachers was rather small in comparison with the number of the Slovak universities' students, this topic creates wide opportunities for further research in this area.

Acknowledgements

This paper has been supported by the VEGA project 1/0121/21 "The Analysis of Impact of Crises Related to COVID-19 on Financial Health of Entities in the Slovak Republic".

Conflict of interests

The authors declare no conflict of interest.

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