ANALYSIS OF STUDENTS' OPINION ON ONLINE CLASSES AND EXAMS AT FOUR PROFESSIONAL UNDERGRADUATE STUDIES

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ABSTRACT

Since the breakout of COVID-19 pandemic in March 2020, post-secondary education in Croatia has been held almost exclusively online. Therefore, teachers and students had to adapt to the entirely way of education. Online classes were held by using web-conference tools (MS Teams, Zoom, Moodle webinar), while class materials and online exams were available through learning management systems (Merlin, 2co2, Moodle). In this paper we present the results of surveying students of electrical and civil engineering at Zagreb University of Applied Sciences, students of midwifery at the Faculty of Health studies, University of Rijeka, and students of preschool education at the Faculty of Education, University of Zagreb. The survey was conducted during June 2021 and 106 students participated in the survey. A purposive sampling technique was used by distributing questionnaires online using Google Form. We used descriptive statistics methods, the chi-squared test analysis and software Statistica to analyze the results. In this survey, students expressed their opinion on the quality of several online subjects in mathematics, estimated their ability to use online learning tools, and evaluated the quality of questions in online exams. Based on the statistical analysis of the survey results, we present our conclusions regarding the efficacy of online classes, the degree of realization of learning outcomes, the utility of using elements of online exams for monitoring students' progress in the future, and the quality of online class materials and exams. We propose an optimal combination of the elements of standard (contact) forms of examination with online examination. The latter should be more important as a separately evaluated form of monitoring students' progress (e.g. class activity, homework, etc.).

Keywords: online education, online examination, learning management systems, learning outcomes, contact teaching

INTRODUCTION

In March 2020, all educational institutions in Croatia had to switch to online teaching quite abruptly due to the breakout of COVID-19 pandemic. The Croatian government decided that all school and university lessons have to be delivered via distance learning [1,2]. Teachers, mostly unprepared for such a radical change, were forced to adapt almost immediately in order to preserve the continuity of the education process. In the initial period, spanning the summer semester of 2020, mathematical course lectures at Zagreb University of Applied Sciences were delivered mostly in an asynchronous manner: students were given typed lessons and exercises, communicated with teachers via e-mail and online forums, and attended colloquia in Moodle. Synchronous teaching had started only in the fall 2020 after the staff and students were properly educated on how to use e-

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learning tools. In the academic year 2020/2021, synchronous online lectures held via MS Teams / Zoom / Moodle webinar were combined with non-obligatory interactive tests and online homework assignments, for which we used Moodle / Merlin / 2co2. In our case, students were provided with significantly more material to advance their learning progress than in the time before the pandemic. Students were attending colloquia online, while the written and oral examinations were held in classrooms because it was possible to implement all epidemiological measures prescribed at the time. Students' grades at colloquia/exams did not deviate significantly from the results achieved in the years before the pandemic. Since the examination exercises were conceived in accordance with the set learning outcomes and goals of the respective subjects, it is our opinion that these outcomes and goals were successfully achieved despite the radical change in teaching methods. In this case study we present and discuss the results of a survey on the students' perception of online learning in mathematics classes during the COVID-19 pandemic. The survey was conducted in June 2021 on 106 students of electrical and civil engineering at Zagreb University of Applied Sciences, midwifery at the Faculty of Health studies, University of Rijeka, and preschool education at the Faculty of Education, University of Zagreb. We used descriptive statistics methods, the chi-squared test analysis and software Statistica to analyze the results [4].

Since the COVID-19 pandemic is still an ongoing worldwide issue, online education could last longer than initially expected. Even after the pandemic is over, online teaching might leave a permanent impact to education, causing the number of virtual schools to grow globally [3]. Therefore, it is imperative to understand students' learning conditions and experience in an online environment during the pandemic. At the time of this writing, epidemiologic situation in Croatia due to COVID-19 is significantly better in relation to the beginning of academic year 2020/2021 [2]. However, given the unpredictability of COVID-19 strain development and infection outbreaks, the conditions awaiting us at the beginning of the following academic year are still not clear. Hence this and similar research [5-7] provide us with feedback data which is useful for improving e-learning methods and conditions, as well as for better understanding of students' needs and experiences.

METHODS

A purposive sampling technique was used by distributing questionnaires online using Google Form. Using the chi-squared test, we determined whether there is a significant statistical difference between the answers given by full-time and part-time student. In total, 106 students participated in this survey. The survey itself consists of 25 close-ended questions which are listed in Table 1.

Table 1. *Survey questions*

Mark	Question	Question types	Mark	Question	Question types
Q1	What college do you attend?	Slider questions	Q14	Evaluate the quality of teaching materials prepared and published by the subject teacher.	Single-response
Q2	Year of study	Slider questions	Q15	To what extent have you done well in online teaching?	Single-response
Q3	Study status (full-time/part-time)	Single-response	Q16	In relation to the usual contact method of teaching in classrooms, online teaching took you: more time, less time, equal time.	Single-response
Q4	Age	Slider questions	Q17	How would you assess your level of proficiency in using online teaching tools?	Single-response
Q5	Gender	Slider questions	Q18	If you had difficulty following online classes, please indicate what it was about:	Multiple-response
Q6	How do you assess the achievement of the set goals of the course in online classes?	Single-response	Q19	I need more time to master the material presented through online teaching than is the case in contact classroom teaching.	Single-response
Q7	How do you assess the achievement of the set learning outcomes in online classes?	Single-response	Q20	Distance and contact learning equally help to achieve the set goals of the subject and the prescribed learning outcomes.	Single-response
Q8	How do you assess the teacher's engagement in online classes?	Single-response	Q21	I quickly learn how to use new e-learning tools and systems.	Single-response
Q9	How do you assess the quality of communication with the teacher and the clarity of the instructions given by the teacher in online classes?	Single-response	Q22	I find using an e-learning system easy.	Single-response
Q10	For which parts of the teaching did you use the e-learning system (Merlin, LMS, 2co2)	Multiple-response	Q23	Do you consider teaching through online web conference tools (MS Teams, Zoom, Moodle webinar) better than one that includes available pre-recorded digital materials and instructions?	Single-response
Q11	Indicate which forms of online knowledge testing were used during the online teaching period	Multiple-response	Q24	Did you use illegal means during online knowledge tests?	Single-response

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Q12	To what extent did the mockup tests and homework created in the e-learning system help you prepare for the colloquium / written part of the exam?	Single-response	Q25	If you answered YES to the previous question, write which one: I used a photomath app, someone else solved the test for me; I copied my colleagues' answers; I used the materials published on the Internet; I used course materials with step-by-step solutions.	Multiple-response
Q13	Assess how similar examples and assignments from regular classes, homework and mockup tests are to the assignments from written exams (including colloquia).	Single-response			

Of the total 106 students, 78.3% were students of electrical and civil engineering at Zagreb University of Applied Sciences, 8.5% were students of midwifery at the Faculty of Health studies University of Rijeka, and 13.2% were students of preschool education at the Faculty of Education, University of Zagreb. Descriptive data of demographic characteristics, including gender and age, type and year of study, are presented in Table 2.

Table 2. *Profile of Participant (N=106)*

	Frequency	Relative frequency
Gender		
Male	63	59.4 %
Female	43	40.6 %
Age		
< 25	73	68.9 %
25 - 35	18	17 %
35 >	15	14.2 %
Type of study		
Full-time students	60	57.1 %
Part-time students	45	42.9 %
Year of study		
First	75	70,8 %
Second	24	22.6 %
Third	7	6.6 %

RESULTS AND DISCUSION

Figure 1 show students' answers to questions Q6-Q9, Q12-Q14, and Q19. Students assessed the achievement of the set course-goals and outcomes, the quality of course materials, and expressed their opinion on the purpose of using e-learning platforms.

Given the answers to the questions Q6-Q9, Q12-Q14, and Q19, we conclude that students were generally satisfied with the level of teachers' engagement and the quality of online lectures. Also, they consider the set course-goals and outcomes to be successfully achieved. According to the chi-squared test, there is no significant statistical difference between answers to the questions Q6-Q9, Q12-Q14, and Q19 when comparing the full-time and part-time students. Regarding the questions Q6-Q9, the part-time students

reported a higher average score (see Figure 1), while the full-time students reported a higher average score when assessing the quality of online teaching materials (see Figure 2). The answers to the question Q10 are shown in Figure 3.

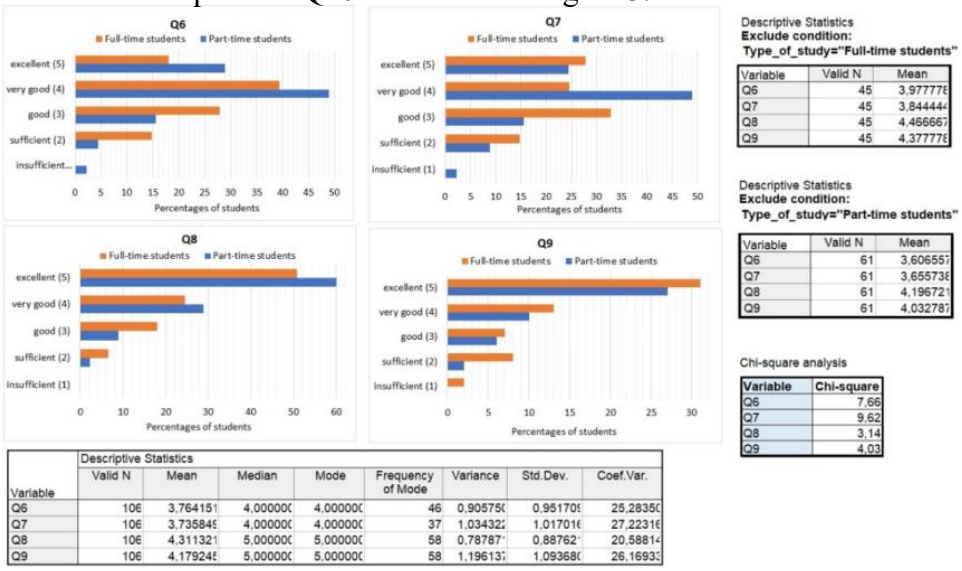

Figure 1 *Students perception about online classes*

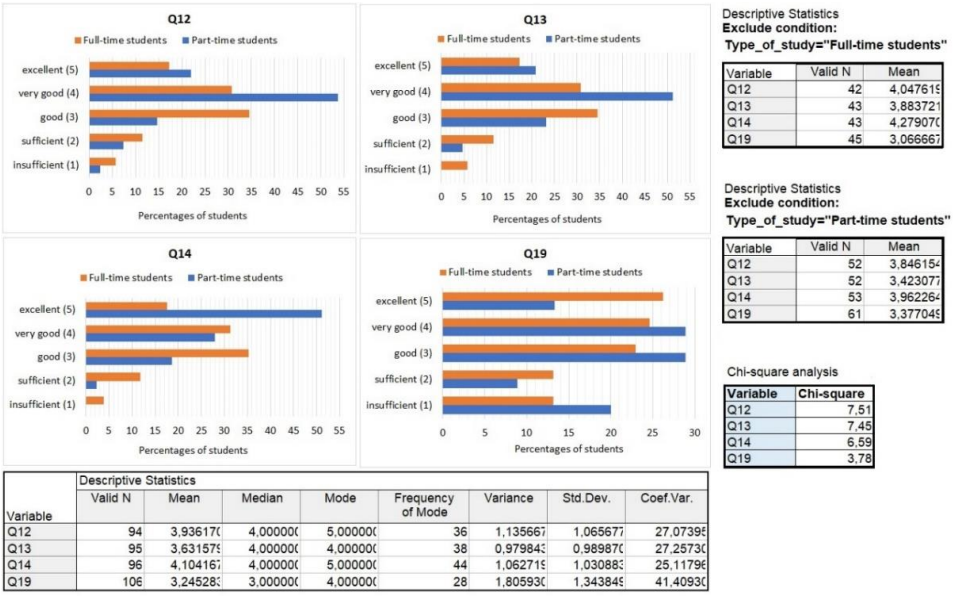

Figure 2 *Students perception about online teaching materials*

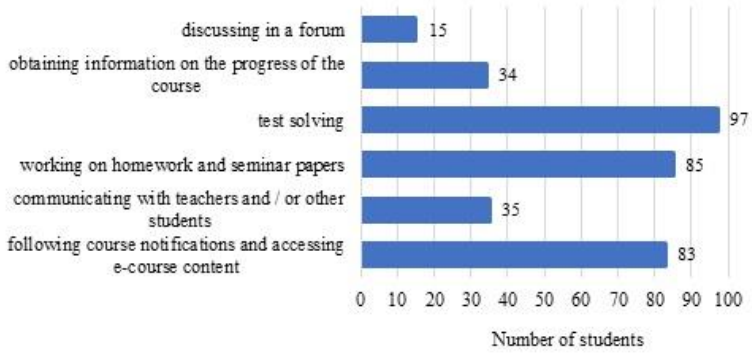

Figure 3 *For which reasons did you use the e-learning system (Merlin, LMS, 2co2)?*

The answers to the question Q11 are presented in Table 3.

Table 3 *Indicate which forms of online knowledge testing were used during the online teaching period*

	oral exam	written exam	colloquium	seminar papers	homework	trial tests
Frequency	38	78	104	25	84	84
Relative frequency	36.2%	74.3%	99%	23.8%	80%	80%

As can be seen from the answers to questions Q10 and Q11, students used e-learning platforms mostly for accessing colloquia and written exams. Over 80% students accessed non-obligatory mockup tests and homework assignments, which they found helpful in preparing for colloquia/exams. Figures 4 and 5 show answers to questions Q15 and Q17 and Q20, Q21 and Q22 in which students assessed their proficiency in using online teaching tools.

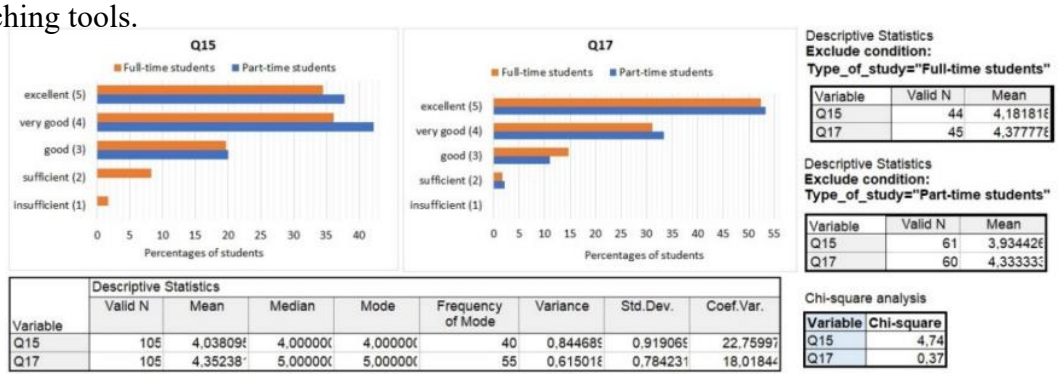

Figure 4 *Assessment of the level of proficiency in using online teaching tools*

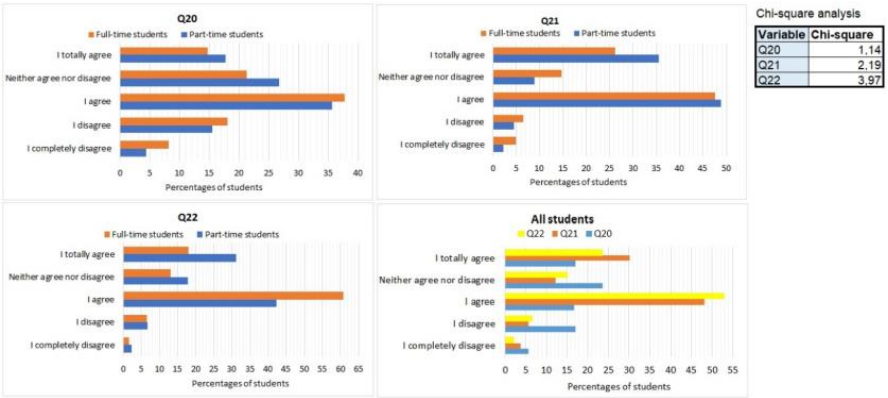

Figure 5 *Assessment of mastering the material, time required and engagement in online teaching in relation to contact teaching*

By using the chi-squared test we conclude that there is no significant statistical difference between full-time and part-time students regarding the questions Q15, Q17 Q20, Q21, and Q22. Part-time students seem to have been coping with online teaching somewhat better (average score: 4.18) in relation to the full-time students (average score: 3.93). The same holds for assessing students' proficiency in using online tools: part-time and full-time students reported the average scores of 4.49 and 4.34, respectively. Regarding the question (Q16) on how much time online classes took you compared to the usual contact method of teaching in classrooms, 23.6% students answered *more time*, 50.9% students answered *less time* and 25.5% students answered the *equal time*. The following answers were given to the question (Q18) of the difficulties that students had in following online classes:

– 58% students answered *quality and availability of internet connection,*

- 8.6% students answered *inability to access the MERLIN / LMS / 2co2 system,*
- 8.6% students answered *lacking a personal / laptop computer for everyday use,*
- 43.2% students answered *hardware problems (webcam, microphone, etc.),*
- 25.9% students answered *problems with the application that the teacher uses for distance learning,*
- 44.4% students answered *sharing space with housemates*.

On the question Q23 34% students answered *it's better*, 11.3% *it's worse* and 54.7% students answered *they are equally good/bad*. In our experience, students had no problems using e-learning tools aside some minor difficulties with hardware (internet connection quality, webcam, microphone etc.), as reflected in their answers. On the question Q24 84.8% students answered *No* and 15.2% answered *Yes*. The answers to the question (Q25) of which illegal means were used are shown in the Figure 6.

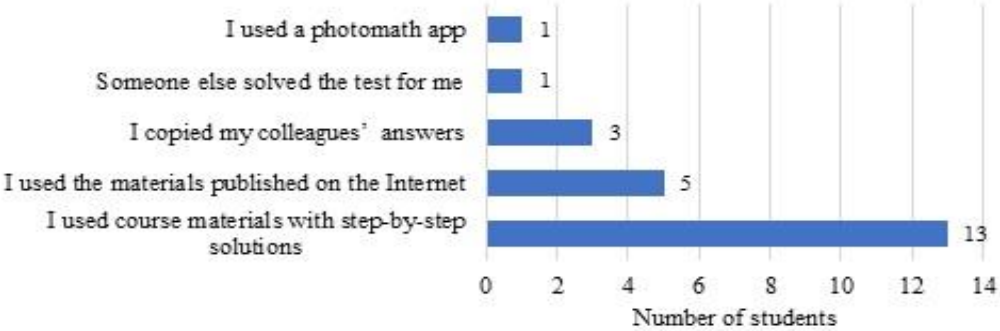

Figure 6 *What illegal techniques did you use in online exams?*

Although 85% students reported that they were not using illegal means in online exams, our experience is a bit different. For example, in the mathematical analysis course attended by students of civil engineering at Zagreb University of Applied Sciences we found that around 30% full-time students copied answers from each other in each online exam. That fraction is significantly less for part-time students. Our findings are in accordance with the fact that students which passed online written exams had significantly worse results in oral exams, unlike the students which passed written exams in a classroom under teacher's supervision. The majority of those in the first group failed to defend their grades when examinated by the teacher, as well as to explain their own answers given in the online (written) part of the exam.

CONCLUSION

The COVID-19 pandemic has completely changed the standard methods of teaching worldwide. Online teaching has been recognized as an adequate replacement for the classic (contact) teaching, providing teachers and students with means to avoid interfering with each other physically. However, it failed to fit some aspects of the usual, pre-pandemic teaching methods. Although our students were not lacking the required hardware (personal computers/laptops, microphones, web cams, etc.), problems with internet connection were frequent (58% survey participants reported such problem), making it difficult for the affected students to participate in synchronous online classes. From the teachers' perspective, at least in our experience, examination is the most problematic aspect of online education. Although learning management systems such as Moodle offer various possibilities for creating online tests and questionnaires, it was

difficult, at least in our experience, to evaluate students' knowledge objectively because the teacher cannot know who is actually solving the test and how it is being done. This is especially true for classes with large number of enrolled students, which are difficult to be watched upon individually. Nevertheless, learning management systems are useful tools and should be used as a supplement in classic (contact) teaching. We propose using such systems for creating small interactive tests and homework assignments following each (set) of the lectures, which helps students to prepare for exams more thoroughly. In addition, by using web-conferencing tools teachers can easily record entire lectures, which is particularly useful for part-time students who have to cope with workplace and family obligations in addition to studying.

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