

Comparative Analysis of Student Assessment during the COVID-19 Crisis

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Abstract - During the coronavirus pandemic (summer of 2019/20) classes at the University were held via videoconferencing tool. The lectures were also available to the students in the form of recordings. For a written online colloquium we designed a specific system. The colloquium was solved while teacher simultaneously held a video conference call for guiding students on time limit of each question. The entire colloquium is divided into smaller tests; first test-the closed-type questions were mixed so that the student received his combination of questions. The open-ended questions were divided into separate tests and the students, via video conference call, received instructions when each question was opened. In this way, all students wrote the same questions at the same time, and a certain amount of time was set for each question. The next generation of students (2020/21) was again the pandemic generation. These students, like the previous generation, also got access to recorded lectures, so they could consult the lectures countless times. This generation wrote colloquia on paper in the classroom. This paper compares the results of these two generations of students in written colloquiums and final success in taking courses that include all the elements that are evaluated during the semester.

Keywords – student evaluation; coronavirus pandemic; students; Moodle;

I. INTRODUCTION

The education system faced great challenges during the COVID-19 crisis. Due to the lockdown, the teaching work had to be fundamentally changed since contact teaching at the college was no longer possible. For this reason, the teaching relied on e-learning systems [1] through which teachers could organize the teaching work using different tools (video conferences, chat, file storage) [2]. Along with synchronous forms of teaching, experts also strongly recommended the transition to asynchronous forms of teaching [3].

Research [4] that was conducted on 150 teachers and 150 students of 5 universities in Nepal showed the positive aspects of online education: increasing independence during learning (76.9%), independent choice of time and place of learning (69.2%) and great source of knowledge (61.5%). The challenges faced by teachers and students mostly relate to the organization of learning and teaching itself; organization of time and access to the Internet as a basic resource (85.7%), finding one's own learning style (84.6%) and social isolation (71.4%). For successful participation in online education, it was necessary to fulfill certain prerequisites; computer literacy (98.9%),

technological preparedness (98.7%) and personal organization of time (96.6%).

Due to COVID-19, the evaluation process itself was either postponed or canceled. Institutions that decided to do the assessment through e-learning systems encountered many challenges using online assessment tools [1].

Research [5] of 13 articles from 9 countries of the world showed that university teachers used Moodle (39.19%) and the videoconferencing tools Skype and Zoom (34.78%) in the highest percentage for evaluation purposes. In order to prevent students from cheating, teachers tried to monitor students (e-proctoring) using cameras, software and detecting plagiarism.

Research [6] conducted over 3 years on 63 students divided into 4 groups in the College of Engineering in France showed that the groups acquired knowledge and skills in different ways (the first two groups had a combination of group work, tutorials and lectures, the third group first had lectures, followed by practical work, while the fourth group worked on projects). They used MS Teams, Zoom and Google Drive. The methods of evaluation were also different. The first and second groups took an online quiz and a final exam that they took in a virtual room with limited time for a written test. They had cameras on and were supposed to be connected to a virtual room via smartphones. In the end, they were given extra time to scan and email the exam. Another way these groups approached knowledge testing was based on time-limited tasks, but the students were not supposed to be connected to a virtual room. The exam was sent to them by e-mail, and at the end they had extra time to scan their answers and send them by e-mail or submit them via drop box. The third group had to write several reports about their practical work. The fourth group submitted a report on the completed project. A comparison of the results of students who in earlier years took the same course face-to-face in the classroom with students who took the course remotely showed that distance education did not affect the mastery of the skill.

Research [7] conducted on 3037 students and 231 teachers from 15 universities in Morocco showed that 70.6% of teachers had no previous teaching experience in distance learning. Despite this, 92.08% of teachers delivered their course via different platforms during COVID-19. Teachers, most often, used several different platforms, and the highest percentage (54.7%) used Moodle, followed by MS Teams (48.8%). Despite the fact that teachers used the platforms for teaching purposes, 64.4% of them believe that it is not feasible to hold exams

remotely. Students are also not happy with the idea of holding exams remotely; 81.45% believe that they are unable to take exams remotely.

II. METHODOLOGY

A. Teaching work in the course Teaching methods in computer education 1

The course Teaching methods in computer education 1 is a mandatory course for students of teacher informatics, which means that all students who want to complete the teaching major must attend and pass the course. The course is held in the summer semester of the first year of graduate studies and is the first methodical course that students enroll to acquire methodical knowledge and develop methodical skills for independently designing and maintaining the teaching process of computer science. Since students need to acquire knowledge about the teaching process of computer science, they listen to two hours of lectures per week, which are held face-to-face in the classroom.

In order to prepare for the independent holding of lessons in the subject of computer science, students attend two hours of exercises per week. Since it is a course on the basis of which students should acquire knowledge and develop the skill of preparing and holding a lesson, a combination of both the theoretical and practical part is necessary.

The teaching work is designed through continuous work during the semester. During the semester, for the purpose of practice, the student writes three individual tasks on the topic of his chosen teaching unit for practice in order to begin the process of designing and preparing the teaching process. At the end of the semester, the student submits a complete teaching preparation for the exercise. During the semester, the student should hold one teaching stage from his teaching preparation for the exercises in order to start his process of practicing the teaching of selected lesson.

During the semester, the students write two colloquiums in order to check knowledge they acquired during the semester. All students write the colloquium at the same time in the classroom. The colloquium consists of a combination of open and closed questions that the student can solve in the order he chooses, but in the exact time given, because each colloquium is combination of a test of depth and speed. At the end of the semester, the student writes another teaching preparation. For all activities, the student receives timely feedback.

Entire teaching work is designed through a combination of lectures and exercises. Since the basic goal of the course is to train the student to independently prepare and hold a lesson, lectures, exercises and colloquiums are held face-to-face in a classroom at the faculty.

B. Teaching work in the course Teaching methods in computer education 1 during COVID-19

In the summer semester of the academic year 2019/20 due to the corona crisis, it was necessary to change the coursework. Lectures, exercises and colloquiums could not

be held face-to-face in the classroom. It was necessary to conduct the teaching work using e-learning.

Since the Faculty of Humanities and Social Sciences of the University of Zagreb has had an e-learning system based on Moodle for many years, and researchers from the Department of Information and Communication Sciences are intensively studying this topic, we managed to adapt to the new way of working in a short period of time.

For the purpose of teaching, we used the BigBlueButton videoconferencing tool, on the basis of which we held classes synchronously. Since the Teaching methods in computer education 1 course consists of lectures and exercises, we have successfully modified the teaching methods to adapt them to the new teaching conditions. Lectures were also available to students through recordings posted on YouTube, so that teaching was also possible in asynchronous form. In this way, students could return to any lecture countless times. When listening to a contact lecture in the classroom, this method of operation is not possible, because after the lecturer has delivered the lecture, the student cannot listen to that lecture again. Student practice of teaching stages was successfully held through the videoconferencing tool.

The following summer semester (in the academic year 2020/21), when the course Teaching methods in computer education 1 was held again, it was also the corona semester. The way of working was the same with this generation of students. It is possible to work through the video conference tool BigBlueButton in synchronous form. The lectures were also available for this generation of students in the form of recordings (asynchronous form) and these students could also listen to the recordings of the lectures they wanted countless times. This generation of students also successfully practiced holding teaching stages through the videoconferencing tool.

The biggest challenge the teachers faced was the verification of acquired knowledge and developed skills. The colloquiums, under regular teaching conditions, were held face-to-face in the classroom, but during the summer semester of the academic year 2019/2020 this was not possible. For this reason, all knowledge tests had to be held in oral form or in writing via the e-learning system. The colloquiums, in the course Teaching methods in computer education 1 in the summer semester of the academic year 2019/20, were held in written form through the e-learning system. Students who took the course in the upcoming summer semester (academic year 2020/21) could take the colloquia in the classroom. Thus, during the corona crisis, two generations of students who attended the course Teaching methods in computer education 1 attended the course under changed conditions of teaching work. Both generations attended the course through the e-learning system. The exercises for both generations were successfully held in a synchronous form through a video conference call. The first corona generation (2019/20) took written knowledge tests at the colloquium via the e-learning system, while the second corona generation (2020/21) took them in written form in the classroom.

TABLICA I. TABLE 1. CHARACTERISTICS OF THE STUDENTS INVOLVED IN THE RESEARCH

Group	Number of students	Academic year	Course
1 st group	1 st colloquium: 24 2 nd colloquium: 23 Overall grade: 23	1.year graduate study (2019./20.)	Teaching methods in computer education 1
2 nd group	1 st colloquium: 20 2 nd colloquium: 20 Overall grade: 19	1.year graduate study (2020./21.)	Teaching methods in computer education 1

C. EVALUATING STUDENT ACHIEVEMENT DURING COVID-19

The colloquium, composed of closed and open-ended questions, could not be sent to the e-learning system and allow students to start and finish writing equally. If the written test of knowledge were to be approached in this way, academic integrity could theoretically be compromised. All students would take the colloquium at the same time and, theoretically, through some other communication channels, they could mutually agree on which question should be solved by which student, and towards the end of the designated time, the answers could be exchanged.

Because of this, for the generation of students who took the course in the summer semester, in 2019/20 teachers designed written knowledge assessment system that sought to take advantage of the advantages offered by e-learning. The written test of knowledge began at the agreed time with the initiation of a video conference call initiated by the subject teacher during the course itself. All students who registered to write a colloquium joined the video conference call with audio. The video conference call was designed for the purpose of holding a colloquium. The subject teacher would tell the exact time when a particular question was opened and warn when the time to solve a particular question was about to end. In this way, students would know how much time they still have at their disposal.

The entire written knowledge test was originally divided into two main parts; the first part consisted of closed type questions and the second part consisted of open type questions. The closed-type questions were chained into one written test in such a way that the written test consisted only of closed-type questions through which the student could only move forward, and could not return to the previous question. The written test with closed-ended questions was time-limited, and each student received a random combination of questions and offered answers. After the time expired, that written verification was automatically submitted to the system.

The second part was open-ended questions. That part of the written test was divided into several smaller parts, i.e. each question represented an exam in itself. Students would be instructed again that a particular question is being opened and they would be informed how much time they still have to solve it. After the time was up, the answer to each question would be automatically submitted to the system. In this way, all students wrote every single open-ended question at the same time, but due to the time limit

and simultaneous solving of only one question, mutual cooperation in solving the colloquium was impossible.

The next generation of students who took the course in the summer semester of the academic year 2020/21 attended tests of knowledge (first and second colloquium) in the classroom. All students simultaneously wrote written knowledge tests, which, as with the previous generation, consisted of a combination of closed and open questions.

This generation of students received the colloquium in its entirety, i.e. they immediately received all closed and all open questions. Also, like the previous generation, they had a time limit to solve the colloquium, but that time was not divided into each individual question, but the time limit referred to the limit of how much time they had to solve the entire knowledge test. The input parameters for both groups of students were the same, i.e. both groups prepared for colloquiums based on lectures that were also available in the form of recordings and could be listened to countless times.

TABLICA II. TABLE 2. STUDENT TASKS

Group	Tasks	Teaching forms	Colloquiums
1 st group (2019./20.)	a) Three individual tasks b) Teaching preparation for the exercise c) Second teaching preparation d) Presentation of the teaching stage e) Two colloquia	Synchronous + asynchronous	Online written colloquiums through the e-learning system
2 nd group (2020./21.)	a) Three individual tasks b) Teaching preparation for the exercise c) Second teaching preparation d) Presentation of the teaching stage e) Two colloquia	Synchronous + asynchronous	Contact written colloquiums in the classroom

In order to conduct a comparative analysis, the following hypotheses were set:

H1: there is no statistically significant difference in the results achieved between the first (academic year 2019/20) and second (academic year 2020/21) generation of students at the first colloquium

H2: there is no statistically significant difference in the results achieved between the first (academic year 2019/20) and the second (academic year 2020/21) generation of students at the second colloquium

H3: there is no statistically significant difference in the final grade between the first (academic year 2019/20) and second (academic year 2020/21) generation of students

Statistical analysis was made using MS Excel Data analysis statistical package and Analyze It package. Differences between results achieved on first and second colloquium and between final results of both groups of students were statistically analyzed using t-test which was calculated with 95% level of confidence.

Statistical analysis revealed that there is no statistically significant difference in the results achieved at the first colloquium between the first (academic year 2019/20) and second (academic year 2020/21) generation of students. Therefore, the first hypothesis is accepted.

TABLE 3. STATISTICAL ANALYSIS OF RESULTS ACHIEVED AT THE FIRST COLLOQUIUM (T-TEST)

	2019./20.	2020./21.
Mean	0,641383	0,6475
Variance	0,013404	0,025359
Observations	24	20
P(T<=t) one-tail	0,443519	
P(T<=t) two-tail	0,887037	

Statistical analysis revealed that there is no statistically significant difference in the results achieved at the second colloquium between the first (academic year 2019/20) and second (academic year 2020/21) generations of students. Therefore, the second hypothesis is accepted.

TABLE 4. STATISTICAL ANALYSIS OF RESULTS ACHIEVED AT THE SECOND COLLOQUIUM (T-TEST)

	2019./20.	2020./21.
Mean	0,731304	0,653
Variance	0,027957	0,032506
Observations	23	20
P(T<=t) one-tail	0,074909	
P(T<=t) two-tail	0,149817	

Statistical analysis revealed that there is no statistically significant difference in the overall grade between the first (academic year 2019/20) and second (academic year 2020/21) generation of students. Therefore, the third hypothesis is accepted.

TABLE 5: STATISTICAL ANALYSIS OF RESULTS ACHIEVED IN THE OVERALL GRADE (T-TEST)

	2019./20.	2020./21.
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Mean	3,478261	3,315789
Variance	1,16996	0,672515
Observations	23	19
P(T<=t) one-tail	0,291611	
P(T<=t) two-tail	0,583221	

D. CONCLUSION

Due to the COVID-19 crisis higher education had to completely switch to e-learning. Major challenge during the COVID-19 crisis was the issue of student evaluation.

This paper presents results of student evaluation on same course where the teaching process of both groups of students was the same; the e-learning system and the video conference tool BigBlueButton were used, and the students followed the classes through synchronous and asynchronous forms of teaching.

The results of the comparative analysis showed that there is no statistically significant difference between the results achieved between the first and second groups in the first colloquium, the second colloquium and in the final assessment. The results of the research showed that, since there is no statistically significant difference between the groups, that the designed evaluation system has its scientific and practical weight in such specific working conditions.

The results of this research demonstrate how the application of a well-designed evaluation system through electronic learning enables the same quality of evaluation of student learning achievements as the evaluation conducted in the classic way with exams in the classroom.

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