ONLINE TEACHING AND LEARNING IN BIOMEDICAL SCIENCES: STUDENTS' AND STAFF' ATTITUDES AND EXPERIENCES ON THE NEW EDUCATIONAL ENVIRONMENT IMPOSED BY THE COVID 19 OUTBREAK

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ABSTRACT

The aim of this pilot study is a preliminary evaluation of previous models / modalities of online teaching at the Faculty of Medical Sciences in Serbia and to examine the attitudes of students and academic staff about education during the COVID-19 pandemic, as well as their previous experiences. The research was designed as an observational qualitative epidemiological study which was conducted on a population of students and academics staff at the Faculty of biomedical sciences, University of Kragujevac during the pandemic of SARS-CoV-2 infection in Serbia. The first phase is a pilot study which included 332 participants performed between December 2020 and January 2021. The pilot study questionnaire is formed for the purposes of the research and consists of 17 closed-ended questions with graduated answers. Students and academic staff completed the questionnaire through an online learning platform in all environments and from all electronic devices. The importance of this study is reflected in the fact that it provides detailed and valid data that can serve the purpose of improving the efficiency of online teaching at the faculties of medical sciences in Serbia In general, the results of our study indicate that in addition to great inexperience, both students and academic staff cope well during online education and the changed environment and learning conditions despite all the difficulties.

Keywords: *Online education, medical education, COVID-19, attitudes, experiences.*

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INTRODUCTION

The outbreak of the SARS-CoV-2 virus pandemic declared by the World Health Organization in early 2020 affected the health system, the economy, education, and other aspects of life (1). The first case of SARS-CoV-2 infection was registered in the Republic Serbia on March 6, 2020, and after only 9 days, due to the increase in the number of infected, the Government of the Republic of Serbia declared a state of emergency. The declaration of a state of emergency has led to a number of restrictive measures, including the closure of state borders, restrictions on the movement of citizens and the suspension of all educational institutions indefinitely (2).

Due to the introduction of such measures, the teaching process at all educational levels has reoriented from the classical model of teaching to different types of online teaching. Accordingly, the Faculty of Medical Sciences of the University of Kragujevac has adapted the teaching process to the current epidemiological situation and an online platform has been formed. The platform for online teaching (studije.fmn.rs) was created with the aim of providing quality support to students but also to teachers and associates during teaching activities with the possibility of checking students' knowledge and testing them at a distance. Students of all study programs of the Faculty of Medical Sciences, as well as teachers and associates had the opportunity to access the teaching content on the platform by creating a user account. Other medical faculties in Serbia have also, in various technical and organizational formats, introduced online teaching during the epidemic.

Due to the transition from the classic to the online way of student education and teacher work, the quality and efficiency of this form of teaching have become the subject of research. An additional challenge is the specificity of the teaching process at the faculties of health care, as well as insufficient previous experience of both students and teachers. Currently, there are only a few publications that assess the impact of the pandemic and its consequences on the educational process in the field of medical sciences, especially in terms of the attitudes and experiences of students and teachers. Previous problems that students have encountered in relation to teaching online methods described in the literature are difficult communication and inability to discuss, inadequate assessment of student knowledge, difficult use of technological tools necessary for this type of education, time management and anxiety and stress due to quarantine and isolation (3, 4). As the most significant shortcoming of this model of education, students state the impossibility of replacing it with classical education, which enables direct contact of the student with the patient. Also, students' attitude is that they cannot learn practical skills through online education (5). The advantages that students notice are reduced costs during their studies and time savings. Also, as positive aspects, they mention the availability and quick access to learning materials, safety and reduced risk of infection. Previous research has shown that students have a positive attitude towards online teaching and believe that it should be in addition to the classical form of education (4). The literature states that more attention should be paid to practical and individual learning needs of students during online education in medical sciences. and clinical practice (6).

By analyzing the advantages and disadvantages of the online learning model that students and teachers of the faculties of medical sciences encounter, this type of teaching can be improved. It is necessary to consider and further adapt this form of education to the needs of all participants in the teaching process due to the tendency to repeat pandemics over time and the inability to predict their scale. Also, in the long run, a mix model of on-site online teaching (hybrid learning) seems to be suitable for teaching in medical and health sciences (7, 8).

The aim of this pilot study is a preliminary evaluation of previous models / modalities of online teaching at the Faculty of Medical Sciences in Serbia and to examine the attitudes of students and academic staff about education during the COVID-19 pandemic, as well as their previous experiences.

PARTICIPANTS AND METHODS

Ethical concerns

Participation in the survey was voluntary, and completely anonymous, identification data of the technical approach of survey participants are available only to in accordance with the standard operating procedure of the Faculty of Medical Sciences, University of Kragujevac, Serbia. The conduct of the study is in line with the principles of the Declaration of Helsinki (revision 2013) and the protocol of the study was approved by institutional ethics committee Faculty of Medical Sciences (Number 01-3491).

Participants and protocol of study

The research was designed as an observational qualitative epidemiological study which was conducted on a population of students and academics staff at the Faculty of biomedical sciences, University of Kragujevac during the pandemic of SARS-CoV-2 infection in Serbia. The first phase is a pilot study which included 332 participants performed between December 2020 and January 2021. The second phase at the national level is in progress. The main including criteria for participants were the following: undergraduate or vocational or postgraduate student or teacher/associate of all faculties of medical sciences in Serbia, the existence of the participant's user account on the appropriate online platform or appropriate online approach and voluntary participation. No special exclusion criteria were defined.

Based on the results of the analysis in the first phase, the redesign / improvement of the survey questionnaire will be approached in order to improve its validity and feasibility. Thus, the new format of the survey questionnaire-assessment

instrument will be submitted again to the Ethics Committee for consideration, and before the implementation of the second phase, in the form of an Amendment to the Protocol. The second phase of testing will be conducted according to the same principles as the pilot study, and upon approval of the protocol amendments. It is planned that in the second phase, the participants will be students, teachers and associates of medical faculties in Kragujevac, Belgrade, Novi Sad, Nis and Pristina-Kosovska Mitrovica, as well as the Faculty of Pharmacy and the Faculty of Dentistry of the University of Belgrade. The implementation of the study in this phase will be coordinated by the Association of Medical Faculties of Serbia, through coordinators appointed by each faculty that accepts to participate in the study, with the main coordinator-manager being a representative of the Faculty of Medical Sciences, University of Kragujevac.

Instrument

The pilot study questionnaire is formed for the purposes of the research and consists of 17 closed-ended questions with graduated answers. Students and academic staff completed the questionnaire through an online learning platform in all environments and from all electronic devices.

The first three questions relate to the socio-demographic characteristics of the participants such as gender, age and academic status. Other questions were formed based on the existing published studies with the same or similar topic. The answers to each of the 14 questions were ranked on a five-point Likert scale (9), where respondents answered by choosing one of the 5 answers offered (I very much support /I support; I do not support; dispute I do not support / I do not support very much; or There are very large ones; There are big ones; There are moderates; There are small ones or They do not exist at all). The questionnaire was modified according to similar research methods (3, 4). In the second phase of the study, a redesigned / improved questionnaire will be used, according to the results of this pilot study.

Before completing the survey, the participants will be explained the purpose of the research and given brief instructions in text form. The technical format and content of the informed consent of the respondents with full information was adjusted to the online environment, in accordance with the relevant recommendations (7).

Statistical analysis

The data were analyzed using IBM SPSS version 22.0. All categorical variables were expressed in frequencies (N) and percentages (%). The $\chi 2$ goodness of fit test was used to determine the differences in the distribution of the participant responses. Differences between the groups were analyzed with the $\chi 2$ test of independence or by Fisher's exact test if assumptions for the $\chi 2$ test were not met. The data were presented in tabular and graphical form. A p-value less than 0.05 was considered to be a measure of statistical significance for all statistical tests used.

The study sample was calculated according to the assumption of a margin error of 5% and confidence interval of 95%. The total estimated available sample of participants at the Faculty of Medical Sciences, University of Kragujevac was 2700 and the response rate was estimated at 30%. Using the online Raosoft sample size calculator (10), a sample of 289 respondents was calculated, which was rounded up to at least 300 participants.

RESULTS

Basic characteristic of study population

This pilot study included 332 participants from Faculty of Medical Sciences, University of Kragujevac in Serbia who filled study online questionnaire between December 2020 and January 2021. Study population consisted of total 332 participants, of which 302 were students (91.96%) and 30 academic staff (9.04%). In relation to gender, of the total number of participants 76.8 % were female and 23.2 % male (χ^2=95.434; df=1; p=0.000). All participant were divided into three categories according to years old: below 19 years old (46 (13.9%)), 20-29 (260 (78.3)) and above 30 years old (26 (7.8%)).

Table 1 shows the distribution of study participants in relation to gender, but also gender representation in general in the student and teaching population of the Faculty of Medical Sciences in January 2021 which represent a similar gender-distribution in study population to the official student-academic staff population at the Faculty of Medical Sciences in Kragujevac.

Table 1. Distribution of male and female participants in study population and in total student and academic population at the Faculty of Medical Sciences.

	Total number	Female (%)	Male (%)
Study population	332	255 (76.8)	77 (23.2)
Students at the Faculty of Medical Sciences	1572	1181 (75.1)	391 (24.9)
Academic staff at the Faculty of Medical Sciences	293	165 (56.3)	128 (43.7)

Results are presented as frequency in percent from total number of selected participants.

Previous experiences of the study population with online learning

In terms of previous experience with online education in study population, the answers were expected. Figures 1-3 show distribution of response in study population. On question (Q4): have you had previous experiences with online education? Most of participants responded that they had a little or no experience. Female participants answered that they had

no experience or very little in as many as 71.8%, while male respondents gave the same answer in 67.5% (Figure 1). On the other hand, students denied the presence of previous experience in 72.2% and academic staff in 56.7% (Figure 2). In general, the majority of the study population had no experience or had very little (70.8%) and only a small number of participants had extensive previous experience in viewing online education (11.7%) (Figure 3). Using Chi squared test, we not confirmed statistically significant differences between distribution of response in relation to gender (χ^2=0.513; p=0.774) nether in relation to academic status (χ^2=3.990; p=0.125).

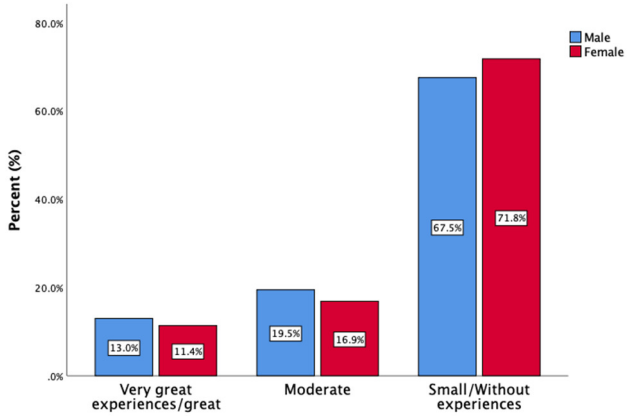


Figure 1. Distribution of responses on Question (Q4): Have you had previous experiences with online education? in relation to gender in study population. The answers are categorized into the following categories: Very great experiences/great, Moderate experiences and Small/without experiences. Results are presented as frequency in percent (%).

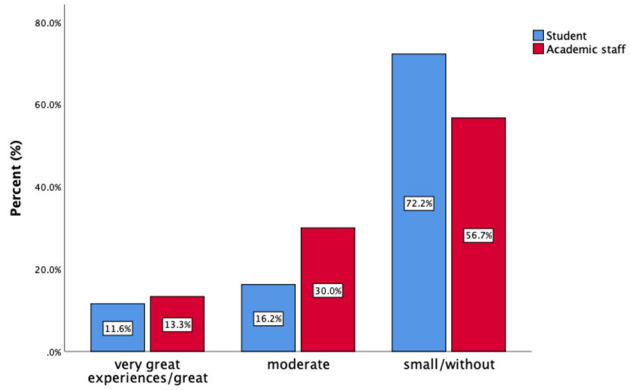


Figure 2. Distribution of responses on Question (Q4): Have you had previous experiences with online education? in relation academic status in study population. The answers are categorized into the following categories: Very great experiences/great, Moderate experiences and Small/without experiences. Results are presented as frequency in percent (%).

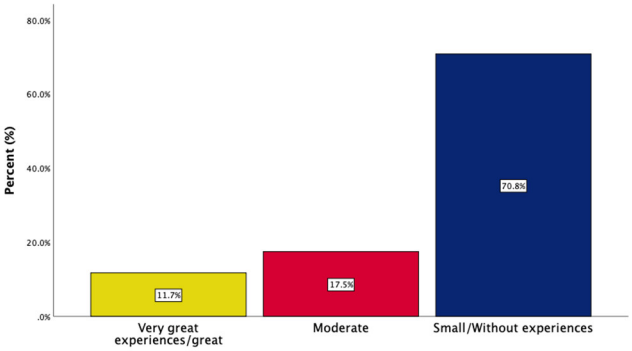


Figure 3. Distribution of responses on Question (Q4): Have you had previous experiences with online education? in study population in general. The answers are categorized into the following categories: Very great experiences/great, Moderate experiences and Small/without experiences. Results are presented as frequency in percent (%).

Attitudes and opinions during online teaching in study population in COVID-19 pandemic

In the second part of study, we evaluated the attitudes on online education with direct, online or combining contact of the male and female students and academic staff. We have founded that almost all responses on Q5, Q6 and Q7 were significantly different in relation to academic status, but only on Q7 in relation to gender of participants (Table 2). Interestingly,

The majority of respondents largely supported the combined way of learning (50% and 86.7%), as well as online learning in student population (56%). On the other hand, the attitude towards learning only through direct contact was divided among students and academic workers with similar distribution of support for each type of education. In relation to gender, in almost all questions there were no statistically significant differences between response and attitudes on online education with direct, online or combining contact of male and female participants. Interestingly, students (56.0%) and female participants (58.0%) are more supportive of online learning than other participants, which is to be expected, given the larger number of female participants in the study population (Table 2).

Table 2. Distribution of male and female participants and in relation to academic status in responses about attitudes on online education. Results are presented as frequency in percent from total number of selected participants.

Variables	**Students (n=302) (%)**	Academic staff **(n=30) (%)**	χ^2/p	**Male participants (n=77) (%)**	Female participants **(n=255) (%)**	χ^2/p
(Q5) **Attitude on combining online teaching with direct contact teaching ***						
I very much support / I support	151 (50.0)	26 (86.7)	**14.814/ 0.001**	42 (54.5)	135 (52.9)	0.071/ 0.965
I do not support or dispute	70 (23.2)	2 (6.7)		16 (20.8)	56 (22.0)	
I do not support / I do not support very much	81 (26.8)	2 (6.7)		19 (24.7)	64 (25.1)	
(Q6) **Attitude about teaching only in direct contact**						
I very much support / I support	105 (34.8)	15 (50.0)	5.971/ 0.055	29 (37.7)	91 (35.7)	4.333/ 0.115
I do not support or dispute	70 (23.2)	9 (30.0)		24 (31.2)	55 (21.6)	
I do not support / I do not support very much	127 (42.1)	6 (20.0)		24 (31.2)	109 (42.7)	
(Q7) **Attitude about teaching only online**						
I very much support / I support	169 (56.0)	10 (33.3)	**7.379/ 0.027**	31 (40.3)	148 (58.0)	**8.316/ 0.016**
I do not support or dispute	49 (16.2)	10 (33.3)		20 (26.0)	39 (15.3)	
I do not support / I do not support very much	84 (27.8)	10 (33.3)		26 (33.8)	68 (26.7)	

Difficulties and problems during online education in study population in COVID-19 pandemic

Furthermore, questions from Q8 to Q16 are relate to difficulties during the duration of online education and concern various aspects. All responses from study population are shown in the form of Table 3. The main differences were observed in testing knowledge, gaining of professional experience, assessing the quality of study during online teaching and other difficulties ($p<0.05$). A large number of students and academic staff reported no or no difficulties at all in testing the knowledge during online education. Then, most of students reported that gaining professional experience during online classes was went with large difficulties but not for academic staff in the same time. Also, most of the student population reported that in assessing the quality of study during online teaching were present some difficulties.

On the other hand, participants reported that difficulties regarding the communication during classes, technical and psychological aspects, organizing time as well as the mastering new health technologies were equally present in student and academic staff or in male and female participants ($p>0.05$) (Table 3).

In relation to gender, all responses on Q8-Q16 are similarly distributed in male and female participants ($p>0.05$) (Table 3).

Table 3. Distribution of male and female participants and in relation to academic status in responses about difficulties during online education.

Variables	**Students (n=302) (%)**	Academic staff **(n=30) (%)**	χ^2/p	**Male partic-ipants (n=77) (%)**	Female partici-pants **(n=255) (%)**	χ^2/p
(Q8) **Difficulties in communication during online classes ***						
There are very large ones	16 (5.3)	0 (0.0)	5.178/ 0.242	40 (5.2)	12 (4.7)	6.371/ 0.173
There are big ones	29 (9.6)	1 (3.3)		10 (13.0)	20 (7.8)	
There are moderates	96 (31.8)	15 (50.0)		30 (39.0)	81 (31.8)	
There are small ones	84 (27.8)	9 (30.0)		21 (27.3)	72 (28.2)	
They do not exist at all	77 (25.5)	5 (16.7)		12 (15.6)	70 (27.5)	
(Q9) **Difficulties in testing knowledge during online classes ***						
There are very large ones	30 (9.9)	2 (6.7)	**10.352/ 0.027**	10 (13.0)	22 (8.6)	6.371/ 0.173
There are big ones	32 (10.6)	5 (16.7)		8 (10.4)	29 (11.4)	
There are moderates	63 (20.9)	10 (33.3)		18 (23.4)	55 (21.6)	
There are small ones	72 (23.8)	10 (33.3)		24 (31.2)	58 (22.7)	
They do not exist at all	105 (34.8)	3 (10.0)		17 (22.1)	91 (35.7)	
(Q10) **Difficulties in technical aspects during online teaching ***						
There are very large ones	15 (5.0)	0 (0.0)	2.912/ 0.556	4 (5.2)	11 (4.3)	1.120/ 0.905
There are big ones	16 (5.3)	0 (0.0)		2 (2.6)	14 (5.5)	
There are moderates	84 (27.8)	8 (26.7)		22 (28.6)	70 (27.5)	
There are small ones	114 (37.7)	12 (40.0)		30 (39.0)	96 (37.6)	
They do not exist at all	73 (24.2)	10 (33.3)		19 (24.7)	64 (25.1)	
(Q11) **Difficulties in gaining professional experience during online classes ***						
There are very large ones	94 (31.1)	4 (13.3)	**11.809/ 0.015**	24 (31.2)	74 (29.0)	7.405/ 0.116
There are big ones	63 (20.9)	10 (33.3)		24 (31.2)	49 (19.2)	
There are moderates	50 (16.6)	11 (36.7)		12 (15.6)	49 (19.2)	
There are small ones	50 (16.6)	3 (10.0)		11 (14.3)	42 (16.5)	
They do not exist at all	45 (14.9)	2 (6.7)		6 (7.8)	41 (16.1)	

Variables	**Students (n=302) (%)**	Academic staff **(n=30) (%)**	χ^2/p	**Male partic-ipants (n=77) (%)**	Female partici-pants **(n=255) (%)**	χ^2/p
(Q12) **Difficulties in psychological aspects during online teaching ***						
There are very large ones	32 (10.6)	0 (0.0)	7.348/ 0.096	5 (6.5)	27 (10.6)	2.374/ 0.676
There are big ones	20 (6.6)	0 (0.0)		4 (5.2)	16 (6.3)	
There are moderates	48 (15.9)	6 (20.0)		10 (13.0)	44 (17.3)	
There are small ones	70 (23.2)	11 (36.7)		21 (27.3)	60 (23.5)	
They do not exist at all	132 (43.7)	13 (43.3)		37 (48.1)	108 (42.4)	
(Q13) **Difficulties in mastering new health technologies during online teaching ***						
There are very large ones	47 (15.6)	2 (6.7)	5.000/ 0.275	12 (15.6)	37 (14.5)	4.648/ 0.325
There are big ones	40 (13.2)	8 (26.7)		10 (13.0)	38 (14.9)	
There are moderates	67 (22.2)	7 (23.3)		23 (29.9)	51 (20.0)	
There are small ones	66 (21.9)	7 (23.3)		17 (22.1)	56 (22.0)	
They do not exist at all	82 (27.2)	6 (20.)		15 (19.5)	73 (28.6)	
(Q14) **Difficulties in organizing time during online classes ***						
There are very large ones	17 (5.6)	0 (0.0)	5.139/ 0.230	4 (5.2)	13 (5.1)	5.448/ 0.239
There are big ones	12 (4.0)	2 (6.7)		6 (7.8)	8 (3.1)	
There are moderates	35 (11.6)	5 (16.7)		8 (10.4)	32 (12.5)	
There are small ones	67 (22.2)	10 (33.3)		22 (28.6)	55 (21.6)	
They do not exist at all	171 (56.6)	13 (43.3)		37 (48.1)	147 (57.6)	
(Q15) **Difficulties in assessing the quality of study during online teaching ***						
There are very large ones	45 (14.9)	1 (3.3)	**11.139/ 0.020**	12 (15.6)	34 (13.3)	7.948/ 0.093
There are big ones	47 (15.6)	7 (23.3)		12 (15.6)	42 (16.5)	
There are moderates	68 (22.5)	13 (43.3)		27 (35.1)	54 (21.2)	
There are small ones	63 (20.9)	6 (20.0)		12 (15.6)	57 (22.4)	
They do not exist at all	79 (26.2)	3 (10.0)		14 (18.2)	68 (26.7)	

Variables	**Students (n=302) (%)**	Academic staff **(n=30) (%)**	χ^2/p	**Male partic-ipants (n=77) (%)**	Female partici-pants **(n=255) (%)**	χ^2/p
(Q16) **Other difficulties during online classes ***						
There are very large ones	20 (6.6)	0 (0.0)	**13.409/ 0.006**	8 (10.4)	12 (4.7)	9.438/ 0.047
There are big ones	16 (5.3)	2 (6.7)		3 (3.9)	15 (5.9)	
There are moderates	67 (22.2)	16 (53.3)		21 (27.3)	62 (24.3)	
There are small ones	101 (33.4)	7 (23.33)		30 (39.0)	78 (30.6)	
They do not exist at all	98 (32.5)	5 (16.7)		15 (19.5)	88 (34.5)	

Results are presented as frequency in percent from total number of selected participants.

Future intention of study population regarding the online education

By filling in the questionnaire according to the principle of self-evaluation of the participants, we followed the intentions of students and academic staff to implement the acquired knowledge, skills, and attitudes into professional practice (Q17) (Figs. 4-6). A large number of students (8.630; p=0.055) and female participants (8.707; p=0.069) reported that there was a very large or large intention for the future intentions but statistically insignificant. In general, more than half of all participants said yes to future intentions (Figure 6).

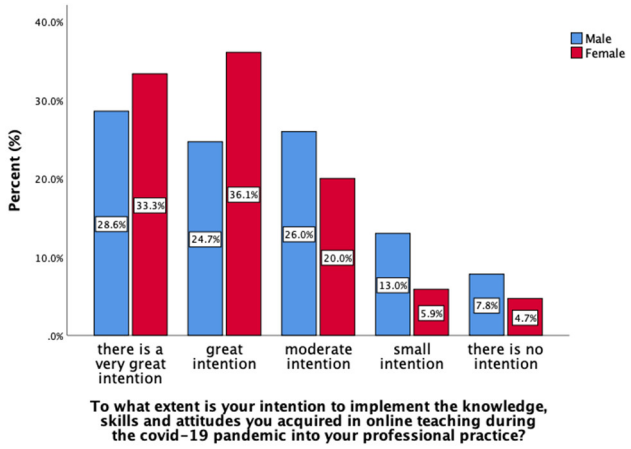


Figure 4. Distribution of responses on Question (Q17): Intention to implement the acquired knowledge, skills, and attitudes into professional practice, in relation to gender in study population. The answers are categorized into the following categories: Very great intention, Great intention, Moderate intention, Small intention and without intention. Results are presented as frequency in percent (%).

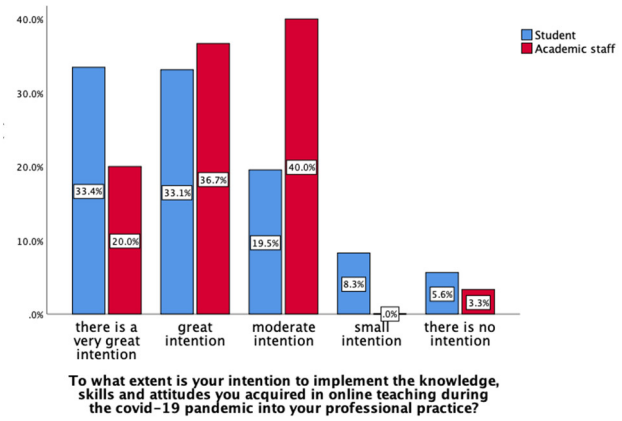


Figure 5. Distribution of responses on Question (Q17): Intention to implement the acquired knowledge, skills, and attitudes into professional practice, in relation to academic status in study population. The answers are categorized into the following categories: Very great intention, Great intention, Moderate intention, Small intention and without intention. Results are presented as frequency in percent (%).

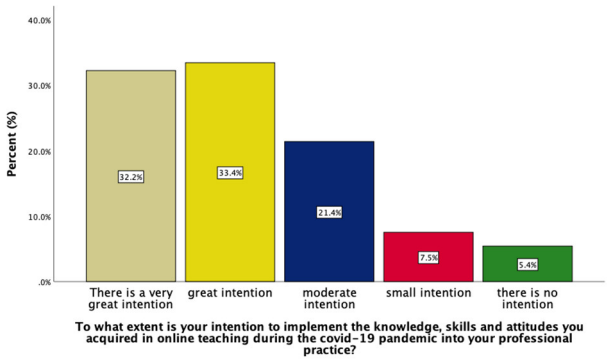


Figure 6. Distribution of responses on Question (Q17): Intention to implement the acquired knowledge, skills, and attitudes into professional practice, in study population at all. The answers are categorized into the following categories: Very great intention, Great intention, Moderate intention, Small intention and without intention. Results are presented as frequency in percent (%).

DISCUSSION

The importance of this study is reflected in the fact that it provides detailed and valid data that can serve the purpose of improving the efficiency of online teaching at the faculties of medical sciences in Serbia. In this way, you will gain insight into previous experiences in educating students during the COVID-19 pandemic. Also, their attitudes and perceived difficulties can serve as a guide for improving the quality of online education in a specific field such as medical sciences (11, 12).

This unique study indicated the attitudes and experiences of students and teachers about the current model of education at the faculties of medical sciences during the COVID-19 pandemic. Also, provided the analysis of the obtained research results which shows what difficulties students and teachers encounter during the teaching process in order to take them into account when improving the existing model. The results will be used as a basis for recommendations for improving teaching as well as teaching competencies in the field of medical and health sciences (13-17). Beside that, using the Likert scale as a technique for the measurement of attitudes we are sure that obtained results are good instrument (9).

Our study collected online responses from a large number of participants students and academic staff and provided interesting results. The majority of respondents largely supported the combined way of learning (50% and 86.7%), as well as online learning in student population (56%). On the other hand, the attitude towards learning only through direct contact was divided among students and academic workers with similar distribution of support for each type of education. That means that academic staff is very despite the sudden changes in the way of education, it can be said that the academic staff was well prepared and therefore had an attitude that supports all ways of education. On the other hand, the student population, as the most promising part of society, mostly supported modern technologies and thus online learning methods (Table 2).

Furthermore, a large number of students and academic staff reported no or no difficulties at all in testing the knowledge during online education. Then, most of students reported that gaining professional experience during online classes was went with large difficulties but not for academic staff in the same time. Also, most of the student population reported that in assessing the quality of study during online teaching were present some difficulties.

On the other hand, participants reported that difficulties regarding the communication during classes, technical and psychological aspects, organizing time as well as the mastering new health technologies were equally present in student and academic staff or in male and female participants ($p>0.05$) (Table 3).

This study highlighted that faculty members, especially students, were generally unsure if they are in favor of online education (18). Ambivalence during the change process is an expected response during the transition. According to Kurt Lewin's 3 Stage Change Model, transition during change is typically accompanied by feelings of hesitation and confusion (18, 19). The ambivalent attitude of faculty may possibly be due to the fact that while faculty seem to have concerns about online teaching and learning to include but not limited to depersonalize instruction and proliferation of academic dishonesty, faculty are left with less options as they are required to adopt the new normal of education (19).

Currently, there is a little literature data about the attitudes and experiences of students and academic staff in the field of biomedical sciences on the online education during the COVID-19 pandemic.

One of the previous studies was conducted in the North Macedonia. A significant number of teachers in North Macedonia disagreed with changing the traditional teaching method with e-learning (20).

Another study also included institutional, interpersonal, training and technology, and cost/benefit analysis barriers to online education (21). The finding of this research suggests that problems and challenges associated with online education must be addressed, and online courses must be carefully planned and regulated (21, 22).

Unger Sema and coworkers examined responses of the undergraduate student attitudes towards rapidly shifting to an entirely online learning environment were assessed due to COVID-19 in Pakistan. Also, they have founded that many students (75.6%) responded they held some level of anxiety towards rapidly shifting to finishing a semester online, with 84.2% having discussed disease transmission actively and yet only 64.6% felt well prepared for emergency situations (23).

Also, in Cyprus, *Umut Akcil et al* tested by establishing a relationship between digital citizenship and e-learning. The

study was conducted among higher education students. It has been observed that there is a positive relationship between digital citizenship behaviors and e-learning attitudes. In addition, it has been observed that the negative anxiety of students due to the pandemic is reflected in their e-learning processes. However, overall results show that digital citizenship behavior digital learning process could be a positive response to COVID-19 closure period (24).

In Poland, Michal Baczek et al examined the students' perception of online learning during the COVID-19 pandemic. Eight hundred four students answered the questionnaire. According to respondents' answers, the main advantages of online learning were the ability to stay at home (69%), continuous access to online materials (69%), learning at your own pace (64%), and comfortable surroundings (54%). The majority of respondents chose lack of interactions with patients (70%) and technical problems with IT equipment (54%) as the main disadvantages (25).

In Indonesia was evaluated the teachers' attitude towards online learning during Covid-19 pandemic. There were 71 teachers with different demographic background from different state and private education levels in several parts of Indonesia voluntarily participating the self-administered survey using online google form. The results showed that 64.8% of the institution the teachers worked provided online facilities, but 73.2% of the respondent still used their own addition media. 52.1% of the respondent did not feel have problem with online learning, but 23.9% were happy teaching in online mode. Moreover, 22.5% respondent agreed and 16.9% strongly agreed that online teaching must be implemented in addition to conventional mode after COVID-19 pandemic is over (26).

All these studies, as well as our study, confirmed that online education is a powerful tool for teaching medical students and useful tool education for academic staff. However, successful implementation of online learning into the curriculum requires a well thought-out strategy and a more active approach (27).

In general, the results of our study also indicate that in addition to great inexperience, both students and academic staff cope well during online education and the changed environment and learning conditions despite all the difficulties.

Our study has a little limitations and further huge researches are necessary to confirm these results. First, results were obtained by online survey, and second, response rate could be limited by this way of research. Although the scope of the questionnaire is limited to fourteen questions, and the number of the respondents represents a small group appropriate for a pilot study, the analysis of the answers the respondents wrote yields some consistent patterns which are repetitive throughout the entire corpus, highlighting some important aspects related to the students' attitudes towards the nature of online education. Anyway, the outcome of this study can be used as an input in the future educational and research plans of the faculties of biomedical sciences.

CONCLUSION

In summary, the lack of past experience on using online tools and education, were identified by students as the main barrier to online educations but ability to adapt to modern technologies as a characteristic of students as a vital part of society were identified as main advantage of online teaching model in biomedical sciences.

Although the pandemic of COVID-19 appeared as uncommon catalyst for promoting online education, further research is needed to assess whether learners are ready and willing to make greater use of online education to obtain high quality teaching and learning opportunities, which could totally change educators' and students' attitudes and impression, and subsequently the general themes of online education.

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CONFLICT OF INTERESTS

The authors declare that there was no conflict of interest regarding this manuscript.

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