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The impact of the COVID-19 pandemic on the education of medical students

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Abstract—The full-time education only was the traditional basic condition for the development of professional competencies of future health professionals. The COVID-19 pandemic, the digitalization of the medical field, and the effective global experience of distance learning have demonstrated the need to reengineer the established paradigm of medical education. The aim of the study was to assess the effectiveness of distance learning of Ukrainian medical students during the COVID-19 pandemic. The study involved content analysis, Computer Audio-Recorded Interviewing (CARI), face-to-face interviews, in-depth interviews, qualitative and quantitative analysis of the results of empirical research. Universal and specific problems of distance education are identified. The model of two-stage diagnostics of the state of distance education in medical vocational colleges of Ukraine (2020 - 2021) is presented. The results of the linear experiment showed a positive trend in: the quality of the Internet and the workplace arrangement of medical students (from 40% to 90%), special training in distance education technologies (from 13% to 74%), the use of unified educational platforms (from 39% to 100%), reduced stress level in students (from 100% to 60%), increased assessment objectivity (from 37% to 55%). Stereotypes about distance education as forced and ineffective in the development of practical skills (from 98% to 76%) remained steady. Online technologies in medical education require qualified scientific and methodological support of teaching. It is appropriate to develop and implement a national strategy, proven technologies of distance education for medical vocational colleges.

The focus of further research is the development of reference models, distance education technologies that can provide effective training of mid-level medical staff.

Keywords—distance education, online technologies, medical education, vocational college, bachelor-based junior specialists.

I. Introduction

MEDICAL education is a unique practice-oriented field of professional training, which a priori cannot be part-time. This well-established axiom has long determined the organization of the educational process for medical students. The basic condition for the development of professional competencies of health professionals the personal presence students, their involvement in contact with the practitioner-teacher and the patient, which clearly regulated the organization of the educational process as full-time only. Digitization of all spheres of professional activity, innovative methods of diagnostics, counselling, experience of online education accumulated by world universities testified to the need for post-Soviet countries to reengineer the traditional paradigm of medical education. The crisis caused by the

COVID-19 pandemic has aggravated the contradiction between the traditional interpretation of medical education as full-time only and modern educational trends.

Distance learning opportunities in Ukraine were low at the beginning of the pandemic, unlike the world's leading medical universities. Existing practices proved to be imperfect, undeveloped both in terms of the educational process, technologies, and "in the field of final exams and accreditation of specialists" [1]. At the same time, the effective experience of global medical universities in the application of distance learning technologies in teaching of clinical subjects have allowed them to optimally switch to online learning [2].

The scientific and methodological discourse of the research requires a clear understanding of the concepts of "medical education in Ukraine", "bachelor-based junior specialist". According to the Encyclopaedia of Modern Ukraine, "*medical education* is a system of training and improvement of medical personnel. The standards of the World Federation of Medical Education provide for a three-stage training of doctors:

university stage (single final exam; test system of knowledge assessment, credit-module system of education for 5-6 years, increasing the proportion of independent work in university clinics; rating assessment, elimination of midyear examinations; licensed integrated exams Step-1, Step-2; practice-oriented state exams);

postgraduate education (basic internship; two-year residency training; licensed integrated exam Step-3; competitive admission to clinical residency and specialization; development of distance education);

continuous professional development (credit system of continuous professional development; certification of activities; distance education; increasing role of medical associations; stimulating self-education of doctors) [3]; prospects for medical institution's private brand development [4].

The Ukrainian system of medical education has an additional educational level of the *bachelor-based junior specialist* — "educational professional degree based on professional higher education" [5], [6]. Training of mid-level practitioners in Ukraine is determined by the "initial level of higher education". So, Ukrainian colleges are not analogous to Medical College, University College in the EU or the US, where it is a higher education institution (HEI), [7]. The experience of training health professionals in the context of a COVID-19 pandemic describes the organization of the educational process in universities, bypassing the mid-level practitioners, which are trained by professional higher education institutions in the Ukrainian education system.

A. Aims

The aim of the article is a comprehensive study of the impact of the COVID-19 pandemic on the education of medical students in medical vocational colleges.

The aim involves a number of research objectives:

1) describe the challenges to medical education caused by the COVID-19 pandemic and the basic stages of reorganization of educational institutions in terms of adaptation to the distance learning requirements;
2) determine a relevant circle of respondents — students of medical vocational colleges — for the participation in empirical research;
3) develop a model of two-stage diagnostics of the state of distance medical education in vocational colleges of Ukraine as of June 2020 and 2021;
4) conduct self-assessment of the problem under research by the main recipient of educational services — students of medical vocational colleges by the following parameters: "pool of problems caused by the introduction of distance learning", "quality of education and public access to education", "reflection of distance learning experience".

II. Literature Review

The study of the organization of education of medical students during the COVID-19 pandemic requires an analysis of educational policy events that are synchronized in time with the research and analytical work. This entailed the development of a wide range of analytical reports [8]-[10], including the Wise Global Education Barometer prepared by Ipsos WISE [11]. The results of the international project Almost A Year Into The Pandemic implemented in 47 countries of the Gallup International Association [12] are significant for the selected issues.

The resolution of the World Health Organization on the global transition to distance learning technologies was the onset of the adaptation to the challenges of the medical education of the pandemic context [13], [14]. The next step was the creation of the Global Education Coalition in view of the COVID-19 in order to support countries in the process of implementing distance education [15]. Ukraine has also taken measures to establish a system of distance education simultaneously with the world practice (Table 1).

Table 1 stages of introduction of distance learning in educational institutions of Ukraine in the context of the COVID-19 pandemic

Item No.	Period	State educational policy measures	Legal regulation	Note
1.	2020, March	All educational institutions have switched to distance learning		Article 26 of the Declaration of Human Rights, the Constitution of Ukraine, the Law of Ukraine "On Education" define education as one of the basic human rights
2.	2020,	The educational process began	Regulations on Updated	In October 2020, the Ministry of

	September - October	under the adaptive quarantine. Educational institutions worked remotely; vacations were extended in some regions	Conditions for the Organization of Distance Learning, October 16, 2020	Education and Science recommended that schools set a vacation from 15 to 30.10; institutions of vocational, professional pre-higher and higher educational institutions — switch to distance learning
3.	2020, November - December	The Decision of the Cabinet of Ministers of 11.11.2020 established that groups of up to 20 people can attend all educational institutions	Recommendations of the Ministry of Education and Science for Professional Pre-Higher and Higher Education Institutions to Conduct Blended Learning Provided no More than 20 People in One Group (from 16.11)	According to the State Service of Quality Education, the Viber messenger was the most popular tool for organizing distance learning at the beginning of quarantine, which cannot be referred to as a full education.
4.	January 2021	Increased quarantine restrictions have been imposed, and attending all educational institutions was prohibited	Resolution of the Cabinet of Ministers "On the Establishment of Quarantine in Order to Prevent the Spread of Acute Respiratory Disease COVID-19 in Ukraine" (09.12.2020)	The Ministry of Education and Science provided a brief explanation to the pre-higher professional and higher educational institutions on conducting examination sessions remotely
5.	February-April 2021	The educational process was carried out remotely, as most regions fall into the "red zone"	On April 13, 2021, the Verkhovna Rada of Ukraine passed a law according to which 11^{th}-graders were released from the obligatory state final attestation	The Ministry of Education and Science did not publish recommendations for educational institutions on the organization of education during the quarantine restrictions.
6.	April 2021	Beginning of the regulated process of using personal protective equipment in all educational institutions	Resolution of the Chief State Sanitary Doctor of Ukraine "On Approval of Anti-epidemic Measures in Educational Institutions for the Quarantine Period in connection with the spread of coronavirus disease (COVID-19) of 23.04.2021	The participants in the educational process were not provided with personal protective equipment at the beginning of 2020/2021 academic year
7.	April 2021	The beginning of the teacher vaccination campaign	Roadmap for the Introduction of the Vaccine against Acute Respiratory Disease COVID-19, Ministry of Health, 24.12.2020	
8.	July-August 2021	Introduction of the legal norm that an educational institution can work normally only provided 80% of vaccinated workers	Resolution of the Cabinet of Ministers No. 787 of 28.07.2021 "On Amendments to the Resolution of the Cabinet of Ministers of Ukraine No. 1236 of December 9, 2020"	Recommendations of the Ministry of Health on Vaccination of Children and Adolescents Aged over 12 with Comirnaty/Pfizer vaccine, the issue of vaccination of students is raised for the first time
9.	September	Survey confirming low motivation	No recommendations	According to a study conducted in

	2021	of students (40%) and teachers (44%) in distance learning	were provided at the national level for the provision of psychological support to participants in the educational process	the United States, more than 60% experienced a deterioration in mental health, 80% experienced stress, anxiety, sadness, loneliness
10.	2021-2022	The blended and offline learning was allowed provided 100% teacher vaccination. Lack of material and technical resources, work skills, guidelines on the organization of the educational process	The European Commission has approved the Digital Education Action Plan for 2021-2027	Implemented information campaign "School, We Are Ready" (jointly with UNICEF-Ukraine), an online programme for professional training, exchange of experiences between teachers on distance education (EdCamp Ukraine)
11.	2022	At the beginning of 2022, 97% of secondary schools used distance learning technologies (Google Classroom, Zoom, Microsoft Teams, etc.). In universities, the distance education systems were implemented through the orders of rectors, introductory training and user skills training.	The Diia portal has launched an educational programme "Digital Skills for Teachers". The Ministry of Education and Science has issued " Recommendations for the Introduction of Blended Learning in the Vocational Pre-higher and Higher Education Institutions".	Universities with a well-established distance learning system (usually Moodle) were able to quickly arrange an educational process, others switched from Google Classroom to alternative platforms or completely chose Google services. 86% of Ukrainian teachers did not have significant experience in using online education tools at the beginning of 2020.
SUMMARY: the Ministry of Education and Science of Ukraine claims that the losses caused by the pandemic are not critical and estimates the decline in the quality of education at 8%, the progress in the quality of distance education from December to May — at +10-15%.				

Source: prepared by the author on the basis of Alsoufi et al. [16].

Switching the educational process into distance format has become the most urgent task of transformations of medical education in different countries. Table 2 presents the examples of basic solutions to this issue.

Table 2 organization of education of medical students in the context of COVID-19 pandemic: world experience

Item No.	Country, medical education institution	Closure of educational institutions, suspension of the educational process	First introduction of distance education technologies	Distance education regime	Involvement of students in volunteering aimed at overcoming COVID-19 (communities, hospitals)
1.	USA, University of Pennsylvania	-	-	+	+
2.	Canada	-	-	+	+
3.	Turkey	-	-	+	+
4.	Great Britain	-	-	+	+
5.	Libya	+	+	-	-
6.	Jordan	+	-	-	+
7.	Saudi Arabia				
8.	Brazil, University of Sao Paulo	-	-	+	+

Source: prepared by the author based on [16]-[22].

Scientific and practical research was published on the analysis of educational experience of students of applied majors simultaneously with the spread of the pandemic and the global introduction of distance learning systems [23]-[25]. The most pressing issues for medical institutions in post-Soviet countries were the following:

1) immature distance learning experience [26];
2) insufficient provision of high-quality Internet, computer equipment [25], [27];.

Medical students are the most vulnerable group in the didactic terms. This is due to the significant volume of clinical training, which is minimized through online tools. "The inability to attend medical institutions has led to a threat to quality practical training, certification, employment" [28], as graduates of medical universities also emphasized [28], [29]. Researchers argue the negative consequences of dormitory closure as the factor limiting clinical practice [30]. The only source of practical experience was volunteering in the departments for patients with COVID-19, which "did not provide knowledge and skills beyond this specifics" [31].

So, the list of "universal problems" of distance learning includes:

1) feelings of loneliness, minimized social interaction of students [24];
2) reduced self-organization, learning motivation [25];
3) mental health problems [24].

Specific problems inherent in medical education are:

1) general unreadiness of the medical education system for the full introduction of distance learning [32];
2) the impossibility of clinical training [28], [29], [32], because of the dormitory closure including [30];
3) large-scale involvement of medical students as volunteers in working with patients with COVID-19 as the only possible alternative to the development of professional competencies [16]-[22], [31];
4) lack of practical skills for successful employment according to the self-assessment of medical students [28], [29].

III. Methods

The theoretical and methodological background of the study is an interdisciplinary approach that integrates the tools of didactics, medicine, psychology, sociology, public administration. Methods of information, bibliographic, semantic search and analysis of sources in Google Scholar, PubMed, Scopus, Embase databases are applied.

Triangulation of research procedures was used to fulfil the research objectives:

1) content analysis of documents on the transformation of content, the organization of distance learning in the system of medical education in Ukraine;
2) two-stage questionnaire survey of students of medical vocational colleges using the Computer Assisted Personal Interviewing (CARI) (face-to-face interview according to the guide plan); qualitative and quantitative analysis, statistical and mathematical interpretation of empirical data, testing of the hypothesis;
3) 12 in-depth interviews with leaders of student self-government on the level of organization, access, quality of distance learning in medical vocational colleges.

The questionnaires included short questions with closed-ended answers to diagnose the main range of problems by the following parameters:

1) access, information support, organization of the learning process, socio-psychological comfort. Each answer was evaluated on the Likert scale;
2) the quality of education in distance learning. Respondents' answers were recorded in the questionnaire form.

The survey was followed by statistical data processing (Microsoft Excel 2010).

In-depth interviews provided for the involvement of student self-government leaders of medical colleges in the evaluation of the distance learning effectiveness. In-depth interview tasks: identifying insights on key issues; getting feedback on existing online learning systems; assessment of compliance of a new educational product with the stakeholders' requirements; outlining new opportunities for the development of distance learning for medical students. Table 3 presents the approximate structure of the interview.

Table 3 parameters of reflection on the effectiveness of distance learning in medical vocational colleges by student self-government leaders

Item No.	In-depth interview questions	Respondent's status	Answer description
1.	Introduce yourself, tell about your motives for choosing a medical profession.		
2.	Describe your impressions from the first years of study. Have you had any thoughts on changing your major?		
3.	Describe the educational components that were most valuable to you. Argue why.		
4.	What forms of classes (teaching methods, teaching technologies) medical students like the most?		
5.	Remind the beginning of the pandemic. How the educational process was organized, your first impressions of distance learning. What learning platforms did you use? What did the students like and dislike?		
6.	Can distance learning be considered a sound technology for training medical students?		
7.	Did you feel stress, psychological, social discomfort at the beginning and in the process of implementing distance learning? Describe the objectivity of assessing students' knowledge. Have the volumes of students' independent work increased?		
8.	Has the field studies schedule for the distance learning period changed? Were students involved in health care facilities as volunteers?		
9.	Were there any complaints from stakeholders about the problems caused by distance		

	education?		
10.	Was there training for students on algorithms for working online? Does the performance in offline and online learning differ?		

Source: prepared by the author

The pedagogical experiment involved 180 respondents (60 from each vocational college) in the first stage and the same number with a parity distribution in the second stage. The respondents were graduates of Khmelnytskyi Basic Medical College, Kamianets-Podilskyi Medical Vocational College, Chemerovetskyi Medical Vocational College of the following educational programmes (EP): Obstetrical Nursing; General Medicine Nursing; Nursing (Khmelnytskyi region, Ukraine).

The age category of graduates was chosen for the following reasons:

a) having learnt all the components of general education and basic training, students have fully moved on to learning special components and acquiring professional competencies;
b) senior students are able to assess the level of the resource and methodological background for distance learning, the quality of teaching, the objectivity of assessment, etc.;
c) leaders of student self-government are the representatives of students' public opinion. Their position on the degree of students' satisfaction with distance learning, changes in the volume of educational activities, flexibility of the learning schedule, academic integrity, etc. was significant;
d) the graduates were as objective and candid as possible; graduate status allows avoiding any prejudice from the administration and teachers.

The duration of the study is one and a half years. The initial diagnostics was made in June 2020, at the end of the first "pandemic" semester. The analytical conclusion of the study was passed to the management of vocational colleges, representatives of student self-government. In June 2021, re-diagnostics was performed by similar methods. Both stages provided for a separate assessment of each respondent, followed by reflection on the dynamics of change for each block of questions, drawing comprehensive conclusions based on the results of the study.

RESULTS

An important criterion for the effectiveness of the distance learning was the evaluation of the results of absolute and qualitative performance of students (on the example of one academic group, 25 people) (Table 4).

Table 4 comparative results of college students' performance (Nursing in Anaesthesiology and Intensive Care)

Academic year	**Number of missed classes**				**Total**		**AS***	**AP****	**QP*****
	lectures		Practical classes						
	For a good reason	Without a good reason	For a good reason	Without a good reason	For a good reason	Without a good reason			
2019/ 2020	116	24	124	18	240	42	3.7	84%	52%
2020/ 2021	48	19	47	16	95	35	4.4	92%	74%

*AS – average score
**AP – absolute performance
***QP – qualitative performance
Source: prepared by the author

The analysis of the indicators of the number of missed classes revealed a significant decrease (2.5 times) in the number of absences for a good reason in 2020/2021. Narrative analysis of in-depth interviews showed that the reason for the improvement in the indicator is the improvement of the Internet coverage, coping with the tools and technologies of online learning by students and teachers. A significant indicator is the number of students who were not admitted to the exam, and later expelled: two students in 2020/2021 compared to four in 2019/2020. Tables 5-6 present consolidated indicators on students' assessment of the quality of education, the most common problems caused by the introduction of distance learning.

Table 5 statement of the most common problems caused by the introduction of distance learning: self-assessment of students of medical vocational colleges

Item No.	**Questions**	**Academic year**	**Answer options, number / %**									
			Totally agree		Agree		Neutral		Do not agree		Totally disagree	
1.	Have you been quite familiar with the	2019/ 2020	18	**10**	28	**15**	48	**26**	62	**34**	24	**13**

	distance learning until 2020 (do you have experience of learning using distance technology)?	2020/ 2021	132	**73**	48	**26**	-	-	-	-	-	-
2.	The level of providing your workplace with information and technical means for the organization of distance learning: PC, screen, headphones with a microphone, webcam, etc. was sufficient for the organization of distance learning	Academic year	Answer options, number / %									
			Totally agree		Agree		Neutral		Do not agree		Totally disagree	
		2019/ 2020	24	**13**	38	**21**	36	**20**	68	**38**	14	**7**
		2020/ 2021	64	**35**	86	**48**	18	**10**	12	**6**	-	-
3.	Have you had quality Internet connection for distance learning?	Academic year	Answer options, number / %									
			Totally agree		Agree		Neutral		Do not agree		Totally disagree	
		2019/ 2020	56	**31**	67	**37**	22	**12**	16	**8**	19	**11**
		2020/ 2021	128	**71**	27	**15**	14	**7**	11	**6**	-	-
4.	Have you had to learn new programmes and/or platforms for learning?	Academic year	Answer options, number / %									
			Totally agree		Agree		Neutral		Do not agree		Totally disagree	
		2019/ 2020	93	**52**	58	**32**	29	**16**	-	-	-	-
		2020/ 2021	-	-	-	-	59	**33**	130	**72**	30	**17**
5.	The introduction of distance learning has led to an increased volume of students' independent work.	Academic year	Answer options, number / %									
			Totally agree		Agree		Neutral		Do not agree		Totally disagree	
		2019/ 2020	112	**62**	68	**37**	-	-	-	-	-	-
		2020/ 2021	89	**49**	76	**42**	15	**8**	-	-	-	-
6.	Were special courses on distance learning technologies, trainings on skills of work with new computer programmes/platforms delivered to students of your year of study/group?	Academic year	Answer options, number / %									
			Totally agree		Agree		Neutral		Do not agree		Totally disagree	
		2019/ 2020	-	-	24	**13**	86	**48**	70	**39**	-	-
		2020/ 2021	62	**34**	72	**40**	34	**19**	12	**6**	-	-
7.	Mark the educational portal/online platform through which distance learning was conducted with students	Academic year	Answer options, number / %									
			Zoom		Google Classroom,		Skype		Telegram, Viber WhatsApp, other messengers		Moodle	
		2019/ 2020	68	**38**	34	**19**	75	**42**	71	**39**	-	-
		2020/	64	**36**	24	**13**	16	**8**	14	**7**	62	**34**

		2021										
8.	All teachers used one online platform for distance teaching.	Academic year	Answer options, number / %									
			Yes		Yes, with some exceptions		Different platforms were used					
		2019/ 2020	- /	-	58	**33**	122		**67**			
		2020/ 2021	118	**66**	62	**34**	-		-			
9.	Describe your attitude to the statement: "distance learning has caused stress in students".	Academic year	Answer options, number / %									
			Totally agree		Agree		Neutral		Do not agree		Totally disagree	
		2019/ 2020	94	**52**	50	**28**	36	**20**	-	-	-	-
		2020/ 2021	49	**27**	54	**30**	56	**31**	18	**10**	3	**2**
10.	In case that the number of COVID-19 cases will increase daily, in what format should medical education institutions operate?	Academic year	Answer options, number / %									
			Only distance learning		Blended learning		Offline only		The educational process should be interrupted		Difficult to answer	
		2019/ 2020	-	-	61	**34**	19	**11**	62	**34**	38	**21**
		2020/ 2021	11	**6**	147	**82**	-	-	-	-	22	**12**

Source: prepared by the author on the basis of the empirical research results

Table 6. Assessment of the introduction of distance learning on the "quality of education" parameter by students of medical vocational colleges

Item No.	**Question**	**Academic year**	**Answer options, number/%**									
1.	Describe your attitude to distance learning technology based on your experience.		Positive, the only opportunity to study in a pandemic		Positive, partial use in the educational process		Neutral		Ineffective, in exceptional cases		Negative	
		2019/ 2020	-	-	61	**34**	19	**11**	62	**34**	38	**21**
		2020/ 2021	11	**6**	107	**59**	8	4	32	**17**	22	**12**
2.	Distance learning creates additional difficulties in the study of the educational material.	Academic year	Answer options, number/%									
			Totally agree		Agree		Neutral		Do not agree		Totally disagree	
		2019/ 2020	94	**52**	50	**28**	36	**20**	-	-	-	-
		2020/ 2021	49	**27**	54	**30**	56	**31**	18	**10**	3	**2**
3.	Materials (texts of lectures and presentations, development of practical classes, assignments for independent work with instructions) on the	Academic year	Answer options, number/%									
			Totally agree		Agree		Neutral		Do not agree		Totally disagree	
		2019/ 2020	-	-	58	**32**	64	35	40	23	18	10
		2020/ 2021	118	**66**	62	**34**	-	-	-	-	-	-

	educational components that you have learnt were presented on the educational platforms of the college.											
4.	Students had the opportunity to work with video recording of the lesson in case of absence (non-attendance).	Academic year	Answer options, number/%									
			Totally agree		Agree		Neutral		Do not agree		Totally disagree	
		2019/ 2020	-	-	58	**33**	62	**34**	42	**23**	18	**10**
		2020/ 2021	118	**66**	62	**34**	-	-	-	-	-	-
5.	The distance learning format allows developing practical skills of the health professionals.	Academic year	Answer options, number/%									
			Totally agree		Agree		Neutral		Do not agree		Totally disagree	
		2019/ 2020	-	**-**	13	**7**	49	**27**	62	**35**	56	**31**
		2020/ 2021	9	**5**	47	**26**	48	**27**	44	**24**	32	**18**
6.	Describe the level of your motivation for distance learning.	Academic year	Answer options, number/%									
			High		High, with a few exceptions		Medium		Lower than medium		Low	
		2019/ 2020	3	**2**	15	**8**	48	**27**	49	**27**	65	**36**
		2020/ 2021	21	**12**	42	**23**	62	**34**	23	**13**	32	**18**
7.	Students had the opportunity to receive individual advice from teachers in cases of incomprehension of the material, difficulties with learning.	Academic year	Answer options, number/%									
			Totally agree		Agree		Neutral		Do not agree		Totally disagree	
		2019/ 2020	-	-	24	**13**	86	**48**	70	**39**	-	-
		2020/ 2021	62	**34**	72	**40**	34	**19**	12	**6**	-	-
8.	The cost of offline and online education services should be the same.	Academic year	Answer options, number/%									
			Totally agree		Agree		Neutral		Do not agree		Totally disagree	
		2019/ 2020	-	-	-	-	16	**9**	96	**53**	68	**38**
		2020/ 2021	-	-	-	-	57	**32**	69	**38**	54	**30**
9.	Distance learning has influenced the objectivity of assessing the level of students' knowledge, skills and abilities.	Academic year	Answer options, number/%									
			Totally agree		Agree		Neutral		Do not agree		Totally disagree	
		2019/ 2020	112	**62**	68	**37**	-	-	-	-	-	-
		2020/ 2021	89	**49**	76	**42**	15	**8**	-	-	-	-
10.	The introduction of distance learning contributes to the manifestations of academic dishonesty (for example, copy off,	Academic year	Answer options, number/%									
			Totally agree		Agree		Neutral		Do not agree		Totally disagree	
		2019/ 2020	94	**52**	50	**28**	36	**20**	-	-	-	-
		2020/	49	**27**	54	**30**	56	**31**	18	**10**	3	**2**

	use of unregulated additional resources).	2021										

Source: prepared by the author on the basis of the empirical research results

The differences in the ranking of answers to Questions 1, 2, 3, 8 (total for the answer options "Totally agree" and "Agree") are indicative (Fig. 1).

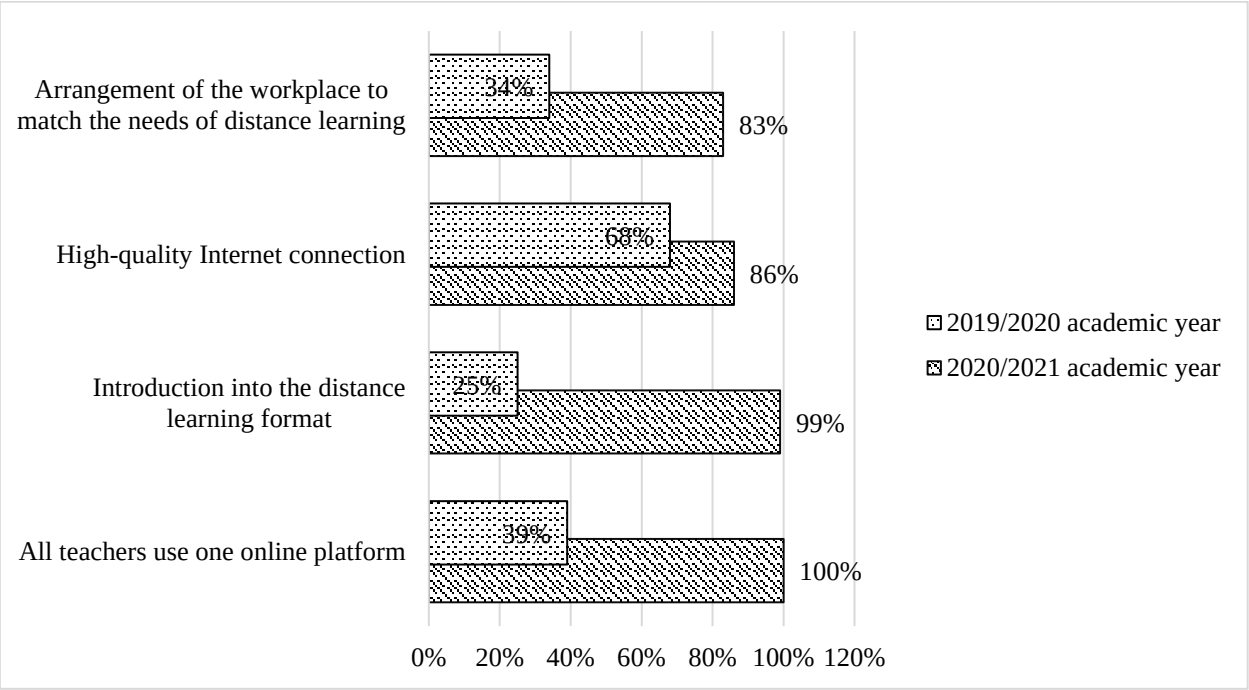

Fig. 1 ranking of answers according to Questions 1, 2, 3, 8 (total for the answer options "Totally agree" and "Agree")
Source: prepared by the author on the basis of the empirical research results

In the 2020/2021 academic year, students did not have to learn new programmes for educational activities (Question 4); 88% of respondents in 2021 against 34% in 2020 believe that given the growing number of COVID-19 cases, distance and blended learning formats are acceptable (Question 10). The results of answering the question about the organization of special training for distance learning are significant: 74% of respondents against 13%.

None of the students agrees with the statement about the same cost of educational services offline and online (Table 6, Question 8) (Fig. 2).

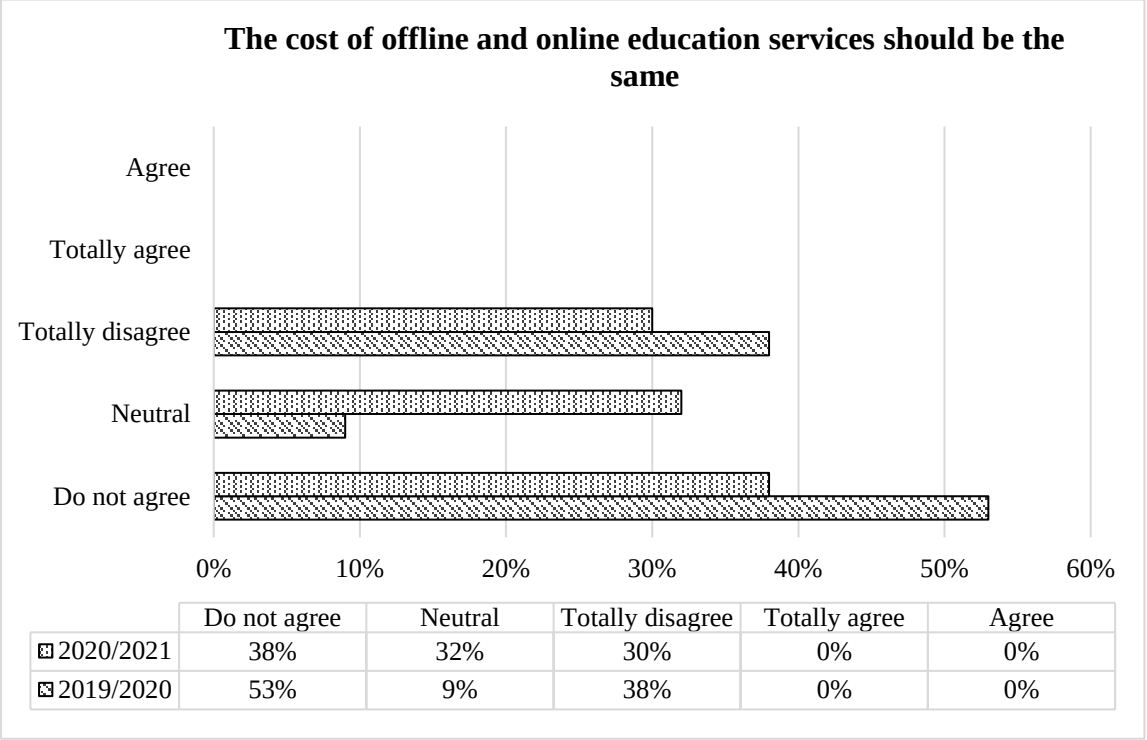

Fig. 2 results of answering questions about the cost of educational services in online and offline formats
Source: prepared by the author on the basis of the empirical research results

At the same time, 65% of respondents in 2021 against 34% in 2020 are loyal to distance learning, although only 31% of respondents in 2021 fully or partially agree with the possibility of developing practical skills in distance learning (in 2020, the share of such respondents was only 7%). Awareness of no alternative to distance learning as a form of education in a pandemic has led to increased learning motivation, increased objectivity in assessment and reduced manifestations of academic dishonesty (Table 6, Questions 6, 9, 9,10).

Describing the results of in-depth interviews aimed at reflecting on the effectiveness of distance learning in medical vocational colleges by student self-government leaders, we note the following:

1) the respondents have made conscious choice of profession (90% in 2020, 78% — in 2021);
2) 15-20% of the respondents had thoughts about changing the major, without significant differences between graduates of different years. The respondents noted that the pandemic forced them to rethink their chosen profession as "necessary, socially significant, but dangerous and unequally paid"; 70% of the respondents indicated a desire to get a job abroad.
3) Practically-oriented educational components, clinical training, practical training were also noted as valuable. Between an academic lecturer with a degree and a teacher-practitioner, students choose a teacher-practitioner. Loyalty (90%) to methodological errors in practitioners' teaching was demonstrated.
4) 100% of respondents experienced stress in the course of distance learning. Despite the involvement of distance learning algorithms, more than 60% of students felt incompetent in the new realities of the educational process. The objectivity rate in assessing student knowledge increased from 37% in 2020 to 55% in 2021.
5) The field study schedule for the period of distance learning changed, which caused dissatisfaction among students. Adult students were involved in work in health care institutions, social protection institutions as volunteers (within 15%).
6) The 2019/2020 academic year was characterized by numerous appeals from stakeholders regarding the problems caused by distance learning. In the 2020-2021 academic year, the number of such appeals decreased significantly and did not differ from the pre-pandemic period.
7) 90% of respondents in the 2019-2020 academic year and 78% in the 2020-2021 academic year do not consider distance learning a full-fledged technology of professional training. The results of in-depth interviews with graduates of professional medical colleges showed that there is a persistent stereotype about distance learning as "forced" and "ineffective".

So, the diagnostic methods and the results of the study of the transformation of the content of the educational process in medical vocational colleges in the context of the COVID 19 pandemic are effective, informative and need to be extended in view of the current situation and particular educational environment.

V. Discussion

The study created sound insights into the fact that the pandemic has become a catalyst for inevitable changes in the

medical education system as a whole [25] and in the training system of mid-level practitioners in Ukrainian medical vocational colleges). It is significant that various studies of the introduction of distance learning in the training of medical students were carried out simultaneously with the introduction of anti-pandemic measures both in world practice [23] and in post-Soviet countries [26]. We state that the organization of distance learning in medical vocational colleges of Ukraine has not been the subject of a separate study. Comparisons with EU and US medical colleges are not fully equivalent due to their diversity (professional pre-higher in Ukraine and higher education in Western European and North American educational practices).

There is a consensus among researchers [33], who define "pandemic" educational practices as "Emergency Remote Teaching and Learning" [34], and use a statement that "the medical education system has proved particularly unprepared for the transition to distance learning technologies" [32]. However, even imperfect distance learning technologies can serve as a "starting experimental platform" for the analysis of narratives, which is equally relevant for the world and Ukrainian practice. This is the basis for the formation of distance learning platforms [34] for future applied majors [35].

The pool of research used in the preparation of this article is descriptive, and changes in the education system are so radical that they differ sharply from established theoretical models [36]. The results of the presented empirical research conducted in Ukrainian colleges revealed: lack of distance learning experience, belief in unquestionably higher quality of offline education, undeveloped algorithms for final exams and accreditation of specialists, difficulties with employment, dormitory closures, a set of socio-psychological problems. The obtained conclusions are in line with the problems in the organization of distance learning at the global level. Special attention should be paid to the quality of Internet coverage and the technical means required for distance learning, which were also acute for students, for example, in India, Yemen, Nepal in the first stage of the pandemic. As of 2021, the situation for Ukrainian students has significantly improved in this context. Researchers from the EU, USA and India [24] note that the level of stress in medical students caused by the pandemic was much higher than in other groups of students. No such comparative studies have been conducted in Ukraine so far. In the 2020-2021 academic year, the problem of distance and blended learning was tolerated as the only possible form of medical education.

At the same time, the world's university practice has a well-established tradition of using distance education platforms such as Moodle, while vocational colleges used such messengers as Telegram, Viber, WhatsApp for educational purposes in the 2019-2020 academic year. Authors from post-Soviet countries noted the formal transfer of the educational process to the e-learning space, which "does not in any way mean solving the problem of distance education" because "not only the volume of information but also the way it is presented are important for students" [37].

It is significant that 96% of students of medical vocational colleges in 2020 and 69% in 2021 considered it necessary to significantly reduce the cost of educational services in the distance format (from 50 to 75% of the cost); the university community expressed similar views, but we do not have information on the expected reduction in the cost of educational services in Western European and American educational practices. The experience of online clinical learning is gaining ground in world universities [38], while it remains an innovation rather than an established practice in Ukraine.

There are significant differences in the experience of mass involvement of medical university students as volunteers in working with patients with COVID-19 [31], while this figure was only 15% among students of Ukrainian medical vocational colleges.

The following hypotheses are confirmed: on the dynamic changes in the organization of distance learning of medical students; tolerance of online education; lower quality of distance learning compared to the university; and the belief in the priority of full-time or blended forms of education in the training of mid-level practitioners.

VI. Conclusion

The results of theoretical and methodological generalizations, the results of empirical research, allow drawing the following conclusions.

The COVID-19 pandemic has been dynamically accelerated the digitalisation of the educational process, which has become a distinctive feature of 21st-century education. However, the pandemic has become a force majeure even for the world's medical universities, which have virtual laboratories and simulation equipment. The pandemic has created much more acute challenges for Ukrainian medical colleges — higher vocational institutions. According to the results of students' surveys, we understand that the use of digital technologies and distance learning platforms in Ukrainian educational practice was mostly formal before the pandemic.

Reliable valid research results were obtained through the diagnostic methods, represented by the triangulation of research procedures: content analysis of documents, two-stage questionnaire survey of students, in-depth interviews, sample size — 180 people. The results of the linear experiment showed positive dynamics in: the quality of the Internet and the workplace arrangement of medical students (from 40% in 2020 to 90% in the 2021 academic year), the organization of special training on distance learning (from 13% to 74%), unification of educational platforms, transition from messengers to specialized digital educational technologies (from 39% to 100%), reduction of students' stress levels (from 100% to 60%), increased assessment objectivity from 37 to 55%.

Stereotypes about distance learning as ineffective in terms of developing practical skills, the one contributing to academic dishonesty (from 98% to 76%), remain persistent. The sharp — triple — reduction in the number of classes missed for a

good reason (usually due to problems with Internet coverage, no workplace for the student, illness) is significant.

The students currently do not approve the idea of a sharp increase in the volume of distance work as a new educational norm. At the same time, the desire to return to medical education after the end of the pandemic is in conflict with expert forecasts. The hypothesis of lower-level medical education compared to university, the quality of distance learning in medical vocational colleges, the priority of offline or mixed forms of education in the training of mid-level practitioners was confirmed through summarized data.

The focus of further research is the development and testing of reference distance learning models that can provide an effective system of training of mid-level practitioners in Ukrainian medical vocational colleges. The research results will be used to share the experience gained at medical colleges in the post-Soviet space.

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