

## INTERNATIONAL STUDENTS' PERCEPTION OF TEACHING MICROBIOLOGY, VIROLOGY AND IMMUNOLOGY AT MEDICAL UNIVERSITIES IN UKRAINE

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The increase in the number of international students at medical universities in Ukraine has made great demands for the quality of instruction in the first three years of study when adaptation of these students takes place. The aim of the paper is to analyse international students' perceptions of teaching Microbiology, Virology and Immunology (MBVI) at Bogomolets National Medical University and outline the recommendations. A mixed research method was applied; the questionnaire with close-ended and open-ended questions grouped in nine sets was developed. Anonymous survey was conducted with the students ( $N=104$ ) after completing the MBVI course with English as a medium of instruction. The survey has indicated general satisfaction of the respondents with the course. Insufficient proficiency in English often affects the quality of learning, and a low level of the Ukrainian or Russian language skills create difficulties in their communication and effective integration to the Ukrainian cultural environment. The survey results have shown the positive attitude of the respondents to the lectures with the requirement to have more interactive communication between the lecturer and students as well as have identified the difficulties concerning practical classes and self-study. The recommendations on how to improve academic performance of international medical students have been given. The focus is on increasing and maintaining language skills, consideration of ethnic and psychological features of students from different countries and implementing interactive teaching methods so that effective interaction in the learning environment could be achieved.

**Keywords:** international medical students; English as a medium of instruction; adaptation; course in microbiology, virology and immunology.

### Introduction

The main task of higher medical education in the context of globalisation, economic internationalisation and, consequently, strengthened competition among educational systems of different countries is to train professionals capable of working effectively in the modern world. In this regard, the demand for higher education abroad has increased significantly, which requires new methodological approaches to the educational process in training specialists in the field of medicine.

The rapid growth of knowledge in the medical field and powerful development of information technology lead to challenges in the system of training and professional development of specialists (Inamorato dos Santos et al., 2019). The research by Cleland et al (2018) has stressed the role of the supportive learning environment that should be created by medical schools to help students achieve success. Particular attention should be paid to the training of international students at medical institutions of higher education (Astfalk & Müller-Hilke, 2018; Huhn et al., 2015; Przyłęcki, 2018; Schulze et al., 2018).

The statistical data from the Ukrainian State Centre for International Education indicate the constant growth in the number of institutions of higher education with international students – from 185 to 443 over the last 3 years. The total number of students has increased from about 53,664 in 2011 to 75,605 in 2018, with a large share of students coming from countries such as India (19.8 %), Morocco (9.8%), and Azerbaijan (8.2%). Among ten most popular Ukrainian universities, there are eight medical universities proving the fact that they are the top choice for these international students. Bogomolets National Medical University takes the fourth position among all universities and the second one among medical universities after Odessa National Medical University (Ukrainian State Centre for International Education, 2020).

As early as in 2004, Bogomolets National Medical University started to train international students using English as a medium of instruction. Currently, international students are doing the following specialities: Medicine, Dentistry, and Pharmacy. Until now the number of such students has grown significantly, and every year over the last five years more than 700 foreigners have become the first-year students at Bogomolets National Medical University. These are the students from Ghana, Jordan, Saudi Arabia, Iran, Iraq, Palestine, India, Lebanon, Kuwait, Chad, Nigeria, Turkey, Poland, Sweden, and the USA.

Studying Microbiology, Virology and Immunology (MBVI) lasts two terms in the second (specialities Pharmacy, Dentistry) and in the second and third (Medicine) years of study. Compared to the world practice,

in Ukraine this course traditionally combines three different disciplines: microbiology, virology and immunology. The course is extensive and informative, taking 8.5 ECTS credits in the curriculum of training the students obtaining a qualification in Medicine and 5 ECTS credits for the students doing Pharmacy and Dentistry. The theoretical concepts acquired during this course provide a foundation for studying the clinical subjects, so the MBVI course can be considered as a prerequisite to Infectious Diseases and Clinical Immunology. Since for the international students this course is taught in English, there appear some difficulties and additional requirements to the preparation of both students and teaching staff who are not native speakers of this language. For example, the learning material must be thoroughly considered, properly delivered by using visuals and applying a lower speed to convey all necessary information. Thus, exploring these challenges and finding the solutions to them arouses a growing interest.

In recent years there has been growing interest in studying the problems of teaching MBVI to international students. Kryzhanovskaya et al (2018) investigated the methodological approaches to delivering lectures on MBVI at medical universities, the features of this course and ways to improve it for international students. Hamorak (2015), Ngamskulrungraj et al (2017), and Brockman et al (2020) presented their experience of teaching MBVI with the use of interactive and distance learning technologies.

Clearly, the growing interest in teaching international students makes great demands for the quality of education, and peculiarities of teaching fundamental, special and clinical subjects to international students should be considered. To a large extent, this applies to teaching the first-to-third-year students because at this time psychological and sociocultural adaptation to the unknown educational environment and traditions of the country takes place (Przyłęcki, 2018). Yang et al (2018) considered the factors that can influence the adaptation of international students, such as age, gender, local language, personality features and state that self-determined motivation can help to cope with culture shock and stress.

Yang et al (2019) addressed their research to the challenges of implementing medical educational programmes with English as a medium of instruction. The language of instruction is English since this language is considered to be the leading international language of medicine and research and an essential tool for international scientific communication (Gupta et al., 2017). Demiral Yilmaz et al (2020) claim that among prominent factors affecting social adaptation are as follows: social relationships; differences in language, culture, race, politics, and the education system; homesickness, and discrimination issues.

Kostiuk (2015) studied the adaptation of international students to the life and study in the different country in a trilingual environment. The author highlights the role of the MBVI course as it is at the time of doing this course that the international students experience difficulties in adapting to the Ukrainian environment. The majority of international students come from Africa and Asia so English is not their mother tongue. Moreover, there are no strict requirements to the knowledge and academic skills of foreign applicants to enter Ukrainian universities (Gresham & Ambasz, 2019). Therefore, an insufficient level of proficiency in English as a means of study and communication and the absence of any in local language often influences the process of adaptation to a new setting. Huhn et al (2015) state that up to now the common problem has been the perceived lack of language proficiency of international students at the initial stage of their studies.

On the other hand, our experience shows that there is one more factor to be considered: a mother tongue of the teachers of MBVI is either Ukrainian or Russian, and English as a language of teaching is foreign for them. The level of proficiency in English requires constant improvement which has a significant impact on both the preparation for the lectures and practical classes and the quality of teaching. It imposes the limitation to the vocabulary of the participants of teaching process, difficulties in communication, explanation, and even the understanding of pronunciation.

If psychological features of international medical students are not considered in a trilingual educational environment, especially while teaching MBVI in the first years of study, some students develop indifference, sometimes even a negative attitude to the course. Thus, students often demonstrate superficial knowledge, lack of creative thinking, and inability to put their knowledge into practice. This requires the use of more effective forms of teaching to develop professional competence as a set of abilities, qualities and personality traits necessary for a successful career in a medical field (Kostiuk, 2015).

In the light of recent tendencies to involve more and more international students in studying in Ukraine, especially when English is used as a medium of instruction, there is now some concern about the quality of such medical education. Thus, the present paper **aims**:

- to analyse international students' attitude to the MBVI course, including their concerns about lectures and practical classes;
- to identify the main problems in teaching MBVI to international medical students and give some recommendations on how to solve them.

## Methods

### *Research Design*

Different methodologies in designing research and data analysis are used while doing pedagogical research, and the most popular are both quantitative and qualitative ones (Tilley, 2019; Eyisi, 2016). Cohen et al (2011) discuss the advantages and disadvantages of these two groups of methods, stating the fact that a quantitative research approach considers human behaviour as an object that can be controlled, thus ignoring opinions as opposed to a qualitative approach. The current study used the mixed research method: quantitative data generates objective, conclusive and numerical figures, so allows us to identify the attitude of the international students to the MBVI course on the basis of the developed questions; qualitative data permits us to focus on understanding students' opinions and to interpret the experience by using small and purposefully selected samples. In order to validate the results of our research, we designed the questionnaire that consisted of 22 close-ended and open-ended questions combined in nine sets for data analysis.

### *Sample*

In December 2019, among 551 third-year international students at Bogomolets National Medical University who had completed the English-language course in Microbiology, Virology and Immunology we chose the representative sample on the basis of their academic performance, sex and age (17-24 years old). On the whole, 110 students agreed to fill the questionnaire, but since six questionnaires were completed partly and could not be considered valid, 104 questionnaires have been analysed in the research.

### *Instruments and Procedure*

The data collection included the use of a questionnaire that consisted of 22 questions of both close-ended and open-ended types in English. Besides the questions that asked about nationality, English as a mother/foreign language, and general opinion on the MBVI course, there were items that were rated on a 5-point Likert scale ranging from "totally disagree" (1) to "completely agree" (5) or from "fair" (1) to "excellent" (5); from "I don't like it" (1) to "I like it very much" (5); from "very difficult" to "very easy". These questions were combined with the open-ended ones to delve deeper into the students' impression about the lectures, practical classes in MBVI as well as their adaptation experience.

### *Data Analysis*

Data analysis was conducted in three stages. At the first one, the printed questionnaires were completed by the international students. Then a focus group of four teachers discussed and identified the themes in students' responses to open-ended questions. Quantitative data from the questionnaire surveys were collected in a form of excel sheet and statistically analysed providing frequencies and percentages. At the third stage, all qualitative data received from the respondents in the survey underwent analysis and interpretation, using a comparative method of analysis and open and template coding techniques (Blair, 2015).

### *Ethical issue*

According to the ethical considerations for qualitative research (Traianou, 2014) all students were informed about the aims of this survey and of their right to withdraw from it at any time. The questionnaire, to which a consent form was attached, did not contain any identifiable information (names, group number, age).

## Results

The results of the survey showed the general positive attitude of the students to the course in Microbiology, Virology and Immunology (MBVI) and allowed us to reveal some issues that appeared during the teaching process. The data obtained were collected in nine sets in accordance with the sets of questions in the questionnaire.

**Nationalities and mother tongues of respondents.** The first set was related to the questions about the nationalities of the students and their mother tongue. The breakdown of the respondents by nationality was as follows: Indians – 75 students, Nigerians – 7, Egyptians – 9, Ghanaian – 1, Iranian – 2, Israeli – 1, Korean – 1, Lebanese – 1, Moroccan – 3, Swazi (Kingdom of Eswatini) – 1, Syrian – 1, Yemenite – 1, and American – 1 student.

Only 7.7% of all respondents speak the English language as their mother tongue (3 students from India 3 – from Nigeria, 1 – from the Kingdom of Eswatini, and 1 – from the USA). The main part of students, mostly from India, consider English to be their secondary (76.9%) and a foreign language (15.4%) (Table 1).

**Table 1. Breakdown of the respondents by the English language usage**

Country of origin	The number of respondents	The English language is		
		a mother tongue	a secondary language	a foreign language
	Number (%)	Number (%)	Number (%)	Number (%)
India	75 (72.1%)	3 (2.9%)	61 (58.7%)	11 (10.6%)
Nigeria	7 (6.7%)	3 (2.9%)	3 (2.9%)	1 (0.96%)
Egypt	9 (8.7%)	0 (0%)	9 (8.7%)	0 (0%)
Ghana	1 (0.96%)	0 (0%)	1 (0.96%)	0 (0%)
Iran	2 (1.9%)	0 (0%)	1 (0.96%)	1 (0.96%)
Israel	1 (0.96%)	0 (0%)	1 (0.96%)	0 (0%)
Republic of Korea	1 (0.96%)	0 (0%)	0 (0%)	1 (0.96%)
Lebanon	1 (0.96%)	0 (0%)	1 (0.96%)	0 (0%)
Morocco	3 (2.9%)	0 (0%)	2 (1.9%)	1 (0.96%)
Kingdom of Eswatini	1 (0.96%)	1 (0.96%)	0 (0%)	0 (0%)
Syria	1 (0.96%)	0 (0%)	1 (0.96%)	0 (0%)
the USA	1 (0.96%)	1 (0.96%)	0 (0%)	0 (0%)
Yemen	1 (0.96%)	0 (0%)	0 (0%)	1 (0.96%)
<b>Total</b>	<b>104 (100%)</b>	<b>8 (7.7%)</b>	<b>80 (76.9 %)</b>	<b>16 (15.4%)</b>

As is seen from Table 1, the majority of the respondents must understand the course taught in English, being native speakers or bilinguals.

**Self-assessment of English language proficiency.** The second set of answers gives us the idea on how international students assess their proficiency level in English, Ukrainian, and Russian. According to self-assessment, the respondents have a quite high level of the English language communicative competence, whereas the majority of international students do not speak Ukrainian or Russian well. The self-assessment results show that 12.5% of the respondents think that their English is excellent, 84.6% of them find their English level to be very good and good, and 2.9% – satisfactory.

On the other hand, the Russian language is spoken very well and well by 4.8% of the international students, 35.6% of the respondents have a satisfactory level of language proficiency, and 59.6% either do not speak Russian at all or understand it fairly. As far as the Ukrainian language is concerned, the results are much worse: only 2.9% of the students assess their language proficiency level as very good and good, 15.4% state about their satisfactory level of language skills, 81.7% of the respondents have either insufficient or zero level of the Ukrainian language proficiency. Therefore, students' self-assessment indicates the sufficient level of language proficiency to understand the MBVI course.

**General opinion on the course.** According to the third set of responses, the majority of students (85.6%) appreciated the course in MBVI, 13.5% of respondents liked it partially, and 0.96% (only 1 of them) did not like the course. The participants of the survey agreed that the course was informative (87.5%), well presented (80.8%), up-to-date (71.2%), and covered all necessary information they expected (73,1%).

**Attitude to the lecture course.** The fourth set of questions concerned the students' attitude to the lectures, their understanding of the lecturer, interactive communication between the lecturer and students (Table 2).

**Table 2. Students' attitude to the lecturer of the MBVI course**

Questions from the questionnaire	The number (%) of respondents giving the positive opinion ('agree' or 'completely agree')	
The lecturer was:		
- enthusiastic;	76	73.1%
- able to explain the material properly;	77	74.0%
- encouraging.	71	68.3%
Interaction of lecturer with students was active.	70	67.3%
The English language of the lecturer was:		
- correct;	76	73.1%
- easy to follow;	78	75.0%
- easy to understand.	83	79.8%
I am completely satisfied with my lecturer.	55	52.9%

While describing the positive characteristics of the lectures on the course, the international students pointed out that lectures were up-to-date, easy to follow and well presented (67.3%), and slides were very informative and helpful to prepare for practical classes, especially because the soft copies of them were provided (21.2% of similar responses). In students' opinion, the lectures were interesting and informative, with excellent PowerPoint presentations full of examples from a real life. The students mentioned that "only important bacteria and viruses had been included in the syllabus". A few students gave the reserved characteristic: "not bad".

Interestingly, to the positive characteristics were added the ones about the physical environment, namely "the lecture hall was spacious and comfortable, well-lit and warm". A number of responses to the qualitative question were given about the personality of the lecturer: "the lecturer was very patient and always ready to explain", "has a very good command of English", "helpful and cooperative".

**Attitude to practical classes.** The fifth set of questions was related to the features of practical classes in MBVI (Table 3).

**Table 3. Students' attitude to the practical classes in MBVI**

Questions from the questionnaire	The number (%) of respondents giving the positive opinion ('agree' or 'completely agree')	
The teacher in practical classes:		
- was easy to understand;	93	89.4%
- presented the material related to real life experience;	84	80.8%
- gave the material useful for your future work.	91	87.5%
Self-preparation for practical classes was:		
- difficult;	65	62.5%
- too time-consuming.	61	58.7%
The references for self-study were:		
- sufficient for practical classes;	58	55.8%
- sufficient to revise for the exam;	55	52.9%
- easy to find the appropriate information;	52	50.0%
- relevant and interesting.	62	59.6%

As is seen from the table, the majority of the respondents appreciated the work of the teacher, but at the same time reported the difficulties in self-preparation for practical classes: 55.8% of the international students agreed that the references for self-study were sufficient to prepare for practical classes, whereas 19.2% of the respondents did not agree with that. Only half of the students (50%) did not have difficulties in finding the appropriate information, and for 59.6% of them the information is relevant and interesting.

Almost half the respondents (42.3%) gave the extended answers to the question: "What topics would you recommend us to include in the course?" In their opinion, more experiments with modern microbiological equipment should be carried out in the class (15.4%). The international students show the interest in the topics such as: "Treatment of emergent infectious diseases", "Diseases and microbial infections specific to different regions (e.g. in tropics)", "Parasitology", "Industrial and food microbiology", "Biotechnology", "Oncogenic viruses", "Clinical topics", and "Mycology".

Among the positive characteristics, in the open answers, the international students indicated "active interaction of the teacher with the group about each topic" (4.8% of the respondents), the possibility to revise for the qualification exam KROK-1, and usefulness of writing the protocols. In addition, the students liked the practical classes, describing them as informative (9.6%), interesting (5.8%), interactive (4.8%), and encouraging (1.9%).

A great number of qualitative responses were given to describe the teacher of practical classes, which confirms the importance of this point for them. The students indicated both the professional competence of their teachers and personality traits, as well as the level of the English language proficiency.

**Difficulties in understanding the lecture course.** The sixth and seventh sets of answers helped us to identify the main challenges that the respondents encounter while doing the course. As for the lectures, the issues concerned the fast speed of presenting information to the audience, the lack of interaction at lectures (2.9% of the responses), poor explanation and little time allotted for it without further practical studies on the whole material given in class (1.9%). All the respondents would prefer to have lecture slides with all information necessary for the exam so as not to search for it while self-study.

Some students (7.7%) admitted the problem of waking up early in the morning for the lecture or having the last lecture (feeling tired already). In addition, a few respondents (2.9%) pointed out the noise made by students during the lecture. One should admit that 33.7% of the students did not indicate the difficulties in understanding lectures at all.

**Difficulties in practical classes.** As far as practical classes are concerned, 32.7% of the international students had difficulties during study, requiring more time for laboratory works rather than protocols writing. They suggested giving the necessary material beforehand, i.e. at lectures, to understand it properly in practical classes. Some students found grammatical mistakes in the protocols (4.8% of the respondents). The most difficult topics for the international students appeared to be serological tests, fungal infection, zoonosis diseases, clinical microbiology, as well as using special terms. As expected, the difficulty in waking up early in the morning, especially in winter, was also indicated (6.7% of the respondents).

What is important is that some international students (11.5%) were not ready for autonomous study, which they admitted by themselves pointing out that the tests had been difficult and required extra work, the questions in the class had been too long and giving answers to them took more time than they had expected. They reported that sometimes they could not understand the tasks at all, and the numerous mistakes in their responses to our questionnaire show that it happened because of their poor performance in English.

**Self-assessment of knowledge by international students.** In the eighth set of questions, the international students assessed their level of knowledge of fundamentals as quite high: 16.3% of the respondents think that have excellent knowledge, 35.6% – very good, 33.7% state about good knowledge, and only 3.8% of them admit a fair level. After the completion of the course, their self-assessment of MBVI knowledge was more objective and modest: “excellent” – 8.7% of the respondents, “very good” – 30.8%, “good” – 45.2%. Thus, these responses give us evidence to say about rather high effectiveness of teaching the MBVI course to the international students.

**General adaptation to educational environment.** The ninth set of responses gave us a general opinion on the adaptation of international students to the educational environment and life in Kyiv as well as on the quality of their communication. Although the international students that participated in our survey got accustomed to life in Kyiv rather easily (57.7%), quite a few of them (20.2%) found it to be hard. The adaptation to the communication with fellow students was not difficult: 76.9% of the respondents found it easy, and only 7.8% of them had some problems with it.

## Discussion

More than ten years’ experience in teaching microbiology in English to international students has made it possible to develop a number of ways to improve teaching practice and to increase students’ involvement in the educational process and active interaction with the teacher. The results of the survey based on a questionnaire have allowed us 1) to understand whether such work is effective enough and 2) to identify the problems to be solved while the MBVI course.

One of the main problems faced by international students in the host country is the language barrier. According to our findings, English is the second or foreign language for the majority of international students at Bogomolets National Medical University. And although most of them rated their English proficiency as good and very good, all of the respondents admitted that a language, not cultural background, is an impediment to effective training. It is consistent with the study of Yang et al. (2019) who identified challenges involved in programmes with English as a medium of instruction, even though the students performed well in their examinations.

Huhn et al. (2015) studied the difficulties of foreign students related to poor language skills at the beginning of their studies, despite the fact that they had to demonstrate these skills during the application process. In Ukraine, to be enrolled for the study at medical universities (in our case – Bogomolets National Medical University), the applicants from abroad do not take any English language exam, and the submission of valid international certificate of language proficiency confirming at least B2 level of the Common European Framework of Reference (the Test of English as a Foreign Language (TOEFL), the International English Language Testing System (IELTS) or Cambridge English Language Assessment (CELA)) is not required.

Kostiuk (2015) points out that English language proficiency of the international students at Ukrainian medical universities is often insufficient for proper communication and effective instruction. This contrasts the responses from our survey, but our experience, as well as the presence of numerous mistakes in answers to qualitative questions, proves that the respondents tend to overvalue their English language skills.

On the other hand, the English language skills of teachers are another crucial factor for effective instruction. All the teachers of Bogomolets National Medical University who are engaged in the programmes

with English as a medium of instruction have done the English language course at the department of foreign languages of the same university, and in 2016 some teachers completed the British Council course. The lectures are delivered by the highly-qualified professors who have B2 level English certificates from the British Council. But although 76% of the respondents stated that the English language of the lecturer was correct, a continuous increase in language proficiency should be regular for all teachers (Gupta et al., 2019; Krajnov & Popova, 2019).

Since the surveyed respondents study in Ukraine, they often have to understand Ukrainian or Russian, even though they use English for study. The proficiency in these three languages can significantly influence the ability of international students to study, to solve everyday situational problems and get accustomed to a new cultural environment (Kostiuk, 2015). It is important to mention here that quite a few respondents speak Ukrainian (according to their self-assessment, 2.9% of the respondents have good and 15.4% – satisfactory level of language skills) which represents the tendency towards learning Ukrainian, not only the Russian language, by international students coming to Ukraine.

A low level of the Russian or Ukrainian language skills slows down students' adaptation to the learning environment because it might be an obstacle to developing a personal network of contacts with native peers, teachers, etc. It accords with Astfalk and Müller-Hilke (2018) who indicate the importance of personal surroundings in combating learning stress, fostering the development of a professional identity and promoting wellbeing. In their study, Astfalk and Müller-Hilke (2018) state that the cultural knowledge of international medical students should be incorporated into medical training by reforming the framework conditions of the educational programmes created by faculties. Thus, for example, within the German Medical Students' Association there appeared the project "International Medical Students" (Schulze et al., 2018) aimed at connecting local support programmes for international medical students, organising welcoming events, and promoting the integration of international students into students' community. At the same time, the international students may want to participate in social activities, but because of the fear of academic failures, they can choose to study instead of taking part in activities (Demiral Yilmaz et al., 2020).

Przyłęcki (2018) highlights that because of cultural and phenotypical differences contributing to the problems experienced in contacts with host students in Poland, the students from Africa and Asia have adaptation challenge and experience a great culture shock. Even more, these students claimed that they did not always feel safe in Poland (Przyłęcki, 2018). In contrast, in the tolerant community of Ukraine, the international students did not have difficulties in communication with fellow students: 76.9% of the respondents found it easy, and only 7.8% of them had some problems. It can be explained by the fact that international medical students at Bogomolets National Medical University do the course with English as a medium of instruction in the groups which are formed in accordance with their nationality, e.g. the students from India usually study together.

An important factor that must be considered is the difference between education systems and methods of learning preferred by the Ukrainian and international students. The students from different countries could have different, compared to Ukrainian, academic environments, levels of education and the curricula of the secondary education. They may have a different attitude to group work, discussions with tutors, individual learning, etc. Especially, it refers to the students from Africa, India and the Middle East who account for the majority of international students in Ukraine.

Hamorak (2015) found that students from Africa tend to learn more slowly. When working with them, it is not recommended to apply a democratic style of communication, but instead, to pay attention to the development of self-discipline. Students from the Middle East are more open-minded, interested in other people, and have no fear of criticism; they are easily irritated and not disciplined. In communication, they are considerate, calm, and prefer learning through discussions. All these features should be taken into account by the teacher, in particular when in one group there are international students from different countries.

In the Ukrainian setting, it is important to increase the quality of instruction to international medical students, even though, in general, our findings demonstrate the positive attitude of them to both the faculty and teaching methods. Reviewing the traditional roles of a teacher and a student, when the student plays an active part in the educational process, and the teacher is not only a transmitter of knowledge, but also a moderator of students' intellectual activity, can significantly improve the educational process. This is made possible by the involvement of interactive methods, information technologies, consideration of students' individual and psychological features, the use of distance learning courses and intellectual tasks aimed at developing flexibility and intellectual mobility (Mikhnenko & Absaliamova, 2018).

In 2017-2018, Bogomolets National Medical University put into use interactive lectures which last only 45 minutes, but allow combining the leading role of the lecturer with high student activity by using modern interactive technologies. Modern lectures at university perform a number of functions: informative,

educational, methodological, motivational (stimulate interest in science and importance of the subject), organisational (develop self-study skills and the ability to search the necessary information), and developmental (develop academic and self-assessment skills) (Nahorny et al., 2016). The interactive lecture contains the statement of the educational goal, rationale of the topic in question, presentation on specific questions, cross-curricular material, determination of professional orientation, answers to students' questions, summarising, etc. Every lecture for the MBVI course was accompanied by a multimedia presentation, the quality of which was highly appreciated by the international students (21.2% of the responses qualitative question about the opinion on the lectures).

At the same time, during the lectures, there is a problem with students' attention because of the language barrier. This requires as many slides as possible to present the material, reduction in the rate of giving the lecture as well as the information volume. The lecturer should involve the audience in the interactive activity by asking the problem questions, due to which they have the opportunity to independently come to the conclusions. This draws attention to the most important issues of the topic and enhances learning. The task of the teacher in organising such a lecture is to encourage students' mental activity, analytical thinking, reasoning, and making conclusions. As Alaagib et al (2019) claim, lectures based on problem encourage students to make the transition from listening to the learning material to its active assimilation.

Our findings show that more than half of the respondents (67.3%) were satisfied with interaction at the lectures, making the lecturer evaluate his/her work and consider how to increase this percentage, involving more students in interactive activities. We find it useful to introduce educational programmes for teachers, workshops on lecturing with feedback and discussion. Mirzazadeh et al (2018) present the experience of their university in implementing interactive lecturing workshop using peer observation and show how this practice can empower faculty members in effective and interactive lecturing method. Also, it is useful to apply the method of peer teaching as an alternative to one lecturer's activity (Ngamskulrungrroj et al., 2017). Another way to enhance the performance of international students among whom there are people with the low language skills is to allow the students to access podcasts of lectures where slides are accompanied by lecturer's narration as complement to traditional face-to-face instruction (Shaw & Molnar, 2011).

Practical classes account for the substantial part of the MBVI course. Our results prove that, although the majority of the respondents appreciated the work of the teacher in practical classes, they still have the difficulties in practical class performance (32.7%). The fact that almost half of the respondents (42.3%) gave various recommendations on the practical classes shows that this type of activity makes them worry.

All practical classes in MBVI are conducted according to the curricula. The initial level of knowledge is assessed by the teacher through a test control involving the questions formed on the basis of the qualification test tasks KROK-1 and through oral examination, after which there is a discussion of all the tasks to initial level of the student, his/her ability to think and to analyse mistakes. For most of the topics, the teachers developed case studies, which contain laboratory data and illustrative materials. Working on cases in a group encourages students not only to memorise the theoretical material received, but to form a holistic picture of the disease, apply in practice the methods of microbiological diagnostics of infectious diseases and choose appropriate preventive measures.

Due to performing laboratory works, theoretical material is learned better. The results of our survey showed that students highly appreciate the teachers who thoroughly explain the most difficult topics. At the same time, the international students would like to carry out more laboratory tests using modern diagnostic methods, but because of objective difficulties, the departments cannot always afford to engage students in practical work in the laboratories.

Brockman et al (2020) compared online and in-person microbiology laboratory learning experiences and made a conclusion that using online lab content is not worse than the in-person group as the former provides flexible schedules. We suppose that the creation of online laboratories may satisfy the international students' request to study modern methods of diagnosis in medical microbiology at their individual speed.

Furthermore, quite a few respondents pointed out the lack of all necessary information for self-study (Table 3), and some of them had difficulties in searching for it. Therefore, we completely agree with Brockman et al (2020) that convenient access to materials at any time (i.e. from off-site locations) can enhance the ability to study a new material.

One of the mechanisms to develop clinical thinking of students is the integration of clinical subjects with the disciplines of the first three years of study, and MBVI is one of them. While doing the MBVI course, international students both study theoretical concepts and learn how to use them independently in the study of clinical disciplines taught later (Kostiuk, 2015). For this purpose, didactic material to practical classes is substantially supplemented with photo illustrations of clinical examinations and results of



microbiological studies of patients with bacterial, viral, fungal infections, and it is used in the preparation of lectures as well. The respondents highly assessed their level of knowledge of fundamentals and MBVI (85% and 84.7% respectively), which proves the relevance of the used methods in teaching these subjects.

Taken together, the results obtained in the study allow us to suggest the following recommendations on how to improve teaching the MBVI course to international medical students. Firstly, as the English language is used as a medium of instruction, we suppose that the international certificate of language proficiency (at least B2 level) submitted before the enrolment could avoid the problem with the appropriate level of English to study. The teaching staff should be regularly engaged in the programmes on the development of their language skills, updating knowledge in the field of microbiology as well as improvement of their teaching methods and approaches to achieve the high academic performance of the international students. Secondly, we recommend to consider ethnic and psychological characteristics of the international students to ensure the positive interaction in the educational environment of medical universities. At last, carrying out the surveys aimed at revealing the students' perception of teaching MBVI can help both administration and teaching staff to identify the problems in teaching international students and solve them.

### Limitations

Some international medical students could not use English effectively and made many mistakes and short sentences; thus, self-administered questionnaire technique has been used in this study. Also, the survey was conducted only at one university, which restricts the generalisation of its results.

### Conclusions

Effective academic performance of the international medical students during doing the course in Microbiology, Virology and Immunology with English as a medium of instruction can be achieved provided the major problems and difficulties faced by international students are taken into account. Using a questionnaire on completing the MBVI course is one of the effective tools for identifying students' satisfaction with this course as well as the main issues in it. The results of the survey have indicated the general satisfaction with the course by the international students of Bogomolets National Medical University, although there is a problem with insufficient level of English language skills necessary for study as well as difficulties in communication using Ukrainian or Russian for personal communication. Language barriers appear to be an obstacle to a more effective integration of international students to Ukrainian cultural environment, whatever tolerant it is.

The MBVI course can be improved by implementing interactive teaching methods to the lecture course, combining the test control, case studies, laboratory work with obligatory discussion during the practical classes, and involving students in individual practice. The English language proficiency level of both the students and teachers should be constantly increased and maintained; ethnic and psychological characteristics of students from different countries should be considered so that effective interaction in the learning environment could be achieved.

Further studies should deal with the analysis of the international students' attitude to the course of MBVI after implementing the mentioned recommendations. Also, it will be important to find out the actual level of the English language proficiency of the international students to confirm their self-assessment as well as consider the opinion of teachers on the MBVI course by using questionnaires.

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Received: February 04, 2020

Accepted: May 06, 2020