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Ukrainian experience of the Internet and ICTs usage in the process of future physicians training at Danylo Halytsky Lviv National Medical University

Lyubov V. Manyuk

CONTACT: *Lyubov V. Manyuk, senior lecturer, Danylo Halytskyi Lviv National Medical University,*
E-mail: lyubov.manyuk@gmail.com

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Abstract:

Ukraine is making a remarkable effort to match the current global educational tendencies. New technologies and the Internet are being implemented in all spheres of educational activity, including higher medical education. However, despite the proved importance of the Internet and ICTs implementation in learning, there is a gap in understanding the students' interests as well as the current state of Web-technologies usage in studying. In order to determine the experience of ICTs usage for learning purposes by medical students and highlight the present problems of e-learning development in Ukraine, the study was carried out at Danylo Halytsky Lviv National Medical University. The survey involved 139 medical students of first through sixth year of study within three specialties, namely: general medicine, pediatrics, medical and prophylactic care.

The results of the survey show that Internet and its technologies are mainly used as the accessory means of study. Medical students search, overview and learn a dditional information including professionally-oriented one (83%, 116/139). Taking into account a high level of trust (7.6/10) to the Internet and the tendency of the students to discuss information from Internet with their colleagues (96%, 134/139) rather than professionals (65%, 90/139) the following situation could have negative consequences in their future professional activity due to the possible presence of incorrect information in such resources.

Students' interest in the usage of different Internet sources for additional learning material forms the background and stimulus for the faculty to provide the possibility of using these resources in the process of study. The primary educational tasks promoting the e-learning development in Ukraine might be the selection, recommendation and development of highly-qualitative Internet sources and materials, as well as the usage of institutional web-sites and social media pages for teaching and learning purposes.

1. Introduction

In just few years the Internet will celebrate the 50th anniversary. Its global usage, as well as the application of mobile technologies and social media in everyday life has influenced nearly all professional and educational spheres of activity. Medicine and medical education are no exception.

The usage of Internet and web-based technologies in order to facilitate the learning process forms the basis for the development of e-learning (Sangra et al., 2012). In the scope of higher medical education of Ukraine the notion of e-learning is new and being profoundly investigated (Friedman, 1996). The main direction of research in the sphere of e-learning at higher medical educational establishments (HMEE) in this country is focused on the implementation of Internet technologies at the post-graduate level and continuing education rather than undergraduate level (Voronenko, 2011; Hryn et al., 2013). In recent times, however, web-based learning has been widely incorporated as a supplementary means of learning in addition to the face-to-face learning in the classroom (Kalibabchuk, 2011; Paikush, 2013). In this context e-learning is characterized as an

effective means of delivering both theoretical and clinical material when combined with traditional methods of sharing and acquiring professional medical knowledge. The benefits are convenience, timeliness, reduced cost, and an increase in students' motivation and attraction (Tse Yan Li et al., 2015).

Higher medical education of Ukraine is characterized by the increasing availability and growing involvement of information and communication technologies (ICTs) in the study process. New methods of teaching and learning based on the usage the web-technologies are being developed by the faculties at HMEE. The objective is discover efficient usage of new technologies as well as pedagogical approaches for teaching medical students, incorporating ICTs and Internet (Ruda, 2013). The institutions of higher medical education develop media with learning material. Useful and required information on learning process is commonly available to medical students on the web-sites of medical universities and academies, virtual learning environment and in social media.

The process of web-technologies implementation in higher medical education in developed countries extends far beyond the analyzing and developing theoretical bases of e-learning. More than a decade ago the scientists stated the significance of e-learning involvement as a supportive complement to a traditional instructor-led learning (Ruiz et al., 2006; Cook, 2006) and the importance of developing new online educational environments (Masters & Ellaway, 2008). Compared to Ukrainian advance in research, which is still focused on determining the effectiveness of Internet technologies, current foreign papers on implementation of e-learning and its components in medicine are mostly dedicated to the issue of improving the level of online delivery of educational material, enhancing the quality of the learning content via Internet, presenting the state of Internet usage and determining the techniques of efficient Internet usage for learning purposes by medical students, as well as the use of social networking sites with learning objectives.

The problem of Internet usage at HMEE has been researched from two perspectives. First, it has been investigated as the problem of development and implementation of e-learning resources by the professionals, and secondly, as the problem of the usage of the developed product by medical students. The necessity of Internet use by medical students and the requirement for self-developed Internet sources of information for future doctors have been researched by D.A. Cook, J.G.Ruiz, M.J. Mintzer, R.M. Leipzig (2006), K. Masters & R. Ellaway (2008); the social media usage in the process of study at HMEE has been analyzed by C.C. Chest, T.E. Flickinger, M.S. Chisolm (2013), D.R. George, C. Dellasega (2011), S.E. Bialy, A. Jalali (2015), G.S. Ryan, T. Kind, K.S. Chretien (2010); the instructor's role in the process of learning with ICTs has been described by R. Ellaway (2011); the usage of Internet sources in teaching and learning clinical procedures has been explored by A. Raikos, P. Waidyasekara (2014), T.Y. Li, X. Gao, K.Wong, C.S. Kwan Tse, Y.Y. Chan (2015).

The most prominent Ukrainian scientists researching the branch of e-learning in medical education are: Yu.V. Voronenko, O.P. Mintser, V.V. Krasnov (Voronenko et al., 2009), who investigate the implementation of e-learning in the system of post-graduate education and the usage of the technologies of e-learning in the undergraduate study, L. Lyakhotska (2012), M. Paikush (2013), V. Kalibabchuk (2011), O. Ziukov (2012) who described the methods and techniques of e-learning organization for teaching basic disciplines at medical universities. However, the notion of e-learning in Ukraine is mainly associated with learning theoretical medical subjects rather than practical ones.

The present situation of e-learning implementation at Ukrainian higher medical educational establishments has not been researched enough to make conclusions about the level of its evolvement, the interests of students in the usage of such technologies, problems and possible prognoses of e-learning in the context of higher medical education of Ukraine. In order to fill this gap the following research has been carried out. The main objective of the research is to investigate and analyze the present situation concerning the usage of the Internet in the learning process by medical students, their motivation and attitude towards this learning instrument.

The research was performed to check the hypothesis that medical students often search the Web to find answers rising in their academic activity and use Internet as the instrument to discover professional medical information required for the learning purposes. It is expected to prove the necessity of the e-learning development and effectiveness of personal learning resources in Internet resulting from the particular interests of students. In order to investigate the experience of using Internet-technologies by medical students for the learning purpose, as well as the impact of open Internet sources of information, a large-scale quantitative study was carried out at Danylo Halytsky Lviv National Medical University (DHLNMU). In addition, the

obtained data may be useful for determining the main problems and prognoses of e-learning in higher medical education of Ukraine.

2. Description and methods of the study

The study was conducted from 11th till 22nd May 2015. It was carried out in order to discover the experience of medical students in the usage of Internet and how it facilitated their studies. The study involved the students of first through sixth year of study within three specialties, namely: general medicine, pediatrics, medical and prophylactic care. The term of studies by these specialties is six years. The curricula, syllabi and subject matter are integrated with the aim to develop professional competency, facilitating the learning process and improving the quality of higher medical education.

During the first two years of study medical students learn theoretical bases of medicine by learning the subjects like anatomy, biophysics, biochemistry, histology, microbiology, etc., and enhance their social and humanitarian knowledge with additional studying in such disciplines as history of medicine, philosophy, psychology, Latin, and foreign languages. From the third year of study these future doctors start their clinical study. They learn clinical subjects, have practice in teaching hospitals. Starting from this time the amount of clinical practice and contacts with patients increases every year (DHLNMU, 2016; Zimenkovsky et al., 2015).

In total 139 medical students gave the answers to the questionnaire (Appendix 1). The participants included female (93 – 67 per cent) and male (46 – 33 per cent) students aged 18-26 years. Most of the students (88 per cent, 122/139) were aged 18-22. The participants were categorized as six groups according to the year of study (Figure 1 near here). In the selection process no criteria concerning the academic performance, gender or age were applied. The protocol of the study was discussed at the meeting of the department of Latin and foreign languages at DHLNMU.

The questioning was performed mainly for the whole academic groups except the students who were absent during the classes. The first (1st and 33rd academic groups) and second year students (7th and 20th academic groups) were reached after the classes of "English for medical purposes". The third year students (19th and 22nd academic groups) filled in the questionnaire after the classes on pathologic anatomy and hygiene respectively. Unfortunately only one – 26th academic group of four-year students participated in the study after the class of social medicine. The fifth year students (24th and 25th groups) responded to questionnaire after the classes of internal medicine and anesthesiology. The questioning in the abovementioned groups was organized with the help of colleagues from different departments of the university.

The academic groups of sixth year medical students were distributed for the practical training in almost all health care establishments of the city. Due to this situation organization of the questioning for the whole groups appeared rather difficult, thus questioning of those students was provided by reaching each participant personally.

The questionnaire was self-designed especially for the following study. It consisted of closed and open questions aimed to determine: demographic information about the participants (age, gender, year, and faculty), ways of Internet usage for the self-study, experience in using Internet during the face-to-face classes, types of Internet sources used for learning purposes, clinical procedures learned through the Internet, the state of sharing useful learning material from Internet with the colleagues and teachers, the level of trust to the information from net, general usefulness of Internet sources for study and students' actions in case of receiving contradictory information from Internet sources.

The questionnaire was written in Ukrainian language as all of the participants were Ukrainian medium students. To obtain the most accurate data the questionnaire contained the terms and notions suggested by famous Ukarainian researches in the branch of e-learning and distance learning, namely: B. Shunevych (2000), A. Kilchenko (2014), O. Borzenko (2012). *Internet technologies* were defined as learning materials and means (texts, photos, multimedia presentations, videos, animations, graphic illustrations, etc.) that are openly available in the Web. Such notions as *Internet-resources/resources of Internet/Internet sources/sources of Internet* were used to determine the informational portals, platforms and sites that are also freely accessible in the Internet. With the aim of differentiation between the types of students' academic activity performed with ICTs the following terms were used: *practical class/face-to-face class/full time class* – types of classes which require a physical presence of a teacher and *self-study/out-of-classroom study/independent work* characterize the types

of learning process performed without the supervision or full-time instructions of a teacher and controlled after the completion. As one of the goals of the research was to discover the experience of learning *clinical/medical procedures/manipulations* in the Internet, these collocations were used to denote any procedure of the curative purpose administered or performed by the specialist in the branch of health care (ULD-11 2016). In addition we defined *medical students/future doctors* as the undergraduate students of medical faculties at higher medical educational establishments before receiving a diploma and qualification of a „physician".

The total number of eleven questions included seven (1, 2, 3, 4, 6, 7, 11) closed ones with 5-6 options of answers. The participants were informed and could choose more than one answer. Other three questions (8, 9, 10) required estimation with a 10-point scale. One of the questions was an open one, students should have listed the practical skills learned through the Internet. Some of the questionnaire questions had the option "other" giving the possibility to the participants to state different answers lacking in the list.

Data analysis was carried out manually by calculating the obtained results and analyzing the received data with building tables and diagrams. A descriptive method was used to describe the social and demographic information. Methods of multivariate analysis and multilevel classification including determination of similarities and differences, links and conclusions, possible consequences and prognoses were applied to thoroughly interpret the study results and to identify the interactions before these results.

3. Results

The results of the study prove that all students (100 per cent) who filled in the questionnaire use Internet technologies with the learning purpose as all participants gave at least one answer to the question No 1: "For what learning activities do you use Internet?" (Table 1 near here). Moreover they defined "search for additional information" as the most common one (119/139, 86 per cent). Out of total 139 medical students 92 (66 per cent) mentioned using Internet for self-study. Almost equal number of participants 69 (50 per cent) and 67 (48 per cent) used Internet for learning about and overviewing clinical procedures. Only 31 per cent (43/139) of future doctors marked using Internet during practical classes. The fifth- and sixth-year students were the most active in the usage of Internet for their studies, while the freshmen were the most passive users. The results of second-, third- and fourth-year students were approximately equal. Activity was determined on the basis of medium number of responses.

According to the responses in the questionnaire 41 per cent (57/139) of participants confirmed the usage of Internet-technologies and resources during classes and 59 per cent (82/139), which is larger share, denied it (Table 2 near here). Only the fifth-year students gave more positive responses than negative (Figure 2 near here).

The carried out study aided to define the kinds of classroom learning activities with the usage of Internet (Table 3 near here). Demonstration of clinical procedures has the leading position in the chart (72/139, 52 per cent) and is followed by presentation of new topics (69/139, 50%) – the second place, e-testing and communicating with colleagues (38/139, 27 per cent and 28/139, 20 per cent) – the third and fourth positions respectively. Some students (5/139, 3.5%) added their own responses, namely: search for additional information (4/139) and social media with entertaining purpose (1/139). One of the students replied that Internet was not used during the classes.

From all available Internet resources which can be used with the learning purpose most students of Danylo Halytskyi LNMU highlighted the university's web-site (107/139, 77 per cent) (Table 4 near here). Other sources placed in accordance with the popularity are: You Tube (91/139, 65 per cent), social media (63/139, 45 per cent), forums / chats (22/139, 16 per cent), e-mail (29/139, 21 per cent), search engines (11/139, 8 per cent), encyclopedias (6/139, 4 per cent), medical web-sites (5/139, 3.5 per cent), scientific web-sites (5/139, 3.5 per cent), medical articles (4/139, 3 per cent), e-libraries (3/139, 2 per cent), dictionaries (2/139, 1 per cent), foreign medical web-sites (1/139, 0.7 per cent).

The fifth question was designed to identify medical manipulations/procedures searched or acquired in Internet. Table No.5 shows the full list of mentioned above procedures that are already arranged according to the popularity rate. Among 139 responders – 83 per cent (116/139) defined 20 medical procedures learned through the Internet, 3 per cent (4/139) did not determine any procedure, however stated that used Internet for learning clinical procedures many times. Moreover, carried out study determined that 14 per cent (19/139) of medical

students never used Internet to learn about clinical procedures. All of them are fourth-, fifth- and sixth-year students. It should be also mentioned that the first- and second-year students defined "surgical instruments", "information on biochemistry", "anatomy of systems and organs" which can be more likely characterized as theoretical medical material. Consequently, following data were not taken into account in our research.

Since in this part of study we wanted to emphasize on clinical procedures we further form their rate on the basis of the proportion of a number of students who answered the question No. 5 and the number of responses according to each manipulation. Thus, 116 students gave 228 responses to the 5th question. The significant number of answers (27 per cent) were: the procedures of medical examination (palpation, percussion, auscultation), (simple) surgeries (21 per cent) and desmurgy (10 per cent). The next group of medical procedures are the ones calculating less than 10 per cent from the general list, namely: injections, procedure of performing sutures or knot procedures, first aid, dissections, punctures, craniotomy, echocardiogram, resuscitation, catheter and colonic tube placements, and incubation. Some procedures were mentioned only once, for instance the delivery procedure, tactical medicine, dropper placement and the massage therapy. The third-year students gave the biggest number of responses. Their share constitutes 35 per cent.

The study also aimed to find out a state of sharing useful learning information from Internet with colleagues (Table 6 near here) and a teacher (Table 7 near here). The results prove that the students are more likely to discuss the information with their friends (96%, 134/139) than with their teachers (65 per cent, 90/139). In addition, 35 per cent (49/139) never addressed their teachers with such purpose and other 4 per cent (5/139) – do not have any experience of discussing interesting data from the Web with their colleagues.

The authenticity of Internet sources was estimated by medical students as 7.6 points within a 10-point scale (Table 8 near here). The level of confidence is approximately similar in all years of study, however the second- and fourth-year students tend to trust Internet more than other students. The level of trust is the lowest in sixth-year students.

With the help of the students' responses to the 9th question it appeared possible to determine the general usefulness of Internet-sources (Table 9 near here). By the following criterion from the maximum number of 10 points the fourth-year students granted the highest point – 9, and the sixth-year students – 7.8, which is the lowest result. The medium point for all students is – 8.4.

The responders estimated the learning usefulness of Internet as 8.45 by the 10-point scale that is the medium index among all participants (Table 10 near here). The highest index belongs to the second-year students and the lowest – to the sixth year students, who, on the basis of their answers to the 8th, 9th and 10th questions, are the most suspicious to the information from Internet.

If the data in the web is different than the information from the lecturer, 63 per cent (87/139) of responders would discuss the information with their colleagues, 60 per cent (83/139) – would check the authenticity of data with the lecturer, 37% (52/139) – would continue the search, 15 per cent (21/139) – will trust the information from Internet and the lowest result is – 3.5 per cent (5/139) who would ignore the information. Some students in such situation would prefer checking information in the printed sources (3.5 per cent, 5/139), compare with other sources (1 per cent, 2/139), believe the lecturer (≥1 per cent, 1/139), or discuss the issue with the lecturer (≥1 per cent, 1/139).

4. Discussion

The results of the study described above have forced the tentative conclusion that the global Internet and ICTs usage have influenced medical education. A modern and efficient learning process is currently impossible without ICTs involvement. Many new sources of information for learning have appeared with the advent of Internet. E-learning in the sphere of higher medical education is becoming more and more popular. Whereas the notion of e-learning in the context of HME of our country is used rather in the context of post-graduate and continuous education (Voronenko, 2011; Hryn, 2013), the obtained data of the study form the basis for other suggestions, since all interviewed students showed the use of Internet-technologies with learning purpose.

In higher medical educational establishments of Ukraine, Internet and its technologies are used as the accessory means of study. Useful learning information can be found on the institution web-sites or self-developed e-learning environments. In accordance with the Law of Ukraine "About higher education", and the resolution "About information distribution on the official web-sites of higher medical (pharmaceutical)

establishments and post-graduate establishments" (2014) the amount of general and learning information on the web-sites has been continuously growing. Such materials include students' guides to different subjects, headlines to practical classes, video and audio materials illustrating subject issues, multimedia lectures, and information for self-study (Liahotska, 2012).

Medical students actively use Internet for the self study. They search, overview and learn additional information including professionally-oriented one, thus improving their creativity, skills of independent critical thinking, and the ability of achieving professional solutions. The development of self-study skills plays a key role in the formation of effective and resultant learning process and further professional success (Paikush, 2013). However, in the process of self-study medical students meet organizational difficulties dealing with the selection of learning content. They try to solve these problems with the help of Internet (Kalibabchuk, 2011). Owing to the fact that more and more medical students frequently search the web to find the answers to both everyday questions and professionally oriented ones rising in the process of study there is a need to provide the correct, up to date content of learning material available in the Web.

In particular, students' interest in the usage of different Internet sources for additional learning material forms the background and stimulus for the faculty to provide the possibility of using these resources in the process of study. The most popular source of learning information for medical students of LNMU is the university web-site (107/139, 77 per cent). It proves the presence of required information for organizational or learning purposes on the web-site and makes hopeful prognosis of the e-learning development, thus modernizing and upgrading the educational process in general. It is time to shift from the evaluation of the usefulness of Internet in studies to the generation and development of efficient ways of Internet and ICTs implementation with the aim of improving the quality of future doctors training (Cook, 2006).

However, a danger appears in case of learning unchecked and untrue information in the Internet. Medical students (83 per cent, 116/139) mentioned that they searched the web for the procedure of different clinical manipulations. Taking into account a high level of trust (7.6/10) to the Internet and the tendency of the students to discuss information from Internet with their colleagues (96 per cent, 134/139) rather than professionals (65 per cent, 90/139) the following situation could have negative consequences in their future professional activity due to the possible presence of incorrect information in such resources.

It has also been found that some students (15 per cent) trust data received in the Internet more than those delivered by their lecturer. Since the case is not single, there appears a need to carry out additional study with the aim of discovering possible reasons for such lack of trust. The problem of choosing the right learning context in the following situation appears sharply. However, a positive aspect of the study is that the dominating share of the participants would discuss received information with colleagues (87 per cent) and teachers (83 per cent). Moreover, more than a half of students would check the information in different sources making the possibility of choosing right information more real.

The research found the degree of Internet involvement in practical classes. Taking into consideration rather difficult social and economical situation in Ukraine, that has influenced medical education too (Hadzhula, 2015), a determined index could be assessed as positive. From the total number of responders – 41 per cent stated that their lecturers used Internet sources during classes for teaching both theoretical and practical themes, presentation of a new topic (50 per cent), demonstration of clinical manipulations(52 per cent) and e-testing (27 per cent).

E-testing has become prevalent in higher medical establishments, but still progresses gradually unless there is the tendency to intense IT development and computerization (Ziukov, 2012). In general, 27 per cent (39/139) of students confirmed e-testing usage. Half of these students are the second-year students who learn a course of medical informatics. The department of medical informatics is known to have beneficial technical conditions – highly equipped classes, sufficient number of computers – to perform e-testing (DHLNMU, 2015). Thus, it might be suggested that the students meant medical informatics when gave answer to that question of the questionnaire. In the following condition, the state of e-testing organization seems unsatisfactory and there is a current need to find some solutions as the effectiveness of this type of knowledge control is long ago proved. E-testing could encourage the students to self-study and improve learning activity (Ivanov & Meleshchenko, 2006).

Students' learning activity in the Internet are approximately equal in all years of study and is confirmed by our study. In addition, students evaluate Internet as both generally useful (8.4) and useful for learning

purposes (8.45). It means that Internet has become irreplaceable learning instrument destroying the barriers of study and communication and in case of accurate and responsible usage could be a reliable means of undergraduate medical education. However, the process of IT implementation is characterized by problems. One of the most outstanding of them is the presence of large amounts of incorrect, untrue, unchecked and even harmful information (Raikos & Waidyasekara, 2014). Taking into account that a large share of learning time is self-study-directed and the most popular teaching methods are project making and problem solving methods, students would face the problem of choosing reliable and correct sources of learning information in Web.

YouTube is one of the most common platforms for watching professional medical videos in the students of LNMU (65 per cent, 91/139). However, the information openly available on that platform does not properly correspond the learning criteria and, thus, requires thorough filtering by students and teachers (Raikos & Waidyasekara, 2014). The teachers should perform the role of content managers by recommending openly accessible reliable sources of learning information in Internet. Thus, the primary task of medical educators is the self-development or selection Internet learning resources of high quality.

Other popular Internet sources of learning information are social media (Ryan et al., 2010; Chest et al. 2013). The result of carried out study has shown that the level of this technology involvement is not high, however this means of learning information delivery may be promising as it could serve as the effective instrument of learning motivation, development of knowledge, communicative skills, collaboration of teachers and students. Social media may act as a bridge connecting a student and an expert delivering correct up-to-date checked learning information (George & Dellasega, 2011).

The problem of social media usage in the learning process at HMEE of Ukraine is being profoundly explored and the first steps towards the solution of this problem have been made, however, in general learning through social networking systems is still on its early developmental stage (Radchenko, 2014; Myhovych, 2014).

Among the first known efforts of implementing social media into learning process at LNMU are working pages in Facebook "Lviv Pharmaceutical Portal" and "More English for Medical Students", developed with the aim of delivering the newest and required for learning materials on pharmaceutical issues and medical terminology.

All Ukrainian students are registered in some SNS but primarily they use it for entertaining and communicative purposes (Kulachkovska, 2014). The problem of SNS usage by medical educators still lacks enough data to make conclusions. The foreign research confirms that only 33 per cent of all teachers registered in SNS used it for collaboration with students and if they used it, the information not always met the needs of students (Safaa El Bialy & Alireza Jalali, 2015). It is important for Ukrainian scientists to analyze a foreign experience, to carry out additional studies and educational experiments to investigate this important and timely for our country problem.

5. Conclusion

In conclusion, it may be stated that the first steps in the direction to modernizing learning process at HMEE of Ukraine are successfully made. HMEE of our country have a strong incentive for the development of e-learning. The availability of highly-informative web-sites, pages in social media and basic technical provision may positively influence the development of modern ICTs-assisted learning. An increasing interest of medical students in the usage of Internet with learning purposes forms a definite ground to increase the rate of computerization and e-learning implementation in the HMEE of country.

The following generalized study data may be useful during the selection and development of Internet learning content for medical students and may also promote the understanding of the modern state of Internet involvement at HMEE of Ukraine:

(1) all medical students have used Internet with learning purposes, positively evaluate its usage in the process of study and consider it useful,
(2) most frequently medical students used Internet with the aim of searching for additional information,
(3) the web-site of Danylo Halytsky LNMU was defined as the most useful among all openly available Internet learning sources,
(4) ICT's are used during face-to-face classes at LNMU,
(5) students search for clinical procedures in the Internet,

(6) there are students who entirely trust Internet,
(7) not all students check information with their teachers if it contradicts the data received during classes.

Thus, the hypothesis towards the usage of Internet resources and technologies as the main instruments of professional information search by the future doctors has been correct. The study proved the suggestion that the primary student's action in case of problematic learning situation would be "google it" rather than "read in a book" or "ask your teacher". Due to this fact the most important educational tasks are the selection, recommendation and development of highly-qualitative Internet sources and materials, as well as the usage of institutional web-sites and social media pages for teaching and learning purposes.

Unfortunately, there are some limitations of the study. The main of them include the following: 1) a number of participants was different in all years of study, 2) the study was performed on the basis of one out of fifteen HMEE of Ukraine, 3) medical students participated in the study without any specialization filtering. In order to understand the problem more profoundly it may be useful to perform additional investigations considering the mistakes appeared in our study, namely: more accurate questionnaire design (avoiding ambiguity in questions, testing questionnaire), performing the study for students of dentistry and pharmacy faculties, collaborating with other HMEE of Ukraine with the aim to carry out similar studies on the basis of their institutions, and finally comparing the results with the results of our study. The following factors are the opportunities for further research and may aid to study the problem more profoundly.

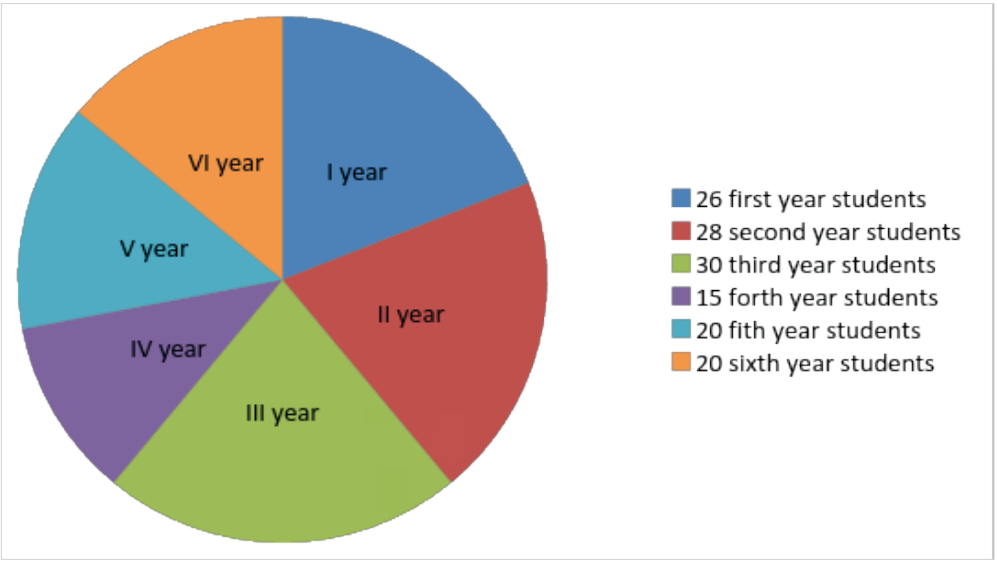

Figure 1. Proportion of the number of study participants

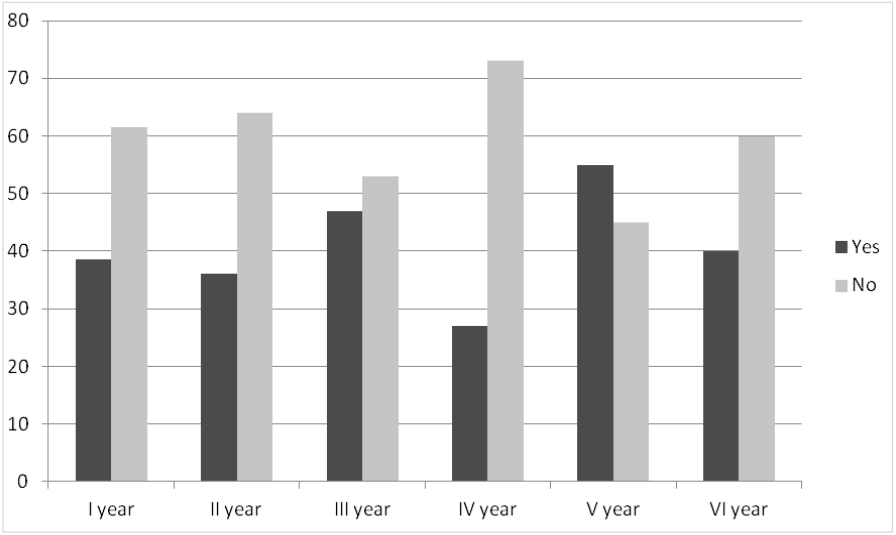

Figure 2. The proportion of positive and negative responses to the question of questionnaire concerning the usage of Internet-technologies and resources during classes

Table 1. *Learning activities for which students use Internet*

Learning activity	Year						Totally
	I (26/139)	II (28/139)	III (30/139)	IV (15/139)	V (20/139)	VI (20/139)	(number/%)
Self-study	17	19	19	8	15	14	92/66%
Search for additional information	23	26	22	12	20	16	119/86%
During practical classes	9	6	8	8	7	5	43/31%
Overview of clinical procedures	8	17	15	5	13	11	69/50%
Learn about clinical procedures	9	12		7	10	13	67/48%
Total	66	80	80	40	65	59	
Medium index (answers/participants)	2.5	2.8	2.7	2.7	3.25	3	

Table 2. *Usage of Internet sources by teachers during practical classes*

Do your teachers use Internet during classes?	Year						Totally
	I	II	III	IV	V	VI	(number/%)
Yes	10	10	14	4	11	8	57/41%
No	16	18	16	11	9	12	82/59%

Table 3. *The kinds of classroom learning activities performed with the usage of Internet*

Kinds of activities	Year						Totally
	I	II	III	IV	V	VI	(number/%)
Presentation of new topic	11	6	10	3	4	8	69/50%
Demonstration of clinical procedures	11	14	15	9	13	10	72/52%
E-testing	3	17	8	3	-	7	38/27%
Communication with colleagues	4	3	8	2	6	5	28/20%
Other:	3	2	1	-	-	-	5/3.5%
Search for additional information	3	1					
Internet is not used		1					
Social media with entertaining purpose			1				

Table 4. *Internet resources used for learning purposes*

Resources	Year						Totally
	I	II	III	IV	V	VI	(number/%)
E-mail	2	8	5	1	4	9	29/21%
You Tube	20	12	19	8	17	15	91/65%
Forums/chats	5	2	5	7	2	1	22/16%
Site of Danylo Halytsky LNMU	21	22	22	12	15	15	107/77%
Social media	13	10	18	6	9	7	63/45%
Other:	10	8	4	1	10	4	37/27%
Search engines	4	1		1	2	3	11
Encyclopedias	4				2		6

Resources	Year						Totally
	I	II	III	IV	V	VI	(number/%)
Dictionaries	1	1					2
E-libraries		3					3
Medical articles		4					4
Medical sites			2		3		5
Foreign medical sites						1	1
Scientific sites		1	2		2		4

Table 5. *Clinical procedures learned through Internet*

Medical procedures	Year						Totally
	I	II	III	IV	V	VI	(number/%)
Total number of responses (activity)	44	36	80	12	31	25	228
Medical examination			30		17	14	61/27%
(simple) surgeries techniques	7	7	22	4		7	47/21%
Desmurgy	7	10	3	1		1	22/10%
Injections	6	5	6	1	2	1	21/9%
Surgical sutures / knot procedure	4	6	4	2			16/7%
First aid	4	7	2				13/6.5%
Dissections	11						11/6%
Puncture			4	1	2	1	8/3%
Craniotomy	3		2				5/2%
Echocardiogram			2		2		4/1.5%
Resuscitation		1			2		3/1.3%
Catheter placement			1	1	1		3/1.3%
Colonic tube placement			2				2/1%
Intubation			1		1		2/1%
Delivery technique					1		1/0.7%
Tactical medicine	1						1/0.7%
Massage technique						1	1/0.7%
Dropper placement				1			1/0.7%
Oral examination	1						1/0.7%
Enema placement			1				1/0.7%
Many different				1	3		4/3%
None				8	3	8	19/14%

Table 6. *Sharing useful learning information with colleagues*

Did you share useful learning material from the Internet with your colleagues?	Year						Totally
	I	II	III	IV	V	VI	(number/%)
Yes	26	26	29	15	19	19	134/96%
No	–	2	1	–	1	1	5/4%

Table 7. *Sharing useful learning information with teachers*

Did you share useful learning material from the Internet with your teacher?	Year						Totally
	I	II	III	IV	V	VI	(number/%)
Yes	14	20	22	9	12	13	90/65%
No	12	8	8	6	8	7	49/35%

Table 8. *Identification of authenticity of Internet resources according to the 10-point scale*

Level of authenticity of Internet resources according to the 10-point scale	Year						Medium point
	I	II	III	IV	V	VI	
	7.3	7.9	7.6	8	7.4	7.1	7.6

Table 9. *Estimating the general usefulness of Internet-sources by the 10-point scale*

General usefulness of Internet-sources by the 10-point scale	Year						Medium point
	I	II	III	IV	V	VI	
	8.3	8.6	8.5	9	8.2	7.8	8.4

Table 10. *Estimating the learning usefulness of Internet-sources by the 10-point scale*

Learning usefulness of Internet-sources by the 10-point scale	Year						Medium point
	I	II	III	IV	V	VI	
	8.5	8.9	8.4	8.4	8.7	7.8	8.45

Table 11. *Analysis of students' actions if the information from the Internet contradicts the information from the lecturer*

Students'actions	Year						Totally
	I	II	III	IV	V	VI	(number/%)
Trust the Internet resources	4	1	6	1	3	6	21/15%
Discuss the information with your colleagues	20	20	15	7	16	9	87/63%
Ignore the information	1	–	1	–	2	1	5/3.5%
Check the information with your lecturer	21	10	18	11	11	12	83/60%
Continue the search	6	14	10	8	6	8	52/37%
Other:	4	1	3	1	–	–	9/6%
Believe the lecturer				1			
Discuss the problem with the lecturer			1				
Compare the information with other sources			2				
Check information in the printed editions	4	1					

Practice points

1) Ukrainian HMEEs have a strong incentive for the development of e-learning.
2) Internet resources and technologies are the main instruments of professional information search by the future doctors
3) An increasing interest of medical students in the usage of Internet with learning purposes forms a definite ground to increase the rate of computerization and e-learning implementation in Ukrainian HME.

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Appendix 1

QUESTIONNAIRE

The aim of the questionnaire is to find out the experience and attitude of medical students towards Internet-technologies in their studies and for learning clinical procedures. Thank you for your assistance, it is very important for us!

Age: _____ **Gender**: _____ **Year of Study**: _____ **Faculty**: _____

your response. YOU CAN CHOOSE **MORE THAN ONE** ANSWER

1. **For what learning activities do you use Internet?**
   a. for self-study
   b. to search for additional information
   c. during practical classes
   d. to overview clinical procedures
   e. to learn about clinical procedures

2. **Do your teachers use Internet during classes?** YES NO

3. **For what kinds of activities are Internet technologies used during classes?**
   a. presentation of new topic
   b. demonstration of clinical procedures
   c. e-testing
   d. communication with colleagues
   e. other _____

4. **What Internet possibilities and sources do you use *for learning*?**
   a. e-mail
   b. You Tube
   c. chats
   d. university's website
   e. social media
   f. Other _____

5. **What clinical manipulations did you learn with the help of Internet technologies?**
   _____ _____ _____

6. **Did you share useful learning material from the Internet with your colleagues?** YES NO

7. **Did you share useful learning material from the Internet with your teacher?** YES NO

8. **Do you trust Internet sources of information? Evaluate by the 10-point scale: _____**

9. **Evaluate the usefulness of Internet sources of information by the 10-point scale (in general): _____**

10. **Evaluate the usefulness of Internet sources of information by the 10-point scale (for learning): _____**

11. **If you notice that the information in the Internet contradicts with what was said by your teacher, what would be your further actions?**
    a. trust the Internet resources
    b. discuss the information with your colleagues
    c. ignore the information
    d. check the information with your teacher
    e. continue the search
    f. other _____