The effectiveness of education with the use of e-learning platform at the Faculty of Health Sciences, Medical University of Bialystok

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Abstract. The publication presents the analysis of education results in the subject "Obstetrics, Gynecology and Obstetrics-Gynecological Care" within the years 2006–2011 at the Faculty of Health Sciences, Medical University of Bialystok. A comparison of effectiveness between traditional and distance teaching methods with the use of e-learning platform introduced for scientific research was performed. An attempt to assess the usefulness of on-line learning with respect to student education was made.

Introduction

Dynamic development of distant education contributes to a greater interest in this form of acquiring knowledge. Better access to the computer and the Internet attracts more and more participants to distant learning. It can be observed in both educational institutions (schools, universities) and companies which use e-learning platforms to educate employees.

Currently, acquisition of knowledge is crucial as it is connected with improving professional qualifications, education and exploring interests. Traditional forms of teaching are gradually becoming insufficient. Therefore, teachers start to search for new forms of transferring knowledge to students as well as checking their abilities. Thus, people learn through the Internet more frequently and more willingly [1–5].

Despite the convenience of distant learning (possibility of learning at any time and place), it will never replace traditional education. Direct contact between students and teachers is irreplaceable. Therefore, we can observe occurrence of offers combining both forms (b-learning), which provides numerous opportunities for both students and teachers [1, 4, 12–13, 16].

Currently, many programs supporting distant learning can be found on the market. They allow for compilation of complete e-learning courses which might be placed directly on educational platforms in SCORM, AICC and IMS standards [6–8]. Moreover, these tools give an opportunity to create modern tests, various quizzes and interactive tasks for checking students' knowledge.

The most efficient educational process involves traditional teaching supported by e-learning methods. In other words, classes conducted in traditional educational facilities are supplemented with virtual lessons. Teachers provide various materials, clues and instructions by the use of distant teaching. This method is perfect for students who find it problematic to deal with a particular part of material. Due to blended learning, the student has a possibility of having numerous revisions of a particular issue [12, 26].

An attempt of introducing distant learning at the Medical University of Bialystok was commenced by Wiesław Półjanowicz MSc, Eng who has been dealing with this method since 2001 [9–10] and Robert Latosiewicz, MD, PhD. In the academic year 2008/2009 both scientists prepared a pilot e-learning course in "Therapeutic massage" in the Rehabilitation Clinic, [11] implemented in LMS/LCMS-Moodle system [Fig. 1]. MOODLE stands for Modular Object-Oriented Dynamic Learning Environment and is a LMS/LCMS system based on GNU GPL (Open Source) [16, 29].

In the academic year 2009/2010 a cooperation between the Department of Obstetrics, Gynecology and Obstetrics/Gynecological Care and Independent Department of Sight Rehabilitation was commenced while in 2010/2011 – with the Department of Integrated Medical Care. Currently, five subjects are conducted in a complementary system (b-learning) with the use of the Moodle e-learning platform. Implementation of the study was approved by the Bioethical Committee of Medical University of Bialystok (regulation no R-I-002/338/2009).

Virtual environment of distant education

Currently used technical tools (modern e-learning platform, e.g. Moodle, server system, databases, broadband Internet access) allow for using mictrotechnology achievements as a new approach to design virtual education. The following mobile devices might be used: notebooks, palmtops (PDA), smart phones and mobile phones. Modern development of professional education should be taken into consideration in designing virtual courses for particular students. Its core is creating the shortest possible pathway of

professional competence development for a student of virtual educational space. The most significant elements are optimal form and amount of knowledge transferred in proper modules by the lecturer as well as student's activity connected with it.

A discrete model of virtual environment in distant teaching (VLE – virtual learning environment) within one or more universities in a city or country ought to contain various information which would complement each other on many levels of theoretical and practical knowledge and would be available for students after logging in and authorization on the e-learning platform. This would raise the attractiveness of studying various courses as students could easily and independently choose subjects they would like to study in a particular semester among a wide range of different thematic issues. With unlimited Internet access the best students would be able to do extra subjects within distant learning and thus gain additional specialties.

Exemplary model of a *blended learning* course

Complementary courses use methods and working styles from both – e-learning and traditional education. An exemplary schedule of the course comprises of three stages:
 – electronic training in basic theoretical information,
 – traditional training which is based on the knowledge acquired during the first stage and allows for gaining practical skills (direct participation in the educational process),
 – e-learning training aimed at strengthening the acquired knowledge, revising and supplementing information, experience exchange in discussion as well as checking the knowledge by means of tests and tasks. This is aimed at determining future objectives and final grade of a particular student.
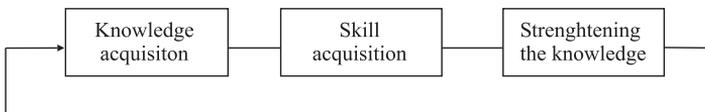
Fig. 1. Model of a three-stage complementary training

Also, models of a five-stage training can be found. The first stage, which is conducted in form of a direct contact between students and the teacher involves presentation of aims and organization of the training. The second,

third and fourth stages are a classic form of *blended learning* course which was presented in the previous model. The last stage is conducted in form of a direct meeting. It is aimed at evaluation of the didactic process as well as handing in certificates of course completion [26].

Organization of b-learning education to students of the Medical University of Bialystok

Blended learning applied in the didactic process constitutes a fully controlled time proportions of mutual and independent work of the teacher with students. Other crucial aspects are as follows: education individualization emerging from the proportions of information conveyed in both distant and traditional ways, the number of students in a group, student activation and the possibility of motivating students in form of both direct contact and distant education (interactive lectures supported by multimedia elements, tests of knowledge, tasks to perform, forum).

Work time organization in the case of traditional classes is an imposed lesson while in the case of distant education – it is flexible. Part of distant classes involves completion of tasks designated for individual performance. As they are placed on the platform in smaller portions, students do them more often, which leads to the development of a habit of dutifulness in completing objectives, provides the opportunity of improving skills and deepening knowledge as well as improves professional and social activeness [12, 26].

The subject "Obstetrics, Gynecology and Obstetrics-Gynecological Care" has been taught in the blended learning system for two years – lectures are given on-line while practical activities and self-education are conducted only in form of traditional classes. Students who decided to learn electronically are given free access to the educational platform and to the course (subject) completed in distant method. While completing a module students have constant (24 hours a day) access to didactic materials while the order of particular topics and period of their availability are determined by the academic teacher responsible for the subject.

Positive aspects of this method include fairly flexible class hours – education of particular modules might be completed in the time suitable for students. The student has the opportunity of choosing the form of classes, traditional or e-learning (Internet access is a necessary condition). Exams and credits take place in "traditional" form upon the rules provided by Study Regulations of Medical University of Bialystok.

Material and methods

The study included a group of 132 students at the III-rd year of the first-degree full-time course in nursing, subject: "Obstetrics, Gynecology and Obstetrics-Gynecological Care" within the academic year 2010–2011. The students were divided into two groups. The study group attended lectures in the e-learning form with the use of LMS/LCMS (MOODLE platform) [16–17] [Fig. 2]. The control group attended lectures in the traditional form.

Fig. 2. The main window of e-learning platform

The final exam in the subject was conducted in the form of multiple choice test with one correct answer in a traditional way in both groups simultaneously. Test results of both groups were compared with consideration of final grades (i.e. level of professional knowledge). Upon the completion of lectures and prior to the final exam both groups were asked to fill in a questionnaire on the classes and the effectiveness elements of education. Exam results were compared with final exam outcomes from previous years (2006–2009) in which the classes were conducted in the traditional method exclusively.

A fundamental element following the completion of this e-course was the evaluation of the questionnaire placed on the e-learning platform connected with elements of the education and satisfaction from the classes (course of learning, access to materials, opinion on the on-line learning) compared with the traditional model [Fig. 3].

Fig. 3. Part of the evaluation questionnaire placed on the e-learning platform (questions 1–4)

Evaluation of e-learning effectiveness might be presented with respect to two aspects: didactic and financial. The former refers among others to a realistic indicator of both: deepening e-student's knowledge with visible effect during practical classes – e-course students remembered theoretical knowledge better (79%) as well as the level of implementation of the didactic e-process due to lecturer's efforts (93%). As regards to the financial aspect, it involves costs of implementing didactic e-process and a ratio of measureable acquired knowledge of the e-student to education cost (no accurate analysis in this respect has been performed yet) [21–22, 27–30].

Results

In the years 2010–2011 women constituted vast majority in both groups of e-learning students – 126 persons – 96% (data from the e-learning platform). As regards to the questionnaire evaluation of the level of students' satisfaction from education course and effectiveness elements, no statistically significant differences were found between the years 2010/2011 [Fig. 4, 5] and 2009/2010 [Fig. 6].

In the evaluation questionnaire students answered many questions. One of them was: "What was the most valuable element in this form of learning?". One of the answers was: possibility of comfortable studying at home,

Czy wprowadzenie elementów zdalnego nauczania zmieniło sposób uczenia się przez Panią/ Pana przedmiotu?		
Odpowiedź	**Średnia**	**Sumarycznie**
Tak	49%	23
Nie	15%	7
W niewielkim stopniu	36%	17
Sumarycznie	100%	47/47

2. Czy był to wpływ pozytywny?		
Odpowiedź	**Średnia**	**Sumarycznie**
Tak	81%	38
Nie	19%	9
Sumarycznie	100%	47/47

3. Czy wprowadzenie elementów zdalnego nauczania było pomocne w lepszym zrozumieniu nauczanych treści?		
Odpowiedź	**Średnia**	**Sumarycznie**
Tak	49%	23
Nie	15%	7
W niewielkim stopniu	36%	17

Fig. 4. Results of the evaluation questionnaire placed on the e-learning platform (questions 1–3), 2010/2011

4. Czy wprowadzenie elementów zdalnego nauczania przyczyniło się do większej trwałości Pani/Pana wiedzy z przedmiotu?		
Odpowiedź	**Średnia**	**Sumarycznie**
Tak	53%	25
Nie	21%	10
W niewielkim stopniu	26%	12
Sumarycznie	100%	47/47

5. Czy wprowadzenie elementów zdalnego nauczania pomoże Państwu w przygotowaniu do zaliczenia (tej części materiału) przedmiotu?		
Odpowiedź	**Średnia**	**Sumarycznie**
Tak	77%	36
Nie	11%	5
W niewielkim stopniu	13%	6
Sumarycznie	100%	47/47

Fig. 5. Results of the evaluation questionnaire placed on the e-learning platform (questions 4–5), 2010/2011

saving time, the possibility of reading lectures and taking achievement test is a convenient time (a few days for completion), mobilization for regular studying. According to the opinion of certain students, they acquired greater
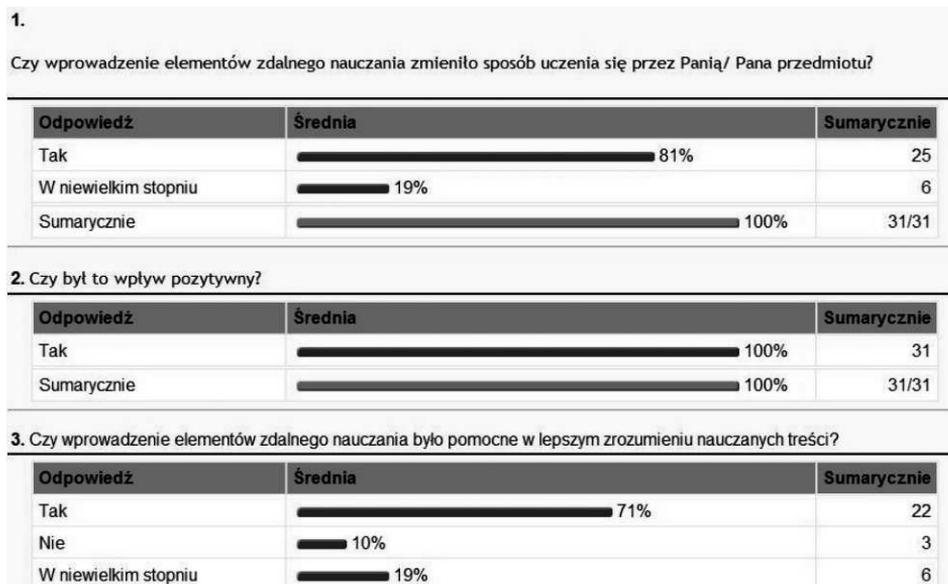
1.

Czy wprowadzenie elementów zdalnego nauczania zmieniło sposób uczenia się przez Panią/ Pana przedmiotu?

Odpowiedź	Średnia	Sumarycznie
Tak	81%	25
W niewielkim stopniu	19%	6
Sumarycznie	100%	31/31

2. Czy był to wpływ pozytywny?

Odpowiedź	Średnia	Sumarycznie
Tak	100%	31
Sumarycznie	100%	31/31

3. Czy wprowadzenie elementów zdalnego nauczania było pomocne w lepszym zrozumieniu nauczanych treści?

Odpowiedź	Średnia	Sumarycznie
Tak	71%	22
Nie	10%	3
W niewielkim stopniu	19%	6

Fig. 6. Window of particular results of the evaluation questionnaire placed the on e-learning platform, 2009/2010

7. Co było najbardziej wartościowe w tej formie kształcenia?

nr	Odpowiedź
1	możliwość wygodnej nauki we własnym domu, oszczędność czasu możliwość czytania wykładów i rozwiązywania quizu w dogodnym dla siebie czasie (kilka dni na rozwiązanie) -quiz mobilizuje do systematycznej nauki -jestem pewna, że zdobyłam większą wiedzę niż byłoby to możliwe uczęszczając na tradycyjne wykłady, podczas, których nie zapamiętuje części materiału, tutaj mogłam zapoznać się dokładnie z tematami, a mając możliwość ponownego ich przeczytania przed egzaminem, nie będzie problemu z brakami w tradycyjnych notatkach
1	-możliwość przeanalizowania całego wykładu
1	.
1	Brak konieczności chodzenia na wykłady
1	Brak pośpiechu w ich czytaniu.
1	brak zdania
1	Dodatki do wykładów.
1	domowy dostęp do kursu.
1	dowolny czas na naukę
1	duża ilość informacji, sprawdzanie wiedzy po każdej przeczytanej stronie
1	Fakt ze mogłam we własnym tępie czytać slajdy i dobrym pomysłem sa pytania sprawdzające znajomość materiału

Fig. 7. Window of answers to the 7th question in the evaluation questionnaire, 2010/2011

knowledge compared with traditional lectures as during the latter students fail to remember part of the material. The educational platform provides opportunity to revise the material before an exam. Other answers are as

Tab. 1. Mean final exam grade in the subject "Obstetrics, Gynecology and Obstetrics/Gynecological Care" in 2006–2011

Academic year	Lectures – traditional method	Lectures – e-learning method	Number of students taking re-sit exam – traditional method lectures	Number of students taking re-sit exam – e-learning lectures
2005–2006	3.10	lack	13%	lack
2006–2007	3.64	lack	3%	lack
2007–2008	4.09	lack	5%	lack
2008–2009	4.14	lack	0%	lack
2009–2010	3.26	3.49	15%	4.65%
2010–2011	lack	3.73	lack	0%

Fig. 8. Window of the last log – in to the e-learning platform in 2010/2011

follows: no necessity to attend lectures, no rush in reading lectures, multimedia extras to the lectures, flexible learning time, own reading pace and good idea of checking knowledge after each part of the material [Fig. 7].

Mean final exam grade in "Obstetrics, Gynecology and Obstetrics-Gynecological Care" in 2001/2011 among students from both groups, traditional and e-learning, as well as exam results in 2006–2009 are presented in [Tab. 1]. It can be assumed that mean exam grade in 2006–2009 had an increase tendency from 3.10 to 4.14 while in 2010 it decreased to 3.26. Standard deviation in this study of final exam grades in 2006–2011 amounts to SD = 4.47 in traditionally learning group. The comparison of study results in this subject based on mean final exam grade in 2010–2011 shows an increase by 0.24 points from 3.49 to 3.73. Standard deviation in e-learning amounts to SD = 0.17.

The highest exam grade (4.5) was received by a person who participated in distant education in 2009/2010 while the highest grade obtained by traditionally learning students was 4.0. In 2010/2011 also an on-line student received the highest exam grade – 4.5. This person was the last from the whole e-learning group to log in on the platform, most probably to gain ac-

cess to didactic materials for the final exam [Fig. 8]. This might suggest that students used the e-learning platform regularly and read didactic materials placed there in order to prepare to the exam.

Discussion

The studies were connected with the effectiveness of teaching the subject "Obstetrics, Gynecology and Obstetrics-Gynecological Care" to students of the third year of nursing course at the Medical University of Bialystok based on both traditional and e-learning methods within the years 2006–2011. Didactic materials prepared in the e-learning form were well received by the students. Almost 92% (43) of the e-learning students stated that introduction of distant learning elements contributed to greater acquisition of knowledge in this subject in 2009/2010 compared with 2010/2011 – 79% (37) students. As regards the question: "Will implementation of distant learning elements help you in preparation to passing the subject (particular part of the material)?" – 94% (90) students answered "yes", while only 6% – "no".

The said opinions prove high level of preparation to the classes. The authors believe that high popularity of distant education might result from interactive access to the knowledge included in the on-line course (lesson, quiz, task, forum) or simply website substantial content. The student might revise preciously analyzed issues many times, learn them better, acquire knowledge on a particular topic as well as check his/her knowledge in a particular field [11, 16, 25, 28].

A significant issue is the change in the role of the academic teachers in on-line education. Using previously prepared tests, they can check students' knowledge in a convenient way and the results are available immediately after checking [16–17]. This increases learning effectiveness while the cost of preparation and implementation of e-learning classes are high only in the first stage of compiling didactic materials. However, they do not exceed costs of traditional methods [19–20, 27].

The study included a group of 90 students of the nursing course who learnt by both traditional and distant methods and a group of 331 students who learnt by the traditional method in a classroom. This comparison confirms an assumption that implementation of e-learning methods would not decrease the level of professional knowledge, students' satisfaction from education or the effectiveness of the educational process compared with traditional methods. It was comparable.

Therefore, it can be assumed that possibilities provided by e-learning tools enrich the education model on the in-class courses. Thus, it is rationally justified to enrich the syllabus with a greater number of subjects which at Medical Universities would be taught in a complementary way (*blended learning*). These should include all lectures and seminars conducted in the distant form while typically practical classes ought to be conducted in the traditional form.

Studies on students' attitudes and expectations as regards to traditional education and e-learning were conducted among students of the Economy University of Poznan during the Economy course as well as in the Institute of Mathematics and Computer Science of Vilnius University. The outcomes confirm positive opinions on e-learning methods applied in the didactic process [15, 18].

The answers to the questionnaire indicate that the development of distant education might be a great form of supplementing traditional education and blended learning. The authors emphasize the need to continue studies in this field, especially as regards to enriching educational offer for a wider range of students of medical courses. A crucial element is the use of methods by part-time students who often work and concurrently wish to broaden their professional knowledge.

Conclusions

1. The results indicate that the e-learning method is as good as the "traditional" method of teaching vocational subjects during a nursing course.
2. Distant education is considered by students as slightly easier in acquiring knowledge due to constant access to materials.
3. E-learning platform tools for automatic knowledge check, systems of questionnaires and voting as well as systems of communication between students and academic teachers increase students' motivation for regular and independent studying which in final effects gives comparable and slightly better results than traditional methods.
4. Didactic materials compiled in electronic form, placed in LMS/LCMS system are available 24 hours a day, seven days a week, which provides more flexible conditions of learning and preparing for the final exam and thus revising knowledge in a particular scope.
5. Virtual register built in the content management system LMS (e-learning platform) allows for control of study results for both the student and academic teacher, which contributes to regular work of most of the students.

Student satisfaction level in the case of virtual courses depends on many factors. Positive view of experience in distant learning is typical for students possessing a particular set of features crucial for success. Most of all, a person registering for distant education should have a desire to learn and acquire new knowledge or skills for his/her own needs or for the purpose of future professional carrier. The motivation of a student, who makes his/her own decisions on what, how, when and where to learn, is one of the most significant self-regulators of student's behavior in distant education process. The aim of every student should be acquisition of knowledge without teacher's supervision rather than receiving certificates. A more independent student should show more responsibility to manage the self-learning process as it decides on when and how much to learn [14, 23–25].

To conclude, it can be assumed that distant education, which is desired by most students (91% – the questionnaire data) and which is successfully implemented in many countries, should not be overlooked. Its crucial element is proper preparation not only in terms of technical matters but also intellectually. "Distant learning is actually an educational issue, not technical" [23–24]. Particularly universities, but also private companies entering the educational market should consider the issue of offering virtual courses in order to avoid situations when an institution offers this form of learning with no proper preparation just because other companies do it or for financial benefits [1, 5].

Knowledge of different impressions of students on particular stages of the distant learning process might help the organizers to adjust the form of material presentation, message content and frequency of contact with course participants to students' needs and possibilities and thus increase their satisfaction and knowledge.

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