

Interpretation of Questionnaire Survey Results in Comparison with Usage Analysis in E-Learning System for Healthcare

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Abstract- Organization of the distance form of study is not an easy task. It can be quite complicated, especially regarding the communication or rather the instantaneousness and promptness of giving the feedback to the students. One of the useful methods of increasing the effectiveness of the learning process and quality of students' results is integrating the on-line content and learning management system. In the paper we describe the applicability of different types of resources and activity modules in the e-learning courses and the worthiness of their usage. The presented ideas are supported by the outcomes of the questionnaire research realized within the e-learning study as well as the usage analysis of particular e-course "Role of a nurse in community care" which was one of the outcomes of the international project E-learning in Community Care. We will also compare the outcomes of data analyses mentioned before and try to find the reasons of these differences.

I. INTRODUCTION

The increasing economical demands on providing the health care in highly developed countries brought about the changes of health care focus and goals. Several governments enforce the development of community health care aiming to health support and sustainability as well as the prevention of diseases. All these factors require the modernization of education, especially education in the field of nursing. New facts are discovered daily, the amount of knowledge constantly grows and they must be reflected in the curricula, e.g. the study programs must be regularly innovated [1]. However, not only the content needs to be modernized but also the form has to be adapted to actual trends and needs of the society. The above mentioned points result in the necessity of cooperation between the universities and companies in the field of e-learning methodology [2][3][4]. The educational system supported by e-learning offers modern form of study which is highly flexible from the point of view of time requirements and material resources. It represents very good accessibility and easy and direct communication with the tutor [2]. Internet learning environments are considered as individual and learner-centered learning environments as they contain multiple and rich resources and have an autonomous character which offers a flexible learning environment [5]. In

general, e-learning is the delivery of education and training courses over the Internet and/or Intranet. It can be defined as a mixture of content (on-line courses or courseware) and communication (reaching online, emails, discussion forums) [6].

Advanced Internet technology in health care learning – including e-learning, web-based learning, online computer-based educational training, Internet-based learning, and distance learning – has been widely adopted in many developed countries [7]. Having entered the European Union the new member countries gained the opportunities for international cooperation. Czech Republic, Slovakia and Poland joined to create the study program for post-gradual specialization study and life-long learning of nurses aimed at community care. These countries were given the opportunity thanks to the international Leonardo da Vinci project named E-learning in Community Care supported by European Commission in Brussels.

LongLife Learning program

Due to the project, the supranational partnership of 5 institutions in the V4 countries and France was established. The project was coordinated by the National Centre of Nursing and Other Health Professions in Brno, Czech Republic. The partners were Constantine the Philosopher University in Nitra, Slovakia and the Medical University of Silesia in Katowice, Poland. The aim of this two-year project was to create new specialized module-based educational program for distance form of study and to prepare the modules for e-learning study so that the nurses-to-be could learn effectively. Web-based learning provides them with a new environment that allows them to develop professional skills and knowledge in self-initiated learning [8].

Analysis of community care was carried out by the participants of the project already in 2005. It showed that the Czech Republic, Slovakia and Poland were, more or less, at the same level. The educational programs which would effectively prepare employees in this area for their future tasks did not exist in these countries at that time. However, this sphere of health care has already been well known in the

developed countries for many years and a serious attention has been paid to it thanks to its high social importance [9].

II. STRUCTURE OF STUDY PROGRAM AND THE METHODS OF EDUCATIONAL ORGANIZATION AND MANAGEMENT

Study program contains the basic specialistic module that is compulsory for all students separately for midwives and for nurses. Furthermore, there are four selective modules for nurses as well as for midwives (see Fig. 1).

- Nurses**
 - Role of the Nurse Specialist in Community Care
 - Specific Activity of Community Nurse in Care of Family
 - Care Of The Elderly
 - Home Care
 - Prevention of Occupational Hazards
- Midwives**
 - Role of the Midwife Specialist in Community Care
 - Breastfeeding counselling
 - Specific activities of a midwife in prevention of occupational hazards
 - Specific Activity of a Midwife in a Care of a Family
 - Ultrasound diagnosis in the work of a midwife

Fig. 1: List of the courses of international study program

Since the most of the content authors were not digitally skilled enough, it was necessary to find a partner who would be responsible for the technical part of the courses. This role was undertaken by the Department of Informatics, Faculty of Natural Sciences, Constantine the Philosopher University in Nitra. Their task was not only to create the resources and activities in the e-course and fill them in with the materials but also to find quick and easy way of collecting the materials and other important information necessary for the course creation from the authors. The usage of structured MS Word template was proved as an applicable and also very convenient solution. The document contained all the information necessary for the course design, i.e. the study materials, glossary entries, quiz questions, written assignments, etc. - all of them in a logical and comprehensible structure. Text of the study materials was written linearly according to the agreed conventions. Some of the materials were very complex, the greatest of them would have about 620 pages in printed version.

For all the modules national and also international versions were created. They were implemented in the LMS Moodle environment. The e-learning portal communicates with LDAP server, which is interconnected with academic information system (students' profiles) and SAP/SOFIA (employees' profiles). Thanks to this interconnection, when users are students at our university, it is not necessary to register them manually [10].

The structure of online course needs to be, easy to follow, relevant, and learner-centered [11]. The elaborated e-courses have a unified structure which was approved in advance by the representatives of each partner organization [12]. We use the same structure also in our Department template and we try to divide each course into *introductory information*, *lessons* and

the *final part* [13]. The main study materials (a text-book) are complemented by automatically interconnected vocabularies of terms, or video recordings. The dictionary was set-up in the mode of so-called automated switching of key words in all study materials (except for the closing quiz, where this switching was turned off [14]. From the point of view of the courses the following were used: web page – study material, label and glossary – help. There were also used an activity modules, such as forum, assignment – upload a single file and quiz.

III. E-COURSE OUTPUTS

In the final phase of the project, the chosen courses were tested on a selected group of participants. In Slovakia, it was he course „The Role of a Nurse in the Community Care“, which was tested by 30 students of external form of study at the Department of Nursing. Participants of the course filled in an output questionnaire, outcomes of which we present in the following paragraphs. Very interesting and useful course usage information were gained also from the log-on file analysis. That can help us better understand the behaviour of the student in the e-learning environment. During the data preparation we took into account recommendations resulting from series of experiments examining the impact of individual steps of data preprocessing on quantity and quality of extracted rules [15][16][17].

All participants of the tested course had finished bachelors degree and also were experienced people from the practice, mainly employed in a hospital. Only 13 % of them had previous experience with an e-learning method of instruction.

TABLE 1. AGE CATEGORIES OF PARTICIPANTS

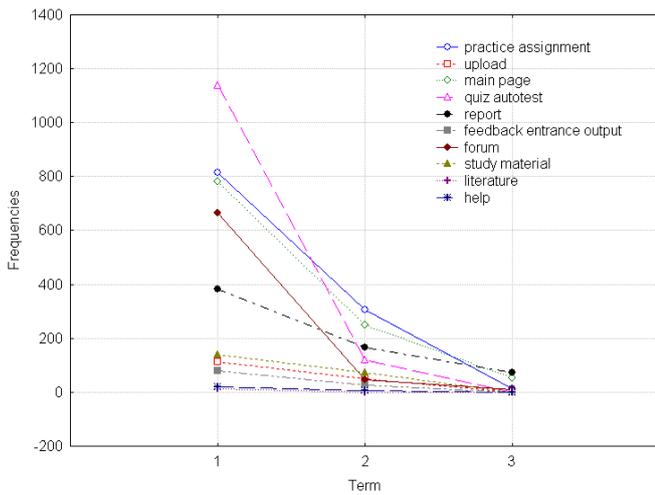
< 30 year-old 26 %	31 - 45 year-old 62 %	46 – 60 year-old 12 %
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TABLE 2. NUMBER OF YEARS OF PRACTICE

< 5 15 %	6 - 10 6 %	11 - 20 32 %	> 20 47 %
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The interaction plot (Fig. 2) visualizes interaction frequencies - Category x Term. The graph represents categorized polygon, where on the x axis are periods of study (Term) and on the y axis are observed frequencies, while one polygon is drawn for each level of the variable Category.

The graph shows that in the first phase the students most often accessed the quizzes. They completed 9 self-tests (altogether 720 attempts) and one closing test. The second most common activity was submitting the assignments (there was more than 287 assignments uploaded into the course).

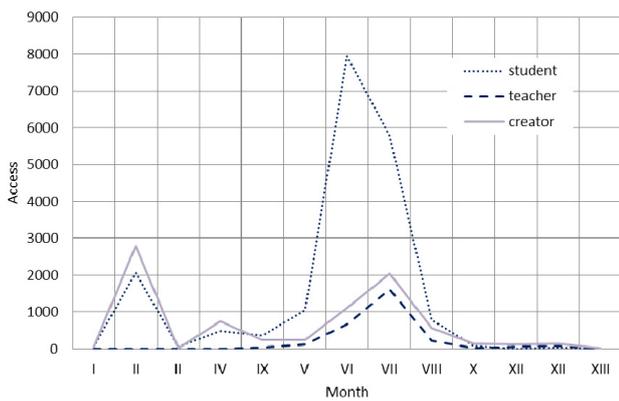


Source: own research

Fig. 2: Interaction Plot - Category x Term

In the second phase, the number of accesses to both type of activities decreased rapidly (Fig 2.). However, they still belong among the most visited course modules (either the resources or activities). Similar outcomes would be found out if we analysed the particular chapters of the course separately [12] (Balogh et. al.).

Integrated tests were motivating for their learning [2]. The results may be significantly different if the online program is perceived as relevant and applicable to the employee's professional role in the organization [11]. Also the fact that the self-test questions were issued from the oral state exam syllabus was also great inhibitor of the students' activities.



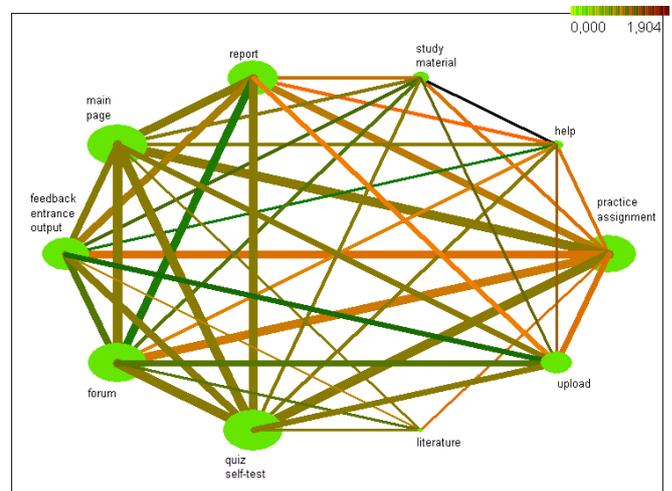
Source: own research

Fig. 3: Frequencies of Access for student, teacher and creator role

The graph (Fig. 3) visualizes frequencies of activities - Frequencies of access x Month, during 13 months. There are periods of study (Month) on the x axis and observed frequencies on the y axis, while one polygon is drawn for each role (student, teacher and creator of the course).

In the graph, we can see the great difference in the amount of access logs of the students in comparison with those of the tutors and the course creators (in the course there were several tutors as well as creators). In the first months after enrolling into the course there was almost no or only very low activity of the tutors. On the other hand, the course creators did the last modifications and settings in the courses (their activity was much higher in the preceding period). The greatest activity of the students can be seen short before the deadlines of particular activities and the tutors were very active at that time, too.

According to the final questionnaire, almost 37% of the students printed the electronic materials, 7% printed only some topics, and the rest studied the materials directly from the computer screen. However, the log file analysis proved that study materials were one of three least visited types of resources and/or activities.



Source: own research

Fig. 4: Web graph – visualization of found rules

As we can see in the web graph that visualizes associative rules, the most visited categories of the course components were: main page, quiz (self-test), forum, practice assignment, report and feedback entrance output as well as the combination of pairs of these categories [9]. The least visited, on the other hand, were: study material, help and literature.

The different outcomes also came out when we analysed the questionnaires dealing with the communication in the forums. They say that only one third of the students were active in the forums (Fig. 5), the rest only occasionally, but this opposes the association rules in the web graph (Fig. 4).

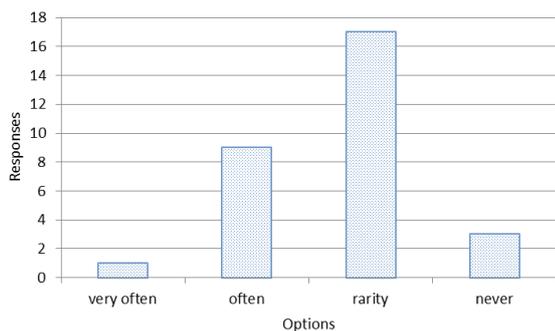


Fig. 5: Activity in the discussions in the forums

As many as 90% of the students stated that the opportunity to study at home was very comfortable for them – this was confirmed also by the analysis of the log file where the most of the course access logs were from the computers outside the university.

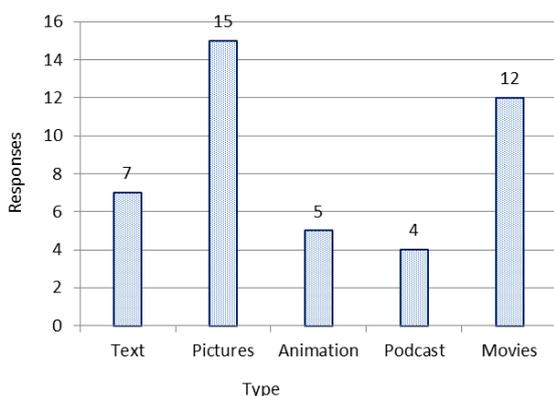
Each chapter contained also the list of additional resources. The outcomes of the questionnaires showed that 73% of the students used them during their study. The web graph, on the other hand, shows that literature was the least visited category. We can suppose that additional resources were seen by the great amount of the students but most of them visited them only once.

E-learning

The next part of the questionnaire was focused on the forms of distance learning. E-learning as the form of education interested quite a lot of participants (Tab. 3).

TABLE 3. THE PREFERRED TYPE OF DISTANCE LEARNING

E-learning via internet	Traditional, printed material, CD	Blended learning
63 %	23 %	14 %



Source: own research

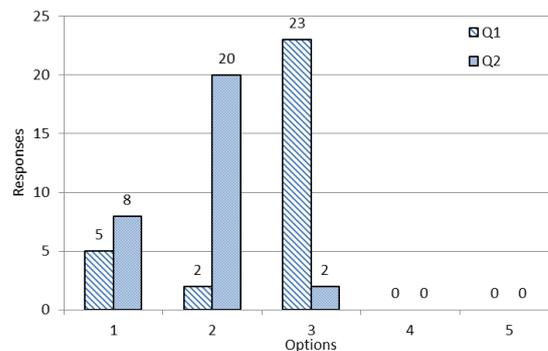
Fig. 6: The preferred type of study material

The pictures and videos as the form of study materials were preferred in comparison to text, animation and audio (Fig. 6).

The chart (Fig. 7) shows the number of responses to the questions:

Q1: What was your study supported by e-learning like?
Answer: Very easy (1) ... Very difficult (5)

Q2: How much have you learnt during the study?
Answer: Very much (1) ... Very little (5)



Source: own research

Fig. 7: Responses on question Q1 and Q2

Only 3 % of participants presented that such form of study did not suit them, on the contrary, as many as 80 % stated that they would like to participate in a course like that again.

Since the participants were at the same time students of Constantine the Philosopher University in Nitra, we were interested in how they perceive the opportunity to study externally and learn via electronic means. The questionnaire outcomes say that they recommend this method mainly in life-long learning.

TABLE 4. RECOMMENDED TYPE OF STUDY FOR E-LEARNING METHOD

Specialisational	Qualificational	Life-long	Do not recommend
27 %	13 %	60 %	0

E-learning form of study is available and accessible 24 hours a day. Each student has his/her own routines and is used to study in different time periods according to individual needs.

TABLE 5. TIME OF STUDYING VIA E-LEARNING

morning	afternoon	evening	Overnight	any time
7 %	17 %	50 %	20 %	7 %

The log file analysis showed that the most access entries were between 4 pm and 5 pm. Except of three hours at night, the activity of the students was distributed among the whole day (Fig. 8). However, the evening activity was much higher in comparison with the activity during the day.

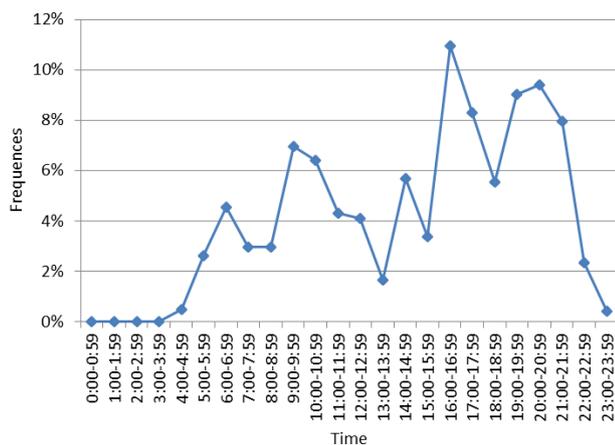


Fig. 8. Log on entries categorized by the time

IV. DISCUSSION

The obtained data, both from the questionnaire and mainly from the adjusted log files of e-courses, were used for finding out certain rules of behaviour of course participants, using usage analysis. It has been shown that the course was considered too textual and the students missed pictures, animations and other multimedia applications, which was also proved by the analysis of the visit rate of categories of parts of the course [9].

The course was mainly used for the communication among the participants as well as the tool for the assignment distribution and collecting. Students were motivated for active studying also by the allotment of 20 credits for successful passing of this course necessary for their career advancement (the assignments were compulsory for the students to obtain this credits necessary for their carrier advancement). Among the most frequent moves from the main page we can name displaying the list of assignments (Assignment view all), displaying the list of users (User view all) and displaying of the list of test (Quiz view all).

Study materials were used much less than we expected. However, that does not mean that the students would not read them. It is possible that they printed them at their first display of them. On the other hand, students used tests quite a lot as they seem to be a good preparation for the state exams (77 % of them stated that self-tests were most helpful activity). The quiz reports show that a lot of students repeated the quiz attempts several times till they gained 100%. The outcomes of self-tests were displayed for some time for all the students so they could compare the results which increased the competition among them.

In some cases, the differences were found in how students responded in the questionnaire and what the analysis of log file proved. The possible reason for this may be that they knew the questionnaire was not anonymous while in case of the study itself they felt more independently. It would be interesting to compare the questionnaire responses and the usage analysis separately for particular participants – that may be the objective of another research.

V. CONCLUSION

The dissemination of the outcomes was carried in MF&Partners Consulting in Lyon [18] (MF MF&Partners Consulting, 2009) which is the expert for supranational management and also took part in the valorization of the project. All the outcomes of the project were presented there, i.e. the e-courses, books, and proceedings, and the coordinators of the project as well as the partners expressed high satisfaction with all presented materials. In spite of the fact that the project finished, the cooperation among the Slovak partners continues in another project, this time at the level of faculties. The project Virtual Faculty – Distance Learning at the Faculty of Social Sciences and Nursing of Constantine the Philosopher University in Nitra started in 2010. Its aim is to create virtual faculty that would be based on e-learning courses available for the students 24 hours a day, 7 days a week. Its effectiveness requires the involvement of pedagogues trained for e-learning education and able not only to manage the education but also to prepare appropriate materials and activities for this type of education. The processes and outcomes defined and verified at the level of one faculty can be, in case of successful realization, applied also to the other faculties that are at the moment functioning rather individually.

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