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EDUCATIONAL SUPPORT OF THE COURSE NURSING PROCEDURES AND INTERVENTIONS

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Abstract

The course Nursing Procedures and Interventions is being taught at the Faculty of Medicine of the University of Ostrava within the scope of the study programs Nursing and Midwifery. Despite the fact that the main part of the course is dedicated to the practical medical skills, it is suitable not only for students of full-time studies, but also for students of combined studies. The teaching of the course is organizationally demanding, because of which a Moodle e-learning course has been developed.

The article describes the aims and the education process of the course Nursing Procedures and Interventions with the support of e-learning. It deals especially with the testing of theoretical knowledge of students within the e-learning course, which has three phases – when introduced to the course for the first time, during the course, and at the end of it. The article presents the comparison of the test results of different education periods. The article also deals with the more complicated issues and parts of the course and also compares students' results with regard to their previous specialty – if they already encountered any kind of health studies or if the course is their first experience with this kind of education.

Keywords
E-learning, testing, distance learning, nursing procedures, interventions.

Introduction

The Faculty of Medicine was established in 2010 when it was transformed from the Faculty of Health Studies. This faculty offers a master's degree program in General Medicine and also bachelor's degree programs in various medical professions. Among many bachelor's degree programs taught at the Faculty of Medicine are study programs Nursing and Midwifery.

Within the scope of the study program Nursing, the course Nursing Procedures and

Interventions[1] is being taught. This course is suitable for the first year students of both full-time and combined studies, who take it during the winter semester, i.e. at the very beginning of their university studies.

The objectives of the course are determined by the annotation:

"The content of the course forms the core of professional skills of nurses and is part of the complex of basic professional subjects. The course is practical and allows students to acquire basic manual dexterity and assurance of safe and high-quality performing professional interventions and procedures in clients/patients. The high-quality procedure respects individual needs of the client/patient, especially the need for comfort, respect, confidence and safety."

The course is aimed at practical medical skills. In the combined studies, education in these areas is impossible. Therefore, within the scope of the course, students will take part in several presence tutorials.

Each year the course Nursing Procedures and Interventions is taken by an estimated 90 students, each of which must test their individual skills under the supervision of the teacher. For practical reasons, the course has to be divided into smaller groups consisting of 10-15 students; i.e. several similar tutorials are taking place at the same time. All teachers aim for the unification of requirements for students, be it in practical education or in testing of their theoretical knowledge.

E-Learning Course

To support the teaching of the course Nursing Procedures and Interventions, an e-learning course in the LMS Moodle (system for education control) environment, which is available to all students of the study programs Nursing and Midwifery, has been developed. The main purpose of the e-learning course is to offer the students the basic information in one place. The advantages of the e-learning environment will be welcomed by teachers of the course as it enables them to unify the requirements for students set in the individual groups and available study materials.

E-learning is used in the preparation of students of medical disciplines increasingly. For example, you can remember teaching in Germany (Buch, 2014), Turkey (Lahti, 2014) or Australia (Lamont, 2014).

The fact that the course is aimed at practical skills means that the e-learning course is nothing but the support of education. It is aimed at theoretical knowledge, term definitions, process descriptions, etc. Practical training in medical institutions takes place after the education ends.

The e-learning course for the support of the teaching of the course Nursing Procedures and Interventions was created as part of the diploma thesis (Babičová, 2013). The course was elaborated according to the methodology of distance learning and was made available for

[1] The course as described in this article is an introduction to the nursing procedures and interventions studies and in the list of subjects, it is numbered as 1. For transparency reasons, this number will be omitted. The education further continues in the same named courses numbered 2 and 3.

students for the first time in the 2012/13 academic year.

Description of the E-Learning Course

At the beginning of the course, students learn basic information about its aims, themes, and teachers. The e-learning course is further divided into 6 chapters, which correspond to the topics of the course as listed in the syllabus:

- Monitoring of the physiological functions
- Extraction of the biological material
- Application of drugs
- Nutrition
- Parenteral nutrition
- Enteral nutrition

The individual chapters of the course have the same structure. Aims of the chapter, keywords and the time required for studying are set first. This is followed by study materials that come in two variants – in the form of a text with hyperlinks; and in the form of video tutorials that clearly step by step demonstrate the individual nursing procedures and interventions. A short 10-question test is included to conclude each chapter.

The course has been compiled on the basis of the methodology for creating distance learning teaching objects (Zlámalová, 2004). Study materials are compiled and structured according to the methodology for creating distance learning study texts (Bednaříková, 2004) and are inspired by the recommended literature for the course (Plevová, 2011 and Janíková, Zeleníková, 2013). For the purposes of the course, the study materials went through appropriate graphic changes. Moreover, icons for easier navigations and many examples were added. To present real activities in the real environment, instructional video tutorials were shot in the practical classrooms. Video tutorials come with a legend and students can browse through them not only at school, but they can also use them for home preparation.

The course is meant mainly for the theoretical preparation of students. Therefore, we will further examine the testing of students' theoretical knowledge within the scope of the course.

Testing Within the Scope of the Course

Every testing of knowledge in the education process has two main functions (Jeřábek, Bílek, 2010):

- Diagnostic – enables diagnosing students' knowledge in a short time. The results are accessible immediately and they are not influenced by the teacher's attitude, opinion or experience.
- Controlling – in the sense of controlling the set educational aims, which may be important for both the teacher and the student.

Depending on what education requires, there are different types of tests. The advantage of the

e-learning environment is that during the testing process the electronic tests can be created and automatically evaluated. The evaluation is at students' disposal immediately after the end of testing. This, of course, requires the closed tasks, such as multiple choice questions, matching questions, dichotomy questions, etc. Open questions with written answers are hard to process and therefore they are not usually included in electronic tests.

	Title of the chapter	**Number of test questions**
1	Monitoring of the physiological functions	9
2	Extraction of the biological material	10
3	Application of drugs	11
4	Nutrition	10
5	Parenteral nutrition	15
6	Enteral nutrition	11
Overall number of course questions		**66**

Tab. 1: Number of Test Questions in Particular Chapters

The bank consisting of 66 test tasks was created within the scope of the course Nursing Procedures and Interventions in the LMS Moodle environment. The tasks were created in accordance with the contents of the chapters and their number for particular chapters is listed in the table 1. All tasks were formulated as closed. The majority of the questions required picking one or more correct answers from the offered variants, only three of them were matching questions.

To ensure higher objectivity of testing, the parameters of questions and tests had been set so that the sequence of distractors was generated randomly as was the choice of the answers from the task bank and their sequence in the generated test. This enabled individualization of testing not only in the group of students but also within the scope of testing of each student. In an individual attempt, each student solved an original test.

Malach (2003) defines various criteria for the division of didactic tests. One of the criteria is when the test is implemented into education according to which there are three types of tests:

- Entering tests are implemented at the beginning of education and its aim is to diagnose the entering level of students' skills and knowledge and the possible chance of their mastering of the curriculum. They are not primarily used for the evaluation of students. They are the most useful when students from different schools or grades join together for studying.
- Continuous or formative tests are set during the course of education. They give the teacher feedback on how students have mastered the curriculum of the particular thematic unit. Such tests tend to deal with the short passages of the curriculum and they

are not primarily used for the evaluation of students.

- Output or summative tests measure mastering of the educational unit and are used for the final evaluation of students.

Considering when the test is implemented into education, the didactic tests have primarily diagnostic function in the first phase. Thanks to the tests, both teachers and students can obtain feedback on actual knowledge in the particular area. In this phase, the test result can even have a motivational purpose by encouraging students to further study or to complete the required knowledge. The fulfilment of these test functions is conditioned by the result not influencing the final evaluation.

On the other hand, in the final phase of the education process the tests have primarily the controlling function as they become the basis for the final evaluation of students' work.

Aims and Process of Student Testing

The division of tests according to when they are implemented into education became the basis of the experiment aimed at testing of the Nursing Procedures and Interventions course students. The experiment took place during the winter semester of the 2012/13 academic year.

The aim of the experiment was to learn students' knowledge gain during the course. The partial aim was to learn the differences in entering knowledge of the students who in their previous studies studied in both health and non-health study programs, and to observe knowledge gain of students in those groups during the course. Considering the specialization of the course and its contents, the differences in the test results between full-time studies students and combined studies students could also be expected. The number of students in individual groups can be seen in the table 2.

	Health	**Non-health**	**Σ**
Full-time studies	31	22	53
Combined studies	48	8	56
Σ	79	30	109

Tab. 2: Number of Students in Individual Groups

Testing had three phases:

- **Initial test** held before the start of the course examined students' entering knowledge. It consisted of 16 questions that were randomly generated from the bank of test tasks (66 questions). The test was held at the end of September 2012.
- **Parallel test** was held after the individual chapters, immediately after the curriculum of the particular chapter had been discussed. The total number of six tests was compiled from the questions belonging to a particular chapter. The tests results were mainly used as feedback for students and teachers. The tests were held during the winter semester in October, November, and December 2012.

- **Final test** was part of the requirements for obtaining the credits and thus was held during the credit week. Again, it consisted of 16 questions that were randomly generated from the bank of test tasks. The chosen tasks covered the entire curriculum, i.e. all the chapters.

The results of the initial test and parallel tests were not included in the final evaluation; they had only motivational and diagnostic function. The final test, which was part of the course and was held at the department in January 2013, was the only one that influenced the final evaluation of students.

Testing Results

The testing results were exported from the LMS Moodle without students' personal data and further anonymously processed in the spreadsheet processor. Each test contained the following data:

- Grading all the answers of individual students 1 or 2.
- The list of specific answers of individual students to generated questions, the list was not connected to the numbers of the questions.
- Students' average success rate in individual questions of the test.

In the list the results of the full-time studies students and combined studies students as well as their previous specialty (health vs. non-health study programs), were visibly marked. The data were used for further comparison of the achieved results for the individual groups of students.

To ensure higher objectivity of the processing, the exact formulation of the questions remained anonymous (questions had only numbers). Therefore, we list only domains within the scope of which the questions were defined.

For easy processing and comparison of the testing results we introduced a term student's success rate in the test, which is expressed as the ratio of their correct answers in the test. For the group of students the success rate is expressed as the percentage of the individual group members' success rate.

Students' Average Success Rate in Tests

The bank of test tasks was used three times during the course – in the initial, parallel and final tests. The results of the students' average success rate in the individual phases of testing are listed in the table 3. The success rate in the first test was 58%. It increased once the students had gone through the curriculum within the scope of parallel tests. In the final part of testing the students' success rate increased insignificantly. Even if the students' success rate in individual test evolved as expected, the end result of the success rate – 75% – did not match the expectations.

Regarding the overall evaluation of the course, the total number of students who participated in individual phases of testing is interesting. 100 students started the initial test, 4 of which did not finish it. Participation in parallel tests during the course of the semester gradually decreased from 88 students who took part in the first test (Monitoring of the physiological functions) to

60 students in the last test (Enteral nutrition). The most probable reason for this would be that as the semester went on, they were forgetting to fill in the tests. 93 students took the final test, i.e. compared with the students' participation in parallel tests, their number slightly increased.

It is positive that even if there were fewer students in the course than what the number of initially signed up students was (12 of the initially signed up students did not take part in the course), students worked continuously and their number decreased insignificantly (3 students).

	Number of Students	Average Success Rate
Initial test	96	58,19 %
Parallel tests	74	73,24 %
Final test	93	75,45 %

Tab. 3: Students 'Average Success Rate in Individual Tests

Success Rate in Individual Questions

Students' average success rate can also be measured for individual questions. Out of all 66 questions, the success rate in the following tests increased in only 32 (48%) questions. The growing importance of tests during the course of the semester was conditioned by the higher number of questions with the increasing success rate. The reasons for the low number of questions with the increasing success rate were clarified by the remaining questions with the decreasing success rate.

From the initial test to the parallel tests, 8 questions (12%) had the decreasing success rate. These were mainly questions for which the students guessed the correct answer in the initial test and then, as they studied the curriculum, they became confused and chose the incorrect answer. Among such questions we can place for example the question on the increased breathing frequency or the question on the presence of substances necessary for protein production. The decline in the first phases of testing is not significant, i.e. not more than 10%.

On the other hand, from the initial test to the final test, 26 questions (40%) had the decreasing success rate. Slight decline in units of a percent might have been caused by students' forgetting or their lowered attention, even if it is, considering the importance of the final test, unlikely. More significant decline (as much as 20%) was detected mainly in the matching questions where students made mistakes due to not paying attention or imprecision.

Success Rate in Individual Chapters

Students' average success rate in the individual chapters of the course can be seen in the figure 1. It can be noted that in the most cases the students' success rate in the individual chapters increased as expected. The same can be said about the success rate as for the entire course (see the comparison with the table 3).

The most successful chapter was the first one: Monitoring of the physiological functions. During the course of the semester, the students' success rate in the individual chapters was gradually decreasing. The last chapter Enteral nutrition was one of the most demanding

chapters.

In the chapters Application of drugs and Enteral nutrition the decline of success rate in the final test when compared with the parallel tests can be noted. By analysing the questions we learned that the decline in the chapter Application of drugs was caused by the higher number of questions with the lower success rate in the final test. As for the individual questions, the decline is insignificant (1-2%). Overall, it meant worse results of the chapter at the end of the course. In the chapter Enteral nutrition the problem-causing questions are those on chronological sequence of performed operations, where there is a variation in the success rate as much as ±20 %.

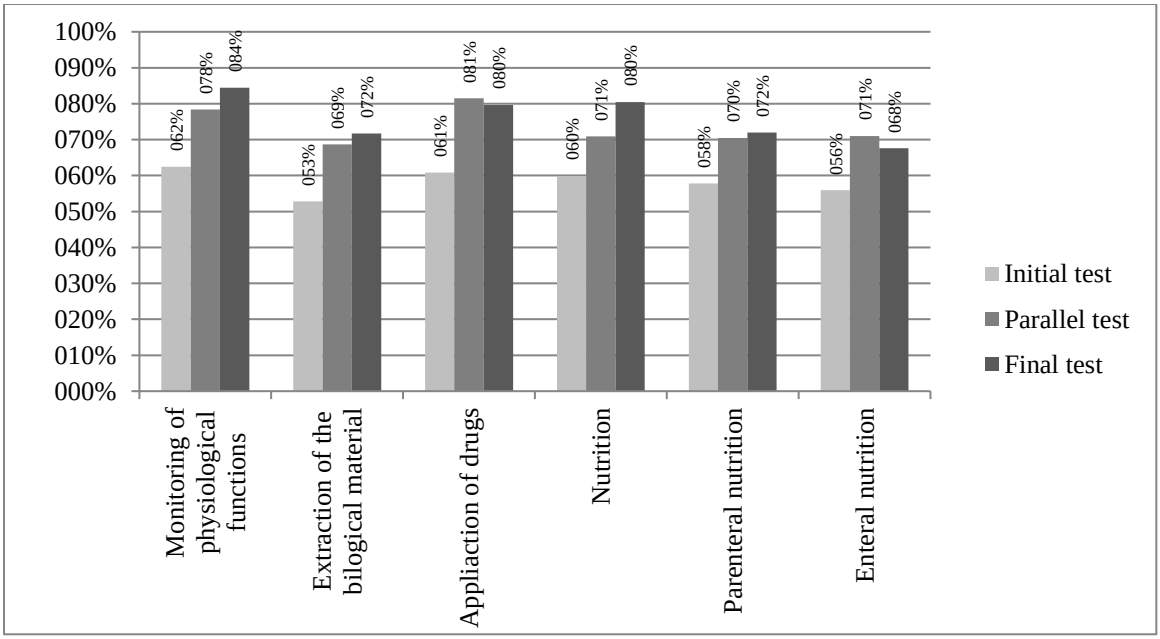

Fig. 1: Students 'Average Success Rate in Individual Chapters

Comparative Test Results According to the Division of Students into Groups

Table 2 shows the division of students into groups. Full-time studies students and combined studies students took part in the testing. The majority of students had already studied in health study programs. However, there were 30 students who had never studied in health study programs before.

We will further try to learn the differences in the results of students of individual groups.

Students' Form of Study

The course Nursing Procedures and Interventions is being taught both in the full-time studies and combined studies. Figure 2 shows the results of the students' (studying in both forms of study) success rate in parallel tests (according to individual chapters) and in the final test. The differences between both groups are not statistically significant. Nevertheless, it is surprising that almost in all tests the students studying in the combined studies had better results.

Largest differences can be found in the first two chapters Monitoring of the physiological functions and Extraction of the biological material. There the difference between the groups is more than 10%, which suggests that the students studying in combined studies have more effort and motivation. This is a general trend, which is connected to the fact that the students studying in combined studies are usually motivated by a job.

In the following phases of the testing (from the chapter 3 and on) the results between groups leveled.

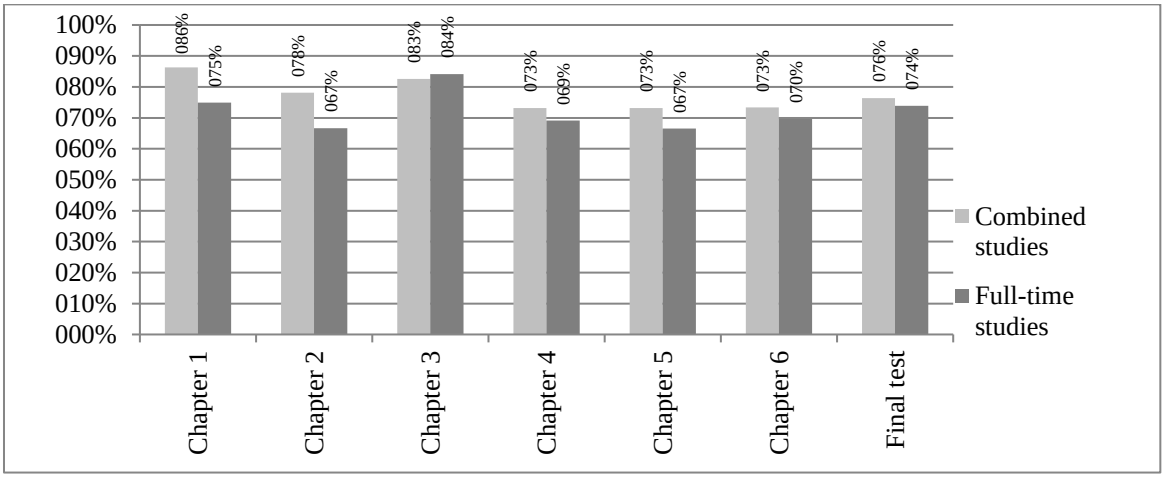

Fig. 2: Students 'Success Rate in Individual Chapters According to the Form of Study

Students' Previous Studies

In the skill-oriented studies, among which health studies can be counted, the differences in the initial knowledge of the students, who had already worked or studied in the given field, can be seen. As for the course Nursing Procedures and Interventions, we traced the group of students who had already worked or studied in the health field. The comparison of the results of both groups can be seen in the Figure 3.

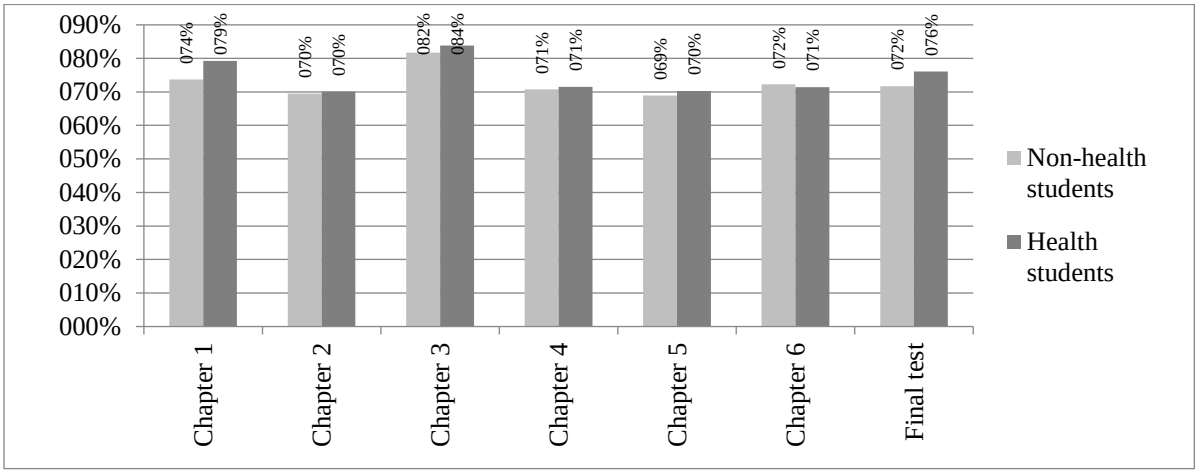

Fig. 3: Students 'Success Rate in Individual Chapters According to Previous Studies

The figure suggests that a larger (but still insignificant) difference is only in the first chapter Monitoring of the physiological functions. Subsequently, the results of both groups levelled very quickly. The results confirm a presupposition that the non-health students are aware of their handicap, try even harder and narrow the fellow students' advantage in a short time. There was no decline in the number of non-health students during the course.

Conclusion

The course Nursing Procedures and Interventions is being taught at the beginning of study programs Nursing and Midwifery, i.e. students take it during the winter semester of their first year. Due to a large amount of the practical skills the students have to master, the course is very demanding. To support the teaching of the course an e-learning course has been developed that tries to present the basic theoretical knowledge of the course, be it in the form of text study materials or in the form of video tutorials demonstrating the individual procedures and interventions. The course was implemented into education for the first time in the 2012/13 academic year.

Tests aimed at continuous diagnostics and the final control of students' theoretical knowledge, were part of the course. Testing within the scope of the course had three phases – the initial test, parallel tests and the final test which had to be passed in order to successfully complete the course.

The processing of the testing results had several phases. That enabled a deeper analysis of students' work during the course of the semester, but also a detailed analysis of the test questions and the test structure in general. On the basis of the results it can be said that the proposed process of testing students' knowledge is a suitable way of teaching that can be used throughout the entire semester. The initial test and parallel tests have the cognitive function and enable self-reflection and diagnostics of students. The final test has mainly evaluating and controlling function. All tests distinguished between students with better and worse knowledge.

The basis findings from the analysis of testing can be summed up in several points:

- Students' theoretical knowledge was gradually increasing during the course of the semester;
- More than 50% of the questions had a decreasing tendency at some point during the testing phase. Be it the questions the answers to which could be guessed in the initial test, the matching questions, or the questions that were not sufficiently remembered, i.e. the students forgot the answers;
- Students' previous studies do not influence their results in the course;
- The differences between the students studying in the full-time studies and combined studies show greater motivation and effort of the students studying in the combined studies.

The testing results did not bring any new findings; they only proved and highlighted the supposed facts. In the course Nursing Procedures and Interventions there is no need to distinguish and focus on the particular groups of students. Previous knowledge, the degree of

motivation and students' effort level during the course of the semester; and students then have similar results.

The analysis proved that in the future it is necessary to focus mainly on the creation and formulation of questions (Jeřábek, Bílek, 2010):

- For questions the answer to which can be guessed in the initial test and without prior knowledge, the distractors (offered answers) must be modified. The higher specialized level of distractors of those questions must be modified so that each of them is picked by the same share of students at the beginning.
- Ambiguously defined distractors in individual questions must be eliminated.
- The matching answers must be modified so that the matching system is clear and the number of students' incorrect answers corresponds to their knowledge.

The presented imperfections of the test tasks are common problems that occur when creating tests. Some of the slight imperfections in the formulation of the test tasks were removed immediately; the more demanding modifications will be carried out continuously according to the results of future analyses.

To sum up, it must be stated that the testing in the course Nursing Procedures and Interventions proved good and will be further continued. The results of the parallel tests were praised by all teachers as they gave them feedback and helped them in their preparation for teaching. After the initial experience, the final compulsory electronic testing of students' knowledge using the tests in the e-learning course has been implemented into the course syllabus.

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