



Teaching the nursing process to undergraduates with the support of computer technology*

Ensino do processo de enfermagem a graduandos com apoio de tecnologias da informática

Enseñanza del proceso de enfermería a graduandos con el apoyo de tecnologías de la informática

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ABSTRACT

Objective: To evaluate the virtual learning environment for the teaching of nursing process to undergraduate students. **Methods:** This was an exploratory study of cross-sectional design. The population consisted of 42 students divided into groups A and B, with 21 each, randomly selected. Data were collected using the web platform and exercises related to program content, including identification and classification of nursing diagnoses, both in the virtual environment as well as in a printed version. **Results:** We found a significant association between the variables “has a microcomputer” and “preference for the exercises on the web platform” ($p = 0.0044$) and between “has a microcomputer” and “Internet access” ($p = 0.000001$). The majority of the students preferred to perform the exercises in a virtual environment for its convenience, speed and practicality (61.9%). **Conclusion:** The use of virtual environment for teaching and learning was positively evaluated by students, but the results pointed to the need for adequacies of educational technology resources.

Keywords: Nursing process; Nursing informatics; Nursing diagnosis; Education, higher

RESUMO

Objetivo: Avaliar o ambiente virtual de aprendizagem no ensino do processo de enfermagem a graduandos. **Métodos:** Trata-se de estudo exploratório, de delineamento transversal. A população constituiu-se de 42 acadêmicos divididos em grupos A e B, com 21 cada, selecionados aleatoriamente. Os dados foram coletados no uso da Plataforma Web e em exercícios relacionados ao conteúdo programático de identificação e classificação de diagnósticos de enfermagem, tanto no ambiente virtual como na versão impressa. **Resultados:** Encontrou-se associação significativa entre as variáveis “possui microcomputador” e “preferência em realizar os exercícios na plataforma web” ($p=0,0044$) e entre “possui microcomputador” e “acesso à internet” ($p=0,000001$). A maioria prefere realizar os exercícios em ambiente virtual pela comodidade, rapidez e praticidade (61,9%). **Conclusão:** O uso do ambiente virtual de ensino e aprendizagem foi avaliado positivamente pelos acadêmicos, mas os resultados apontaram para a necessidade de adequações desse recurso tecnológico educacional.

Descritores: Processos de enfermagem; Informática em enfermagem; Diagnóstico de enfermagem; Educação superior

RESUMEN

Objetivo: Evaluar el ambiente virtual de aprendizaje en la enseñanza del proceso de enfermería a graduandos. **Métodos:** Se trata de un estudio exploratorio, de tipo transversal. La población estuvo constituida por 42 académicos divididos en grupos A y B, con 21 cada uno, seleccionados aleatoriamente. Los datos fueron recolectados usando la Plataforma Web y mediante ejercicios relacionados al contenido programático de identificación y clasificación de diagnósticos de enfermería, tanto en el ambiente virtual como en la versión impresa. **Resultados:** Se encontró asociación significativa entre las variables “posee microcomputadora” y “preferencia para realizar los ejercicios en la plataforma web” ($p=0,0044$) y entre “posee microcomputadora” y “acceso a la internet” ($p=0,000001$). La mayoría prefiere realizar los ejercicios en el ambiente virtual por la comodidad, rapidez y practicidad (61,9%). **Conclusión:** El uso del ambiente virtual de enseñanza y aprendizaje fue evaluado positivamente por los académicos, sin embargo los resultados apuntaron hacia la necesidad de adecuaciones de ese recurso tecnológico educacional.

Descriptores: Procesos de enfermería; Informática aplicada a la enfermería; Diagnóstico de enfermería; Educación superior

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INTRODUCTION

Computers entered the field of nursing hospital care in the 1950s, where they afforded extensive resources on nursing technologies that resulted in possible benefits for the nursing profession, especially in the United States⁽¹⁾. In Brazil, the earliest attempts at the use of computers in nursing ate from 1985 and were mainly centered on teaching; however, the use of information technology is still incipient⁽²⁾. An increasing number of organizations and institutions are employing electronic methods of communication and developing skills in the use of computers and the Internet as a source of information. In educational institutions, the use of information technology is increasingly becoming an important part of the syllabus at all levels and can address crucial changes, allowing the users to overcome geographic and professional limitations⁽³⁾.

The use of the Internet is a global phenomenon, and there has been an increasing tendency to use the Internet to supply creative and novel learning methods for students residing in remote locations. Professional standards in the health profession are also increasingly requiring skills in the use of computers⁽³⁾. In this context, institutions of higher education must facilitate opportunities for computer- and web-based learning. The corresponding adjustments are being made at the national and international levels; however, novel pedagogic and educational methods are required, particularly in the field of nursing⁽³⁾.

Nursing informatics alludes to the use of information technology related to the assistance of patients, healthcare management, and teaching. In this study, a systematic literature review was performed to assess the application of nursing informatics in Brazil between 1985 and 2004. A total of 31 studies were located, among which most had been performed by teachers (44.9%), followed by nurses (15.7%) and undergraduate nursing students (5.6%); most of the studies had been performed in the university setting (71.9%)⁽²⁾.

Regarding the use of virtual teaching and learning environments in nursing, one study was performed in Ribeirão Preto to assess its compatibility with the teaching and learning of psychiatric nursing. The sample comprised 32 undergraduate students from the Nursing School of Ribeirão Preto, University of São Paulo (Universidade de São Paulo - USP), consisting of Psychiatric Nursing students who attended an online course on mood and personality disorders. Data were collected from the virtual environment website records and with three questionnaires to identify the students, their social characteristics and opinions on the investigated technology, the attended course, and the student-software interactions. The results confirmed

that virtual environments are useful tools for teaching and learning in nursing by creating novel educational possibilities and keeping open channels for information exchange and communication⁽⁴⁾.

Factors associated with the phases of the implementation of virtual learning in the hospital setting have been reported in the nursing literature, and nurses tend to rate the process as highly bureaucratic. A particularly defining factor is how this subject is taught in undergraduate nursing courses⁽⁵⁾. Thus, novel technology-based tools should be developed to teach the nursing process to undergraduates as an important method in teaching nursing care. The use of computer-based techniques and technologies at the undergraduate level allows for more creative and interactive teaching⁽⁶⁾.

The experiences reported in the literature reveal that the development and use of computer-based educational resources exerted a significant impact on and created opportunities for the development of the nursing profession. However, the incorporation of novel educational methods requires a paradigm shift. To some, the new methods represent a major challenge and an unknown area, whereas to others, they pave the way for action and growth as tools for practice, teaching, and research⁽¹⁾.

Therefore, the present study sought to assess the use of the virtual environment as a teaching and learning strategy in the Nursing Fundamentals I curriculum, specifically, the Nursing Process course attended by undergraduate nursing students.

METHODS

This cross-sectional, quanti-qualitative, descriptive, and exploratory study⁽⁷⁻⁹⁾ was performed at the Nursing School and Distance Learning Center (Centro de Educação a Distância - CEAD) of the Federal University of Alfenas, Minas Gerais, Brazil. The sample consisted of students enrolled in the third semester of the undergraduate nursing program who attended Nursing Fundamentals I sequence and were randomly divided in two groups, A and B, of 21 students each, with a consideration for gender balance.

Data were collected between May and June of 2008 using a questionnaire containing questions designed for the general characterization of the sample and open questions designed to investigate the students' opinions on the virtual learning environment. Such assessments concerned the format, access, navigation, hypertext, and images in the virtual environment as well as the time allotted to perform a series of indicated exercises related to the course content. The students in turn were evaluated as to their performance on the completion of the indicated exercises, which consisted of identifying and establishing nursing diagnoses according to the North

American Nursing Diagnosis Association (NANDA) Taxonomy II⁽¹⁰⁾, in a test clinical case presented in both the traditional printed version and the virtual environment. Additionally, the features that proved to be easy or difficult for the students to manage in the virtual learning environment were assessed. The correlations between the following variables were also investigated: preference for performing the exercises in the virtual environment, age, previous computer experience, having a personal computer at home, and access to the Internet.

To assess student performance, a series of exercises was assigned by the professors in charge of the course. Both groups A and B performed three exercises using the printed version and three exercises using the virtual learning environment; therefore, all students tested the computer-based resources. The theoretical contents were explained before the performance of the exercises.

All exercises consisted of the analysis of clinical cases that exhibited increasing levels of complexity. Based on clinical interviews and physical examinations, the students identified the objective and subjective data related to the state of health of the patient, selected the pertinent groups of data, and by applying clinical reasoning, established three nursing diagnoses for the patient according to the NANDA Taxonomy II⁽¹⁰⁾. The nursing diagnoses selected by the students were acute pain and risk for falls; the defining traits and factors related to the former and the risks factors of the latter were also identified, always within the context of the corresponding clinical case. The identification of gaps was also performed to confirm the third nursing diagnosis, namely impaired physical mobility. Finally, the students chose a central diagnosis for the patient and established three nursing interventions together with their results. A score between 0 and 10 was attributed to the performance of each student at each step, and the final grade was the arithmetic mean of the partial scores.

The test clinical case was carefully selected by two of the authors, who are the professors in charge of the program and have experience and knowledge in nursing diagnoses, which were established according to NANDA Taxonomy II⁽¹⁰⁾. Access to the web-platform was granted to the participants; both students and professors were provided with user identification and passwords by the Information Technology team at CEAD-UNIFAL-MG.

Importantly, the exercises were exactly the same in the printed version and the web-based platform. However, the order of performance was alternated between groups A and B; while group A was working with the web-based platform at the CEAD facilities, group B was working with the print version in the regular classroom supervised by the professors. The exercises were made available on the website a few minutes before the start of the task exclusively at the CEAD computers, i.e.,

remote access was not allowed, because one of the variables measured in the present study was the time required for the students to complete the task. Free access was provided for the remaining tools (links, downloads, photographs, images, and forums). All tasks in both formats were performed during the regular course schedule, as recommended by the Undergraduate Provost's Office.

The students were instructed on the use of computer-based resources from the first day of the course of Nursing Fundamentals I, including the use of the virtual learning environment as an auxiliary tool in the teaching and learning of the theoretical content of the Nursing Process course, totaling 12 credit-hours. Note that the total course credits required by this discipline are 60 hours of theory and 30 hours of practice; according to the university rules, the credits allotted to the use of computer-based educational technology may not exceed 15% of the total credit-hours when a discipline is taught in the traditional (classroom) format.

Additionally, the course syllabus, the grading system, and the schedule of classes and tasks were explained to the students on the first day of class. The grading system employed allowed for students to review the exercises performed with the professors, and the final results were not negatively affected by the procedures introduced by the present study. The traditional formal evaluation, namely, a test on the Nursing Process contents, was replaced with the abovementioned exercises within the context of the problem-based learning and formative and summative assessments⁽¹¹⁾.

The data were stored in a database constructed with the Epi-Info software version 6.04⁽¹²⁾; means and standard deviations (SDs) were calculated and then analyzed using Chi-square tests with a 5% level of significance ($p < 0.05$). The answers to the open questions were analyzed using qualitative methods, namely, thematic analysis according to Minayo⁽¹³⁾. This method allows for the tabulation and analysis of the students' narratives in their assessment of the virtual teaching and learning environment and provides suggestions for improvement. The questions were open, simple, and direct, allowing the students to express their opinions freely⁽¹⁴⁾.

From the students' narratives, meaning nuclei were extracted as a function of their frequency or significance regarding the investigated analytic object. The students were identified by the letters AC followed by a number representing the order in which they had been interviewed during the data collection. Thematic analysis was divided into three phases: In the first stage, or pre-analysis, the documents were analyzed according to the aims of the present study. An exploratory analysis followed, in which the text was analyzed according to the registered units established in the pre-analysis, which were classified and

then aggregated. Finally, the third phase consisted of the treatment and interpretation of the results; for this purpose, the results were subjected to a formal thematic discourse analysis, in which regularity was preserved. Such content analysis allows for the apprehension of the meaning and comprehension of the studied object⁽¹³⁾. The present study was approved by the Research Ethics Committee of Federal University of Alfenas – UNIFAL-MG, protocol № 23087.001701/2008-14.

RESULTS

A total of 42 students enrolled in the third semester of the undergraduate nursing course participated in the present study. Among them, 85.7% were female; the average age was 21.9 years old (SD ± 2.5); 54.8% had attended public secondary school; 78.6% were residents of Alfenas city; 90.5% had previous knowledge of computers, among which 52.0% had attended computer courses; 64.7% had a computer at their private homes; and 54.8% had an Internet connection. Only 11.9% had previously used a virtual learning environment in other disciplines, which shows that such use is still incipient in the investigated university.

The results indicate that all students composing the sample succeeded in accessing the virtual learning environment; the platform format was rated as appropriate by 95.2% of the respondents, navigation was approved by 92.9%, the hypertext was approved by 95.2%, and the images were approved by 97.6%. Most reported a preference for performing the exercises in the virtual platform because it was more comfortable, rapid, and practical (61.9%). Having a computer ($p=0.0044$) and an Internet connection ($p=0.000001$) at home seemed to exert decisive influence on the preference to perform the exercises using the web platform. This finding may be explained by the difficulties students encounter at the investigated university in gaining access to computer laboratories. Currently, the university has three such laboratories, of which one is exclusively designated for Computer Science students, and another is reserved for classes that require Information Technology resources; therefore, only the third laboratory can be used by the remainder of the students.

Age ($p=0.7818$) and a previous knowledge of computers ($p=0.1267$) did not exhibit significant correlations with the preference for performing the exercises in the virtual environment. Differences were observed in the performance of students in group A (with an average grade of 8.5) and B (with an average grade of 9.2). This difference may be explained by the average number of theoretical classes missed by the students in group A (9.6 missed classes) compared with those in group B (5.4 missed classes), considering the fact that the theoretical contents had been taught previ-

ously. However, because both groups performed the exercises in both the printed and web-based formats, the possibility of performing the exercises in the virtual environment was ruled out as a factor explaining the observed difference in performance.

The grading system that was applied was established by the university Undergraduate Provost's Office; however, the assessment of the students' performance was approached as a process, wherein the progress of each student was continuously and individually monitored, as described above. Therefore, rather than employing a method to measure end-of-course results, assessments were performed at several time points to reorient the direction of the teaching and learning processes regarding the adequacy of the didactic-pedagogic materials and the performance of the academic tasks.

Group B required less time (15.95 minutes on average) to complete the exercises in the virtual environment compared with group A (23.46 minutes); the time required to complete the tasks in the printed version was similar for both groups. It is worth noting that 26.2% and 38.5% of students in groups A and B, respectively, had computers at home and that 81.8% and 93.8%, respectively, had access to the Internet. The fact that more students in group B had home access to computers and the Internet most likely exerted a favorable influence on their performance in the virtual environment.

The difficulties exhibited by the students in the use of information technology were described as an infrastructure that "does not make computers available to all"; navigation was characterized by "errors in sending files", "problems in opening links", or "blocked computers". Conversely, the features identified as facilitators were "quicker", "comfortable", and "practical for the resolution of the indicated exercises". As possible improvements, the students suggested expanding the computer laboratory, inserting a logout link to increase safety, offering training in access to and navigation in the web-based platform to all university students, and unblocking the computers.

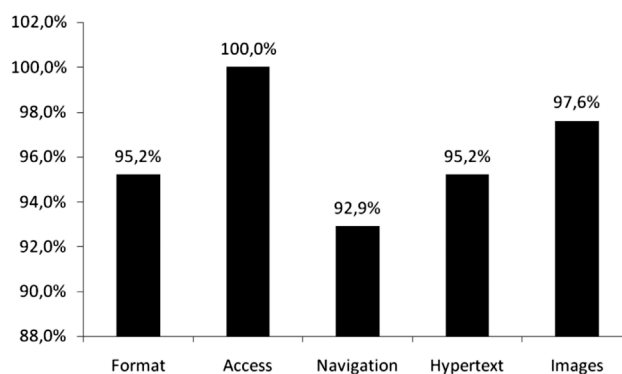


Figure 1. Distribution of the percentages of the assessments of the virtual teaching and learning environment by the students in the undergraduate course Nursing Fundamentals I. Alfenas, 2008.

DISCUSSION

A study performed to investigate the main use of the Internet in the field of nursing found that teaching is the main area that utilized this resource, especially for distance learning. Another well-developed area is patient education, in which nurses play a major role in the supply of health information, especially regarding the prevention of disease and support for specific patient groups. The area of assistance focuses on the representation of knowledge, which is useful for the purposes of evidence-based practice. Although these applications are currently quantitatively small, they exhibit great potential for improving the quality of nursing assistance. However, further research and financial investment are needed to enable their more widespread use. The area of research in nursing exhibited the lowest number of modalities of use, with the main ones being literature surveys and online data collection⁽¹⁵⁾.

According to a systematic literature review, in the 31% of the analyzed studies that concerned the use of computers in nursing, 41.9% were associated with education and teaching. Most studies showed that undergraduate nursing students exhibit positive attitudes regarding the use of this technology⁽²⁾. Considering that the use of computers in nursing is mainly associated with education, the literature reports the satisfaction of students with the use of virtual environments as tools for teaching and learning⁽¹⁶⁾. A study performed to elaborate a proposal for virtual education on assisting cardiopulmonary resuscitation in newborns concluded that teamwork, the quality of the didactic materials, the choice of the teaching platform, and the methods chosen were the determining factors for the success of the project and the satisfaction of teachers and students⁽¹⁷⁾.

Another study investigating student opinions on the format and content of a website developed to teach Didactics in Nursing reported that the students' assessment of the format, content, and use of the website as a teaching environment ranged from good to very good because it made the channels of communication between teachers and students wider and more diversified, allowed for the acquisition of novel content, and made learning easier. The students further highlighted as favorable the possibility of obtain information away from the classroom and better communication with the other students and teachers and suggested introducing this resource in other disciplines. However, some

students reported poor interaction between teachers and students, which must be addressed in the future by adding tools that allow for better communication such as forums and chat rooms⁽¹⁸⁾.

As a function of the benefits associated with the use of computers, nurses must pay attention to the advantages they offer to practice, such as providing quick access to information, making the provision of services less bureaucratic, and supporting decision making. In addition, the technical knowledge and instructional characteristics enabled by computers afford better conditions for teaching and learning⁽¹⁹⁾. Nurses must know how to use computers to strengthen the body of knowledge in this field in line with the current trends⁽¹⁾.

CONCLUSIONS

The present study made it clear that the use of the virtual teaching and learning environment was rated positive by most of the investigated undergraduate nursing students. Having a personal computer at home seems to be a determinant for the preference for performing tasks in a web platform. Although they cannot be generalized, the results of the present study contributed to the development and improvement of the virtual learning environment in Nursing Fundamentals I as well as in other academic disciplines seeking to apply novel educational technologies to teaching, research, and the extension of the undergraduate course on nursing at the investigated university.

For nurses, there is an evident need to understand and incorporate the virtual learning environment into practice as an efficient educational device and to make use of such knowledge as a strategy for adding novel experiences and values to nursing practice. Finally, the present study may facilitate the introduction of innovations into nursing education based on a virtual approach to the nursing process, which is an extremely important subject in this field.

Further studies must be performed with more representative samples and while applying assessment instruments with confirmed validation and reliability to address these limitations of the present study. In addition, such studies must assess the use of the virtual teaching and learning environment not only among undergraduate students but also among teachers due to the previously identified need for teachers to become acquainted with such knowledge's an innovative strategy for training in nursing.

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