Virtual learning objects: contributions to the learning process in health and nursing*

Objetos virtuais de aprendizagem: contribuições para o processo de aprendizagem em saúde e enfermagem

Objetos virtuales de aprendizaje: contribuciones para el proceso de aprendizaje en salud y enfermería

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ABSTRACT

Objective: To highlight the contributions of the application of Virtual Learning Objects (OVAs) for the learning process in health and nursing. **Methods:** A systematic review was conducted using the databases of PubMed / MEDLINE, Scopus, CINAHL and ISI Web of Knowledge. We analyzed 13 studies, published in the English language, for the period of 2004 to 2008. **Results:** The predominate research about OVAs was developed with a focus on patients (50%), students (38.4%) and healthcare professionals (7.1%). With regard to the levels of evidence, 30.8% of the studies were classified as level II and level III-1, respectively, and 30.4% were level IV. **Conclusion:** The OVAs have contributed significantly to the increase in knowledge and learning in patients, students and caregivers, providing a promising perspective for education in health and nursing.

Keywords: Nursing; Learning; Nursing informatics; Educational technology; Computer simulation

RESUMO

Objetivo: Evidenciar as contribuições da aplicação de Objetos Virtuais de Aprendizagem (OVAs) para o processo de aprendizagem em saúde e enfermagem. **Métodos:** Estudo de revisão sistemática realizada nas bases de dados *PUBMED/MEDLINE, SCOPUS, CINAHL* e *ISI Web of Knowledge*. Foram analisados 13 estudos, publicados no idioma inglês no período de 2004 a 2008. **Resultados:** Predominaram as pesquisas sobre OVAs desenvolvidas com enfoque em pacientes (50%), estudantes (38,4%) e profissionais de saúde (7,1%). Quanto aos níveis de evidência 30,8% dos estudos foram classificados como nível II e nível III-1, respectivamente e 30,4% de nível IV. **Conclusão:** Os OVAs contribuíram significativamente para o aumento do conhecimento e aprendizagem em pacientes, alunos e cuidadores, constituindo uma promissora perspectiva para educação em saúde e enfermagem.

Descritores: Enfermagem; Aprendizagem; Informática em enfermagem; Tecnologia educacional; Simulação por computador

RESUMEN

Objetivo: Evidenciar las contribuciones de la aplicación de Objetos Virtuales de Aprendizaje (OVAs) para el proceso de aprendizaje en salud y enfermería. **Métodos:** Estudio de revisión sistemática realizada en las bases de datos *PUBMED/MEDLINE, SCOPUS, CINAHL* e *ISI Web of Knowledge*. Fueron analizados 13 estudios, publicados en el idioma inglés en el período de 2004 a 2008. **Resultados:** Predominaron las investigaciones sobre OVAs desarrolladas con enfoque en pacientes (50%), estudiantes (38,4%) y profesionales de salud (7,1%). En cuanto a los niveles de evidencia el 30,8% de los estudios fueron clasificados como nivel II y nivel III-1, respectivamente y el 30,4% como nivel IV. **Conclusión:** Los OVAs contribuyeron significativamente en el aumento del conocimiento y aprendizaje en pacientes, alumnos y cuidadores, constituyendo una prometedora perspectiva para la educación en salud y en enfermería.

Descriptroes: Enfermería; Aprendizaje; Informática aplicada a la enfermería; Tecnología educacional; Simulación por computador

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INTRODUCTION

The growing use of web-based technology in health education shows new opportunities for online learning in a flexible and easy way[1-3].

In this scenario, the Digital Learning Objects (DLOs) offer a new opportunity for the teaching and learning process in health and nursing. This technology can be defined as a digital resource that can be used to support teaching using a pedagogical perspective and planning, integrated with the teaching and learning process[4-5].

Some of the following factors favor the use of technology in health education: flexibility, simple construction, possibility to reuse, facility to update, interoperability, and support to online or face-to-face teaching[4-7].

Considering that the DLOs can help building the cognitive path of students and that there are very few studies in this area, we asked the following question: What are the contributions of DLOs to the teaching and learning process in health and nursing?

The objective of the revision was to show the contributions of the use of DLOs to nursing and health learning.

METHODS

Systematic review[8] without meta-analysis developed in the following stages[9]: Definition of the research question; Specification of the inclusion and exclusion criteria; Identification of the relevant studies and method test; Search in online data base *PUBMED/MEDLINE, SCOPUS, CINAHL* and *ISI* Web of Knowledge *(*ago/ 2009)*;* Inclusion of articles; Review of the abstracts carried out by two reviewers and application of the inclusion/exclusion criteria; Discussion to reach consensus among reviewers; Analysis of the complete texts by reviewers, application of the inclusion and exclusion criteria and encoding of the studies (A1 to A13); Inclusion of the outcomes in an electronic spreadsheet; and Presentation of the results and discussion.

The inclusion criteria were studies on DLOs related to health and/or nursing from Jan /2004 to Dec/2008, English and full text available; original articles with a clear method description, and result presentation. The exclusion criteria included: lack of compliance to the study theme, not being able to classify the level of evidence and full text not available.

The terms used to search for the articles in the database are available in the Mesh (Medical Subject Headings) vocabulary, except for the term "object learning", because it is a recent theme. The search was organized as shown in Chart 1.

For the present article, we have considered as DLOs all type of media used in the online teaching and learning process (videos, audios, discussion forums, simulated environments, among others).

In the first step, 85 articles have been found and were imported to the software EndNoteWeb®2.7. Forty articles have been excluded because of repetition.

The analysis of the 45 articles with full texts was carried out by two reviewers and, after application of the exclusion criteria, there were 13 articles left, which were the reference for the analysis. The strength of evidence of the studies was classified using the Joanna Briggs Institute scale[10] (Chart 2).

Chart 1 – Combination of the terms in the article search. Florianópolis, SC, 2009

Base	Filters	Set of terms
ISI Web of Knowledge	Lasted 5 years, in: topic	# multimedia teaching materials AND health # virtual teaching materials AND nursing # learning virtual object AND nursing # digital educative objects AND nursing # digital learning objects AND nursing
SCOPUS	TITLE-ABS-KEY (multimedia teaching materials) AND TITLE-ABS-KEY(nursing)) AND PUBYEAR AFT 2003 AND PUBYEAR BEF 2009	# multimedia teaching materials AND health # virtual teaching materials AND nursing # learning virtual object AND nursing # digital educative objects AND nursing # digital learning objects AND nursing
CINAHL	Jan 2004 to Dec 2008, full text, Boolean/sentence, complete text, abstract available, English, clinical trial, systematic review, research; adults, nursing education, informatics; SmartText Searching, exclude records Medline	# multimedia teaching materials (SU subject) AND nursing # virtual teaching materials AND nursing # learning virtual object AND nursing # digital educative objects AND nursing # digital learning objects and nursing
MEDLINE PUBMED	Free full text, abstract, publish in the last 5 years, human, English, Type of article: clinical trial, meta-analysis, randomized controlled trial; Age: al adult	# multimedia teaching materials AND health # virtual teaching material # learning virtual object # digital educative objects # digital learning objects

Chart 2 – Levels of evidence used to classify the studies

Level	Source of the evidences
I	Systematic review of all controlled randomized clinical trials
II	At least one randomized clinical trial with a detailed design
III–1	Well designed controlled trials without randomization
III–2	Comparative studies such as cohort, case-control, preferably from more than one research center or group
III–3	Multiple time series with or without the intervention. Dramatic results and uncontrolled trials
IV	Opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees.

RESULTS

The articles selected were inserted in an electronic spreadsheet (Excel 2007®) and classified according to: article code, complete reference, level of evidence, method, objectives and contributions to the learning (Chart 3).

Based on the analysis, we could identify the predominance of studies on DLOs developed with a focus on the patients (50%), students (38.4%), and health professionals (7.1%).

As for the strength of evidence of the studies, 30.8% were classified as level II (A12, A7, A4, A13), 30.8% as level III-1 (A5, A11, A3, A8) and 38.4% as level IV (A10, A1, A2, A6, A9), and there were no studies level I.

Table 3 – Publications included in the study. Florianópolis, SC, 2009.

Code	Objective / Study Type / Evidence Level	Contribution for learning
A1[11]	To describe and assess an electronic learning setting with nursing students to recognize signs of clinical complication / patients' improvement in intensive care **Study survey** **Level IV**	93.8-100% of the students (n=144) found it easy to use the multimedia setting; the technology helped in the learning experience and the perception of realism (77,8-95,8%), there was more confidence to face similar situation in the practice (68.8-97.9%)
A2[12]	To describe the development, use and assessment of web-based education for nursing students for the study of the Pathophisiology into Pharmacology **Descriptive Study** **Level IV**	The learning experience was high, especially regarding understanding rather than memorizing the subject content and in developing problem-solving abilities and becoming more independent
A3[13]	To assess whether participation in face-to-face discussion seminars or online asynchronous discussion groups had different effects on educational attainment in a web-based course **Non-randomized quasi-experimental study** **Level III-1**	The students who took part on the online discussion had a higher assignment mark (60.8/100) compared to those that chose face-to-face discussion (54.4/100), and the difference was statistically significant (p<0.02). The use of online activity was associated with students' better use of the learning process
A4[14]	To develop and assess a multimedia material (CD-ROM) on exercises during pregnancy and postpartum **Randomized clinical trial** **Level II**	The mean for pre and post test for self-efficacy of the experimental group was higher (2.85) than that of the control (0.29), just as the mean scores about the knowledge on the exercise in the experimental group (3.52) and control (1.56). Women from the control group improved their knowledge regarding the exercise and the self-efficacy during pregnancy and postpartum
A5[15]	To develop simulated physician-patient encounters as a strategy to improve asthma management by community-based primary care providers **Non-randomized quasi-experimental study** **Level III-1**	Professionals improved the control of medications, use of equipment, patient training, development of care plan and availability for practice visits (p<0.05). There was decrease in hospital admission and emergency care (p<0.05), there was improvement in the self-efficacy perceptions and treatment barriers, increasing learning of patients about their self-care
A6[16]	To examine the perception of bachelor in nursing from three university campi on improved web, learning environment, the digital literacy process, the use of technology and satisfaction **Survey** **Level IV**	The quality and the use of technology were assessed above the average; the global satisfaction was associated with the level of information technology (IT), perceived quality and usefulness of the material. Students with good IT skills are more prone to perceive the use of these materials
A7[17]	To assess the impact in patients with poor sight and their caregivers of an intervention using videos on knowledge, self-efficacy and attitudes **Randomized clinical trial** **Level II**	The intervention was significant to individuals' knowledge (1.1 vs. 8 p<0.001), there was an increase in the use of videos (28% to 51%), and there was no changes in the control group (34% in both times). The video had a small but significant impact in the knowledge and will to use devices for care
A8[18]	To improve the spatial memory of patients with damage limited to the hippocampus based on a virtual environment **Non-randomized quasi-experimental study** **Level III-1**	The damage to the hippocampus hinders memory when the memory load increases, that is, when more image locations need to be remembered

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A9[19]	To check the suitability of hypertext, education games and simulation concerning oxygen therapy in nursing academic articles **Exploratory study** **Level IV**	The DLOs received positive assessment in the requirements studied (scale from 1 to 5): presentation (MD 4.23; SD 0.9); use of the objects (MD 4.07; SD 1.02) and content suitability (MD 4.11; SD 0.94)
A10[20]	To examine similarities and differences of the sense of belonging in nursing graduate students taking an on-line versus face-to-face graduate research course. **Comparative descriptive study** **Level IV**	The outcomes suggest that students can experience the feeling of belonging when they use learning environments. Possibly, if the sample size was greater, these differences would be statistically significant, indicating that these online environments would lead to a greater sense of belonging compared to the face-to-face group
A11[21]	To examine the effects of multimedia with printed nursing guides in patient education on the improvement of self-efficacy, functional activity and length of hospitalization in patients with hip replacement. **Quasi-experimental, non-randomized study** **Level III-1**	Patients' hospitalization time was reduced in the experimental group. Its self-efficacy was greater than in the control group (+=-7.93 p<0.001). There was difference regarding functional activities between the scores of the experimental and the control group (+=4.33 p<0.001). The experimental group had better score in the functional activity compared to the control group
A12[22]	To evaluate a clinic-based multimedia intervention for diabetes education targeting lay people **Clinical randomized trial** **Level II**	The access to multimedia lessons resulted in reduction in the complication associated with type II diabetes. Self-efficacy and medical care did not present differences between the intervention and control groups. The change in the perception was greater in the intervention group, with an increase in the personal risk to acquire diseases in the eyes, kidneys and heart (1.19 vs. 0.24, p=0.009)
A13[23]	To determine whether a multimedia program could effectively teach patients about fecal occult blood testing and increase screening rates **Randomized clinical trial** **Level II**	There was an increase trend in the knowledge of the experimental group (56%) compared to the control group (41%), p<0.09. There was no difference between scores of the control and experimental group regarding the performance of the test

DISCUSSION

The DLOs increased students' knowledge, leading to impacts on students' learning averages in online courses[13]. The educational technology has also brought significant contributions to the learning experiences of students in clinical simulation settings[11-12] and an impact in their sense of belonging[20].

Assessments on the quality of the DLOs resulted in students' satisfaction regarding to: content usefulness, quality, presentation and adequacy[12,16,19].

As for professionals, the access to DLOs improved the use of auxiliary equipment in the treatment, patients' guidance and preparation of the care plan[15].

On patients' perspective, the DLOs led to enhancement in care education for their own health[15,17,21], improved the knowledge on certain themes[23], improved memory[18] and have also contributed to the reduction of complications regarding the presence of chronic disease[22].

Based on the analysis of the DLOs contribution for health and nursing learning, the aspects regarding the improvement of knowledge and learning used both by students, health professionals and patients stand out.

FINAL REMARKS

From the diversity of studies currently published in indexed journals on the database searched, we noticed a lack of studies on the use of DLOs in the health and nursing teaching and learning process. Most times, the publications only reported the development of technologies geared to learning, but they did not include the assessment of the outcomes of its application.

The main contribution of the study was to identify research with evidence levels strong enough to demonstrate the contribution of DLOs in the health and nursing teaching and learning process, cooperating for evidence-based practice.

We highlight that the DLOs can significantly contribute to the learning process of patients, health professionals and students and, for that reason, we believe that new studies should be carried out to further study the theme and identify the impact of its application in health and nursing learning in the several care areas.

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