



Use and development of teaching technologies presented in nursing research

Uso e desenvolvimento de tecnologias para o ensino apresentados em pesquisas de enfermagem

Uso y desarrollo de tecnologías para la enseñanza presentados en investigaciones de enfermería

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Objetivo: caracterizar as tecnologias para o ensino utilizadas ou desenvolvidas nas dissertações e teses de enfermagem do Brasil. **Métodos:** pesquisa documental, que teve como fonte de coleta de dados os catálogos de teses e dissertações disponíveis no sítio da Associação Brasileira de Enfermagem, do Volume XIX (2001) ao Volume XXI (2013). **Resultados:** de 6346 estudos, 18 (0,28%) utilizaram ou desenvolveram tecnologias para o ensino, compondo as categorias: uso de mapa conceitual; uso de jogos; desenvolvimento de Ambiente Virtual de Aprendizagem; desenvolvimento de material educativo; desenvolvimento de curso de Educação à Distância; e desenvolvimento de artefato. **Conclusão:** as pesquisas nacionais acerca do desenvolvimento e do uso de tecnologias para o ensino na enfermagem ainda são uma lacuna existente, sobretudo nas regiões Norte e Nordeste. Destacou-se os múltiplos benefícios da utilização de tecnologias nos ambientes de ensino e aprendizagem da enfermagem, tanto com estudantes e profissionais, quanto com os pacientes.

Descritores: Educação em Enfermagem; Inovação; Tecnologia Educacional.

Objective: characterizing teaching technologies used or developed in nursing dissertations and theses in Brazil. **Methods:** a documentary research that had data collection sourced from directories of theses and dissertations available on the website of the Brazilian Nursing Association, from Volumes Nineteen (XIX) (2001) to Twenty-one (XXI) (2013). **Results:** of 6346 studies, 18 (0.28%) used or developed teaching technologies, composed of the following categories: use of conceptual map; use of games; development of Virtual Learning Environment; development of educational materials; development of Distance Education courses; and artifact development. **Conclusion:** national research on the development and use of teaching technology in nursing are still insufficient, especially in the North and Northeast. Multiple benefits of the use of teaching technologies in nursing and learning environments were highlighted, not only for students and professionals, but also for patients.

Descriptors: Education, Nursing; Innovation; Educational Technology.

Objetivo: caracterizar las tecnologías para enseñanza utilizadas o desarrolladas en disertaciones y tesis en enfermería del Brasil. **Métodos:** investigación documental, que tuvo como fuente de recopilación de datos de tesis y disertaciones disponibles en el sitio de la Asociación Brasileña de Enfermería, del volumen XIX (2001) el volumen XXI (2013). **Resultados:** de 6.346 estudios, 18 (0,28%) utilizaron o desarrollaron tecnologías para la enseñanza, componiendo las categorías: uso del mapa conceptual; uso de juegos; desarrollo del Entorno Virtual de Aprendizaje; desarrollo de materiales educativos; Curso de Desarrollo de Educación a Distancia; y el desarrollo de artefacto. **Conclusión:** las investigaciones nacionales acerca del desarrollo y uso de la tecnología para la enseñanza en la enfermería son todavía una brecha, sobre todo en el Norte y Nordeste brasileño. Destacó los muchos beneficios de la utilización de tecnologías en ambientes de enseñanza y aprendizaje de enfermería, con estudiantes y profesionales, y también con pacientes.

Descriptores: Educación en Enfermería; Innovación; Tecnología Educacional.

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Introduction

The formation of nursing professionals has been the focus of important changes over time, being influenced by the representation that such a profession had in the course of history. In 2001, the National Curricular Guidelines of the Undergraduate Nursing Course were established, consolidating another breakthrough in nursing education. The pedagogical principles of integrating the teaching of skills, learning to learn, general, humanist, critical and reflective training, and the training focused on the student and the teacher as facilitator⁽¹⁾.

What is sought nowadays is the formation of a health care professional from the perspective of skills development that acts in a multidisciplinary manner, in accordance with the needs of the Unified Health System (Brazilian National Healthcare System). Thus, today's training assumes a role that transcends "... teaching that merely aimed at pedagogical and didactic scientific update, in other words, it turns into the possibility of creating spaces for participation, reflection and training..."^(2:343).

The academic restructuring process of training of nursing professionals therefore involves the recognition of the multidisciplinary professional practice, stimulating clinical reasoning, appreciation of theory and practice articulation, the use of active methods of teaching/learning, and flexible curriculum. It seeks the consolidation of dialogue competence, which presupposes active and differentiated teaching, clarifying new roles for teachers and students.

In this context, it aims for formative changes of nursing professionals associated with a broad overview of innovations, in which intellectual capital predominate, from the appreciation of creative and critical knowledge, mediated by technological tools that translate into nursing advances and challenges⁽³⁻⁴⁾.

Since 1998, the World Declaration on Higher Education established the necessary focus on the potential incorporation of new information and communication technologies in higher education,

capable of generating changes in ways of teaching and learning⁽²⁾. Thus, when addressing the essentiality of technological tools in the teaching of nursing, it is emphasized that it is imperative to demystify the idea of technology only linked to the use of the latest equipment, as professional knowledge and relational process are intrinsic mechanisms in the health work process.

Understanding that the interdependence of three technology categories: hard technologies, characterized by the use of equipment; light-hard technologies, made up of structured knowledge, standards, protocols and understanding; and light technologies, of relationships⁽⁵⁾.

Moreover, it emphasizes the essentiality of overcoming an erroneous view that the merger of teaching technology closes in on itself, since it understands that technology is not a self-sufficient tool, and pure and simple application will not solve all problems inherent in teaching⁽⁶⁾.

To be made effective, an innovative nursing education based on the principles established by their Curriculum Guidelines, as well as the use of technological tools as mediators of their teaching/learning process, some challenges are instituted: the transformation of design on teacher-student interaction; the proper preparation of teachers; and structural changes in educational institutions, both in the organizational domain as well as in education and research⁽⁶⁻⁷⁾.

It also highlights the essentiality of incorporating technological tools for teaching in the light of philosophical approaches and therefore pedagogical theories to ensure the maximization of the potential benefits of teaching strategies⁽³⁾. In this scenario, the important thing in the use of technology in education is the pedagogical approach that the teacher has and not the technology itself, as the technological tools are able to qualify teaching practices through joint participation between faculty and students, mediated by interactivity and creativity.

Teaching technologies can be understood from

this work as the incorporation of technological tools for teaching purposes in learning environments, understanding that in nursing, the teacher-student relationship goes beyond the academic panorama; it also happens in the nurse-patient relationship, as well as in the process of health work.

In this context, research gains importance as a key strategy for building and/or validating the use of technology for teaching. This is considered a processing tool that enables research and reflection about a phenomenon that involves the life of a subject and/or population and its possible modification⁽⁸⁾.

The area of new research approaches is one of the key points for Nursing to reach new heights with regard to research and appropriate incorporation of technology in learning environments⁽⁹⁾. Therefore, this study emphasizes the need to know what Nursing has been producing about teaching technologies and how these are being applied, in order to subsidize the construction of innovative, reliable and replicable knowledge in the area.

Thus, the following research questions were defined: What are the characteristics of the dissertations and theses available in the Theses and Dissertations Catalogue of the Brazilian Association of Nursing that have used or developed teaching technologies? What are the teaching technologies and how have they been used in scientific studies of nursing? Thus, this study aims to characterize teaching technologies used or developed for teaching in nursing dissertations and theses in Brazil.

Method

This is a documentary research, which consists in using documents as a source of the study, aiming to extract information from proper techniques for handling and analysis, according to scientific principles⁽¹⁰⁾.

This study was conducted from the Theses and Dissertations Catalogue of Brazilian Nursing Association, a document that gathers dissertations

and theses produced by postgraduate programs in Brazilian Nursing. The choice of such scientific study arrangements occurred because these research investigations and reflections are characterized by: personality, addressing issues experienced in a meaningful way by the investigator; autonomy, production of the author's efforts; creativity, resulting in collaboration with the development of science; and rigor, assuming logicity and competence⁽¹¹⁾. It is emphasized that the *creativity* element represented fundamental guideline to the research, as it sought to elucidate innovations in the context of using developed teaching technologies.

In order to unify the language of collectors, a protocol entitled "Documentary Research Protocol" was established, composed of the following items: purpose of the study, guiding questions; search strategies; study selection criteria; strategies for critical evaluation and synthesis of data. Data collection was performed by a master's degree and two doctoral students, in the period January-February 2014.

We used catalogs of theses and dissertations available on the website of the Brazilian Nursing Association, Volumes XIX (2001) to XXI (2013), as the source of data collection.

This choice of data collection source was made because it gathers nursing research, providing a summary of these studies and a *link* to access the full paper, thereby optimizing the data search. In addition, as the documents are available in PDF format, the use of such catalogs allows no loss of data collected as a result of Internet network problems or unavailability of information.

Inclusion criteria established were: theses and dissertations from the Catalog of Theses and Dissertations of the Brazilian Nursing Association, which have used or developed teaching technologies. And as exclusion criteria: dissertations and theses that only used conventional technologies for data collection (methodological procedures that did not incorporate creative elements for data collection and/or that

used existing techniques, products and frequently or conventionally used tests); and dissertations and theses not fully available in electronic databases.

Initially, the studies were selected according to the abstracts available in the catalogs, according to established inclusion criteria. Next, full versions of pre-selected studies were consulted in the electronic databases, excluding those which were not available in their full version. Finally, those which were selected for the final sample study were read in full, also excluding those which were not relevant to the theme.

We conducted a critical evaluation through a spreadsheet built in *Microsoft Excel 2010*, and listed collection indicators according to their respective standardization analysis: 1) Academic Level: Academic master's, Professional master's or Doctorate; 2) Educational institution: Higher Education Institution where the scientific work was developed; 3) Publication year: year in which the dissertation or thesis was published in full; 4) Education of the Author: Author's graduation, according to Lattes Curriculum; 5) Teaching Technologies used: if there was use or development of technology for teaching and what it was; 6) Type of technology: according to the classification that explores the technologies in health, in light technologies, light-hard, and hard⁽⁵⁾, considering: light - data collection guided by human interaction, with or without simple resource materials, not guided by systematic theoretical frameworks; light-hard - use of simple materials, but guided by systematic theoretical frameworks and development of organization instruments and/or evaluation of teaching from simple resources; and hard - development of organization instruments and/or evaluation of teaching from cutting edge technological resources, using equipment and/or computerized materials; 7) Methodological design: according to the classification that divides the research into literature, descriptive, exploratory and experimental⁽¹²⁾, and the approach used - is it qualitative, quantitative or

mixed; 8) Study Objective: grouped into categories of teaching, research, management or care practice; and 9) Resulting benefits and limitations.

Results

From the initial quantity of 6346 abstracts of dissertations and theses analyzed that composed the catalogs of the Brazilian Nursing Association - Volume XIX (2001) to Volume XXI (2013) - 121 monographic studies (1.91%) used unconventional data collection technology, understood as techniques used in an innovative way in Nursing, which incorporate creative elements or the use of techniques, innovative products and tests in the data collection stage. Of these, 18 studies (15.00%) refer to the use or development of technologies for teaching, composed of the following categories: use of conceptual map; use of games; development of Virtual Learning Environment; development of educational materials; development of Distance Education courses; and artifact development (Figure 1).

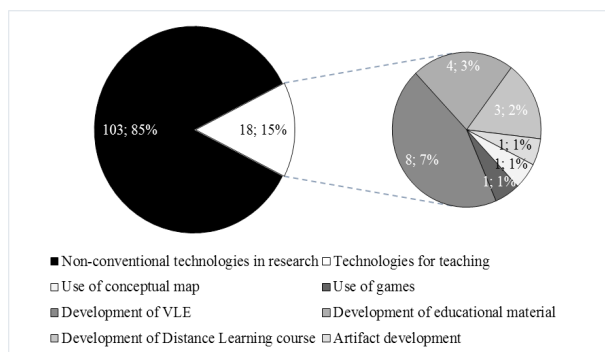


Figure 1 - Result of documentary research on the use and development of technologies for teaching in nursing research

Thus, studies that have sought to develop technologies for teaching were predominant (16; 88.89%), highlighting the creation of Virtual Learning Environments (8; 44.43%). Thus, regarding the type

of technology that has been developed or used in research, the following results were obtained: Hard (12; 66.67%); light-hard (5; 27.78%); and light (1; 5.56%).

From this perspective, there was a majority of exploratory studies (15; 83.33%), which are configured as methodological research, consistent with the predominance of studies that have developed technologies for teaching.

With respect to the temporal dimension, the period from 2004 to 2008 comprised almost the entire sample (17; 94.44%), especially studies in 2006 (7; 38.87%). As for academic level, studies resulting from academic master's totaled 72.22% of data (13 studies), followed by doctoral thesis (5; 27.78%), and there was an absence of professional master's research.

As for the university where the studies were developed, the University of São Paulo (10; 55.55%) can be highlighted, followed by the State University of Campinas (3; 16.67%), both the Federal University of Santa Catarina and the Federal University of Rio de Janeiro (2; 11.11% each), and the Federal University of São Carlos (1; 5.56%).

Nurses wrote 94.44% of the analyzed studies (17 studies). Just one academic master's thesis was written by a graduate student in mathematics, whose primary purpose was to plan the curriculum and implement an online course on construction and handling of the *Epi Info* statistics database.

Teaching was the most elucidated study objective (17; 94.44%). Only one research resulting from an academic master's student had care practice as a research subject, from the development of a device configured as an artificial "pregnant belly" as an aid instrument for fatherhood, with the scope of creating opportunities for men to experience some biological concreteness of carrying a child.

Figure 2 highlights the benefits and limitations of the use of technology for teaching, which were elucidated by investigations conducted.

Benefits	Limitations
<ul style="list-style-type: none"> -Stimulating motivation, reflection and commitment of students; - Dynamic education through active participation of students; - Multisensory learning from the use of different media; - Flexibility to the rhythm and students' learning styles; - Familiarity of students with technology resources; - Evaluation at different times and different dimensions; - Creating space for sharing experiences and information (forums, chats, etc.). 	<ul style="list-style-type: none"> - Time required for the development of innovations; - Need to assess the impact of technological incorporation in education; - Existence of students with little skill; - Educational environments with poor structures; - Validation of need that requires qualified experts.

Figure 2 - Benefits and limitations of the use of technology for teaching highlighted by the analyzed investigations

Discussion

The fact that the research sample represents only 0.28% of the study components of Theses and Dissertations Catalogue of the Brazilian Nursing Association, 2001-2013, disturbingly reveals the scarcity of studies that seek to analyze the use or development of technologies for teaching and are therefore innovative in the context of Nursing research, as well as properly focus on incorporating technology into Nursing education.

It is known that the development of research focuses on sustaining economic growth and improving the quality of life as it is directly related to daily lives and is oriented towards the most immediate demands and the search for answers to universal questions⁽¹³⁾. Graduate programs therefore integrate such assumptions, accounting for promoting research on social returns, incorporating and responding to the demands to which they belong.

With nursing, this assertion is no different. The growth in production of theses and dissertations form an imperative scientific collection, as shown by the concerns of scientists⁽¹⁴⁾ and, therefore, should seek with efficacy, efficiency and effectiveness, to solidify

the principles of personality, creativity and rigor⁽¹¹⁾.

In this context, innovation in education becomes a critical condition, especially in modern times characterized by constant technological evolution, understood in an expanded concept of not just machines and equipment, but also involving knowledge and human interactions, bringing new demands and requirements for research. Thus, in addition to consuming new technologies, it is believed that Nursing should create or generate innovations, stimulating those which are to be tested and systematized by scientific research⁽¹⁵⁾.

The documentary research in question thus elucidated a field that needs to be developed in Nursing: the analysis of the use and development of teaching technologies. This reality, however, is not an exclusive problem of the Brazilian context.

Teaching technologies are already globally recognized as beneficial to the innovative and differentiated process that are currently demanded by learning environments, contributing to critical thinking, complex decisions, practical skills, teamwork, motivation, interaction, problem solving and generating hypotheses, because it is guided in the active participation of students, encouraging their autonomy and their criticality^(3,16).

However, all these benefits are still empirical findings, or even studies with a low level of scientific evidence, with the evidence regarding the benefit of using technology for teaching in nursing education being problematically insufficient.

An example of this fact is elucidated from the results of a systematic review performed from the Cochrane database about the use of games in Nursing education, which resulted in the identification of only one qualified study on mental health from the scientific and methodological point of view on the surrounding theme. The conclusion, therefore, was limited evidence of the use of games in Nursing education⁽¹⁷⁾.

The predominance of dissertations resulting

from academic master's students in line with the reality of Brazilian post-graduation in academic master's degree is following a historical trend, and is the type of graduate course with more titles and more growth in the country, an aspect also revealed in other documentary research. As for the geographical distribution of the analyzed research, the majority was in South and Southeast Brazil, an aspect also shown in other studies, which may stem from quantitative aspects of the distribution of graduate programs in the country⁽¹⁴⁾.

The existence of other training areas of knowledge by the authors of the research produced in the field of post-graduate Nursing elucidates a trend of research in partnership, as these incorporate innovations that demand a collective work of experts, especially those guided by the computerization of elements of teaching.

In that sense, the predominance of methodological studies which sought to develop technologies for teaching is noticeable, thus contributing to the development of Nursing. The methodological study aims to research, organize and analyze data in order to develop tools and/or materials to enable obtaining reliable, accurate and usable results so they can be replicated by other researchers⁽¹⁸⁾.

As for the benefits of using technology in the teaching of nursing, it was unanimously elucidated in the studies analyzed that various elements come together in promoting an innovative learning environment, which is an unquestionable demand of modern times.

In the Nursing context, it highlights even more complex challenges of the learning environment: it evolves to an environment practice that requires high levels of nursing skills; it requires the training of critical and reflective nurses, with cognitive development as an inherent demand of the Evidence-Based Practice; and the educator is inserted in a context of dialogical change, in which students

stand with diverse learning styles and needs, and which should be known by educators in order to use effective teaching methods⁽⁴⁾. In addition, it is known that the nurse, as an educator, is inserted in multiple teaching spaces - with students (academic), with the professionals themselves (continuing education) and patients (health education)⁽¹⁹⁻²⁰⁾.

In the meantime, the Nursing educator must be in line with technological additions in response to current demands, aspects which should, in a fundamental way, join in dealing with a pedagogical approach to guide the incorporation of technology in educational settings.

What is argued, therefore, is that the use of technology for teaching should not be consolidated as an end in itself, capable of modifying a traditional educational setting. It is therefore emphasized that in light of philosophical approaches, the pedagogical theories are essential to ensure the maximization of the potential benefits of different teaching strategies, which require knowledge and skill of educators⁽³⁾.

Besides the benefit of technology for teaching, it is also possible to ensure a multisensory and dynamic teaching from the use of different resources and pedagogical approaches. It is noteworthy that among the determinants of learning, learning styles preferred by students are a key diagnostic evaluation element, which are understood as more efficient and effective forms and conditions through which apprentices learn, considering the cognitive, emotional and psychological factors⁽¹⁹⁾.

The Nursing educator in this context has two major responsibilities: to accept the diversity of styles in order to create an atmosphere for learning that offers encouraging experiences for each individual to reach their full potential; and match different approaches from a critical analysis of its fundamentals, as Nursing curriculum based on just one approach can restrict the educational development of students⁽¹⁹⁾.

Thus, the possibility of motivating, reflective, multi-sensory, dynamic, flexible with regard to the

times and geographical spaces, and collaborative teaching and that promotes the socialization of knowledge are benefits highlighted by the works analyzed in relation to the incorporation of technologies for teaching in Nursing education in its various learning environments.

Therefore, it is essential that the limitations which are understood as challenges that still permeate Nursing education are overcome. They are procedural aspects, which are summarized as challenges of the educational system itself, particularly the need to reflect on the new role of the teacher and the student and to contribute to the solidification of multi-skilled driven learning environments from pedagogical concepts that enforce quality education.

Final Considerations

The study revealed that there is still a gap in the use and development of technologies in teaching in Nursing research, indicating a problem from the lack of sufficient studies which reconcile unquestionable empirical benefits of incorporating innovative methodologies in Nursing education spaces.

The many benefits of using technology in teaching and learning Nursing environments unanimously stood out for students, professionals, and patients, elements in agreement with with the demands and challenges that characterize the current reality of education systems, especially Nursing.

It stressed the essentiality of understanding that the technologies for teaching should integrate a broader educational process resulting from theoretical reflections and dialogical skills of the nurse as an educator.

It is emphasized that this documentary research portrays a national reality and thus grasps the importance of investigating and comparing those results with an international picture, and to evaluate the resulting productions of the analyzed dissertations and theses.

It also notes that the dissertations and theses with available abstracts were analyzed in catalogs available on the website of the Brazilian Nursing Association, from Volumes XIX (2001) to XXI (2013). Thus, the sample used does not reflect the research profile of the Brazilian Nursing universe, an aspect that may have influenced the reduced number of studies that focused on the use and development of technologies for teaching.

While there are contributions and implications for nursing, the study aims to encourage discussion about the importance of incorporating technology in education being the result of a guided process of research with methodological rigor and reflections of teachers from pedagogical approaches that support qualified teaching practice.

Collaborations

Salvador PTCO, Rodrigues CCFM, Lima KYN and Alves KYA contributed to the design, data analysis, interpretation and writing of the article. Santos VEP contributed with guidance, research design, review and approval of the final version to be published.

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