Revision Article

Analysis of the concept of technology in nursing according to the evolutionary method*

Análise do conceito de tecnologia na enfermagem segundo o método evolucionário

Análisis del concepto de tecnología en enfermaría según el método evolutivo

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ABSTRACT

Over the years, the technology concept was modified, especially from the development of scientific knowledge and the philosophical and artistic conceptions. Thus, it was used the evolutionary approach in order to analyze the concept of technology found in nursing journals; the analysis included 39 articles selected by searching the BDENF database, performed in November 2008, and covering the period 1996 to 2007. The results showed the design of technology as a product and as a process. Regarding technology as a product, it was associated with knowledge, training and thinking on the administration of these new technologies. As a process it encompassed groups and their organization, as well as training for capacitation. This technology, in turn, was organized in psychosocial rehabilitation, protection, and in group strategy. It was concluded that understanding the concept of technology helps nurses to utilize it and to support their actions in the theoretical and methodological ambiance, enabling the application of the concept to its fullest.

Keywords: Concept formation; Research; Technology

RESUMO

Ao longo dos anos, o conceito de tecnologia sofreu modificações, decorrentes, sobretudo, da evolução do conhecimento científico e das concepções filosóficas e artísticas. Assim, utilizou-se o método evolucionário com vistas a analisar o conceito de tecnologia nas publicações de enfermagem, que incluem 39 artigos selecionados, a partir de busca na base de dados BDENF, em novembro de 2008 abrangendo o período de 1996 a 2007. Os resultados evidenciaram a concepção de tecnologia, como produto e processo. Enquanto a tecnologia como produto esteve associada ao conhecimento, capacitação e reflexões a respeito da administração dessas novas tecnologias e, como processo compreendeu os grupos e suas conformações, além dos processos de ensino e capacitação. Esta tecnologia, por sua vez, foi organizada em reabilitação psicossocial, acolhimento e estratégia de grupo. Concluiu-se que a compreensão do conceito de tecnologia auxilia em sua utilização pelos profissionais de enfermagem e respalda suas ações no âmbito teórico-metodológico, possibilitando a aplicação do conceito em sua plenitude.

Descritores: Formação de conceito; Pesquisa; Tecnologia

RESUMEN

A lo largo de los años, el concepto de tecnología sufrió modificaciones, provenientes especialmente de la evolución del conocimiento científico y de las concepciones filosóficas y artísticas. Así, se utilizó el método evolutivo con la finalidad de analizar el concepto de tecnología en las publicaciones de enfermería; el análisis incluyó 39 artículos seleccionados a partir de la búsqueda en la base de datos BDENF, realizada en noviembre de 2008, abarcando el período de 1996 a 2007. Los resultados evidenciaron la concepción de tecnología, como producto y proceso. En lo que se refiere a la tecnología como producto, ésta estuvo asociada al conocimiento, capacitación y a reflexiones a respecto de la administración de esas nuevas tecnologías; y, como proceso comprendió a los grupos y sus conformaciones y también a los procesos de enseñanza-capacitación. Esta tecnología, a su vez, fue organizada en la rehabilitación psicosocial, en la protección y, en la estrategia de grupo. Se concluyó que la comprensión del concepto de tecnología auxilia en su utilización por los profesionales de enfermería y respalda sus acciones en el ámbito teórico-metodológico, posibilitando la aplicación del concepto en su plenitud.

Descriptores: Formación de concepto; Investigación; Tecnología.

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INTRODUCTION

Many researchers are paying particular attention to methods of clarifying concepts. Among the most widely accepted in nursing, it is highlighted the evolutionary method, because it considers inter-related aspects that influence the definition of concept beyond its contextual dependence[1].

One of the concepts in constant change, since its inception until today, refers to technology, especially regarding its use in nursing. Research regarding the use of the term technology in the work process of nursing has shown that discussion of technologies has presented a multifaceted aspect, summarized to equipments only. In addition, some classifications have been identified related to the work process in health[2].

According to literature, technology can be considered as the apprehension and application of a set of knowledge and assumptions that enable individuals to think, reflect, and act, transforming them in subjects of their own process of existence[3]. At the same time, the creation of technologies resulting from the act of caring is based on technical and scientific knowledge, daily life observation, and concern for welfare of caregiver and subject of care[4].

A study on the concept of technology used in nursing indicated that the changing demands of health care require from the nurse the understanding of this concept in order to apply it to decision making, which will elevate the quality of patient outcomes. But, popular knowledge about this concept, limited to modern artifacts, further complicates their understanding in nursing[5].

Another research on technology and nursing practice has shown growth in the use of technologies as support for nursing actions, especially in the last two years. However, it's still observed a small number of papers that mention or utilizes technologies of relationship or soft technologies. This fact may be the result of difficulties that professionals have in defining what these technologies are and recognize them as technological resources[6].

Considering the mentioned facts, it's emphasized the importance of doing a conceptual analysis of technology in nursing, emphasizing the contextual elements that are found in definitions and applications in this science, aiming to provide a broad understanding of concept construction and contribute to its correct use. Thus, the purpose of this study was to analyze the concept of technology in nursing publications, based on the evolutionary method.

METHOD

The study was based on the evolutionary method of Rodgers[7]; according to this method, the concepts could be: dynamic, broad, absolute and clear, being influenced by the context and considering a particular usefulness or purpose.

Therefore, its use requires some basic activities, such us: a) to identify the concept of interest and associated expressions; b) identification and selection of appropriate field to collect relevant data in order to identify the attributes of the concept and contextual bases (including variations: interdisciplinary education, socio cultural, temporal); c) analysis of data related to characteristics of the concept; d) identification of example of concept - if necessary; and, e) identification of implications and hypotheses for concept development. Many of these basic activities are implemented simultaneously in research because they are complementary and interdependent[1]. However, in this study only the first four approaches were followed.

In this study the concept of interest was technology in nursing, considering discussions about it and its relevance to nursing practice, the objective was to clarifying the phenomenon in this area of knowledge.

The articles were searched in the Virtual Health Library (BDENF database), because it's a database with specific publications about nursing; by doing that we could achieve the objective. The sampling was collected in November 2008, by writing the term –technology- in the field "word." We found, in total 200 articles, dissertations, theses, periodic publications of events, books, and other materials. After reading the abstracts, were excluded the ones that mentioned only the term "technology" without discussing them; also were exclude those not related to the chosen theme – since the aim was to analyze, in detail, the concept of technology in nursing publications. Of these, were selected only those that were available in full in the global data network, in the magazine site or in the SciELO portal, regardless of the language of publication, totaling 39 articles. Rodgers[7] says that is necessary randomly select a minimum of 20% of all findings, which will allow the generalization of results. Instead there were used all 39 items, contained in the period 1996 to 2007.

To collect the concept attributes, were considered the discriminatory characteristics of various definitions of technology. Also, to apply the concept, we considered aspects like situation, time, social, cultural and, disciplinary - because their analysis will allow to understand the situations in which they were used[7].

Data were summarized and analyzed with inductive techniques, according to inherent characteristics of the concept (attributes, antecedents and consequences). The identification of similarities in the nature and purpose of technologies evaluated, allowed to define two distinct classifications: technology as a product and technology as a process. After that, according to this classification, the organized data were submitted to a professor with experience in concept analysis and utilization of the

evolutionary method, who agreed with this categorization.

RESULTS

After analyzing the articles, two attributes were highlighted which embody the concept of technology as a product and as a process. In Chart 1, we present the constituent elements of each attribute, as well as its antecedents and consequences.

Technology as a product

By analyzing the concept of technology as a product, it was noted that the concept includes the construction of a palpable artifact, based on scientific knowledge, aimed at improving health situations, also aimed at obtaining the emancipation or generation of knowledge. Three elements characterize this attribute: informatization, information and artifact.

It was noticed that the examined articles rescued the use of computer and its components, which are adopted in nursing education and public health, as ways of ensuring the service organization and improvement of learning. The type of informatization applied in the field of nursing is a specific area that relates to data processing tools and information on health of individuals and communities[8].

Information refers to construction of sites, aiming to disseminate knowledge. The electronic publishing, for example, allows to observe and to access information, using digital media and technological resources that ensure scientific and technical disclosure, becoming a powerful educational resource[9].

Other researched articles, referred to the artifact, represented by construction of products through adjustments or inspirations in existing technologies and by the construction of educational technologies, focusing on individual/collective care. Such artifacts include curative or therapeutic intervention, for example, building tools for emancipation.

Antecedents and consequences of product conception

Studies about informatization showed as antecedents: costs, qualification of human resources, health professionals resistance, and humanization of relations. In general, the consequences of such use, involves the rationalization of services and human resources and the ease of data manipulation, which would influence the improvement of quality of care[10].

Another study shows that the use of computer technology aims to manage the information, increasing productivity and worker satisfaction improvement. It also helped in organization and development of nursing[11].

As a tool for teaching nursing, computer technology allows enhancing the education process which ensures greater flexibility of information, stimulating the learning activity. However, its use requires prior knowledge of computing and the need of make investments in this sector[12]. Information through the use of digital media and technological devices stimulates learning. However, it requires specific language which is obtained by means of specialized knowledge[9].

At the same time, the antecedents of artifacts development, involves manual labor associated with scientific knowledge, observation of events with their cause and effect relation, and creativity. Its consequences are related with aspects such us: bio-safety, problem solving, job security in procedures, customer comfort, profits, and promotion of care[10,13-14]. On the other hand, emancipatory artifacts presented as consequences aspects such us: construction of knowledge, improvement of nursing care, self-care, quality of life, and change of behavior.

Technology as a process

Technology as a process is understood as all methods whose function includes qualification of individuals or groups to perform a particular function or activity and management of services/products/staff - and even the promotion of any form of human approach. The elements that characterize the attribute "process" include: qualification, management and human approach.

Qualification includes the constant qualification of human resources, able to absorb existing technology which must consider effectiveness, efficiency, cost-benefit relation, and safety[15]. As examples of qualification methods, can be mention orientation manuals and distance learning courses[15-16].

On the other hand, the process, conceived as a management function of services or products, concerns the assessment to promote safe environment for professionals.

At the same time, the human approach, predominant in the analyzed articles, was organized in psychosocial rehabilitation, acceptance and group strategy.

The psychosocial rehabilitation has been cited as a "process for helping people", "process that facilitates the opportunity for individuals who are disadvantaged, disabled or have difficulties to reach an optimal level of functioning independently, in the community"[17]. The acceptance/shelter was characterized as situations of affection, solidarity and education between the nurse and the users[18]. Finally, the group is presented as an intentional action that generates symbolic goods, based on practices that are essentially educational, and on appreciation of the process of relations[19] understood as encompassing the "technology of relations"[20].

Antecedents and consequences of the conception process

When referring to knowledge as an antecedent of

Chart 1 – Antecedents and consequences of technology as a product and as a process. BDENF, 1196/2007

	Antecedent	Source*	Consequent	Source *
Technology as product	Scientific Knowledge	Nascimento et al., 2004[14] Bellini et al., 1996[15] Trentini et al., 2005[20] Neira et al., 2008[8] Caetano et al., 2006[31] Pagliuca et al., 1998[32] Toniolli et al., 2003[33]	Problem solution	Nascimento et al., 2004[14] Bellini et al., 1996[15] Neira et al., 2008[8]
	Practical Knowledge	Mendes et al., 2000[11] Nascimento et al., 2004[14] Bellini et al., 1996[15] Pagliuca et al., 1998[32] Toniolli et al., 2003[33]	Emancipation	Caetano et al., 2006[31] Pagliuca et al., 1998[32] Toniolli et al., 2003[33]
	Professional qualification	Mendes et al., 2000[11] Nascimento, 2005[13] Trentini et al., 2005[20] Pagliuca et al., 1998[32] Toniolli et al., 2003[33]	Assitance Improvement	Zem-Mascarenhas et al., 2001[12] Nascimento et al., 2004[14] Bellini et al., 1996[15] Trentini et al., 2005[20] Pagliuca et al., 1998[32] Toniolli et al., 2003[33]
	Training	Mendes et al., 2000[11] Zem-Mascarenhas et al., 2001[12] Nascimento, 2005[13] Trentini et al., 2005[20]	Organization	Silva et al., 2001[9] Zem-Mascarenhas et al., 2001[12]
			Social Isolation	Zem-Mascarenhas et al., 2001[12]
	Creativity	Neira et al., 2008[8] Nascimento et al., 2004[14] Bellini et al., 1996[15] Caetano et al., 2006[31] Pagliuca et al., 1998[32] Toniolli et al., 2003[33]	Detachment	Barra et al., 2005[34]
			Access to information	Mendes et al., 2000[11] Zem-Mascarenhas et al., 2001[12] Nascimento, 2005[13] Caetano et al., 2006[31] Pagliuca et al., 1998[32]
			Rationalization of services and human resources	Zem-Mascarenhas et al., 2001[12]
Technology as process	Knowledge	Silva et al., 2001[9] Zem-Mascarenhas et al., 2001[12] Peres et al., 2007[16] Bastos, 2002[17] Tavares et al., 2003[23] Guimarães et al., 2006[26] Silva et al., 2006[28] Barra et al., 2006[29]	Behavior change	Zem-Mascarenhas et al., 2001[12] Peres et al., 2007[16] Bastos, 2002[17] Guimarães et al., 2006 [26] Barra et al., 2006[29]
	Capacitation	Silva et al., 2001[9] Zem-Mascarenhas et al., 2001[12] Peres et al., 2007[16] Bastos, 2002[17] Tavares et al., 2003[23] Barra et al., 2006[29]	Fulfillment of needs	Bastos, 2002[17] Hirdes et al., 2004[18]
	Individualized care	Zem-Mascarenhas et al., 2001[12] Bastos, 2002[17] Hirdes et al., 2004[18] Barra et al., 2006[29]	Valorization	Hirdes et al., 2004[18]
	Constructive and dialogic approach	Zem-Mascarenhas et al., 2001[12] Bastos, 2002[17] Hirdes et al., 2004[18] Lima et al., 2004[21] Tavares et al., 2003[23] Barra et al., 2006[29]	Strengthening social safety and social inclusion nets	Bastos, 2002[17] Barra et al., 2006[29]
	Environmental changes	Silva et al., 2001[9] Zem-Mascarenhas et al., 2001[12] Bastos, 2002[17] Hirdes et al., 2004 [18] Lima et al., 2004[21] Barra et al., 2006[29]	Promotion of health and quality of life	Bastos, 2002[17] Hirdes et al., 2004[18] Barra et al., 2006[29]
	Respect, ethics and commitment	Galvão et al., 1996 [10] Peres et al., 2007[16] Hirdes et al., 2004 [18] Tavares et al., 2003[23] Guimarães et al., 2006[26] Barra et al., 2006[29]	Implementation of education and services	Silva et al., 2001[9] Zem-Mascarenhas et al., 2001[12] Peres et al., 2007[16] Lima et al., 2004[21]
			Participation	Bastos, 2002[17] Hirdes et al., 2004[18] Lima et al., 2004[21] Guimarães et al., 2006 [26] Barra et al., 2006[29]
			Independence and empowerment	Silva et al., 2001[9] Zem-Mascarenhas et al., 2001[12] Bastos, 2002[17] Hirdes et al., 2004[18] Tavares et al., 2003[23] Barra et al., 2006[29]
			Reduction of stigma and prejudice	Bastos, 2002[17]
			Humanization of care	Hirdes et al., 2004[18] Barra et al., 2006[29]
			Vocational, physical and social rehabilitation	Bastos, 2002[17]

*The source of publication corresponds to the ordinal number of citations in the references.

process, theoretical or technical, it should be mentioned the need for continuous qualification of professionals, as a result of the dynamics and infinitude of knowledge. Such qualification is essential, since the ignorance of how to use the tools determines the factors of its disuse, causing fatigue and avoidance in the professionals[15]. The method of distance education led to positive impacts on services and education, promotion of citizenship, better self-esteem among the subjects, enhancement of nursing, social inclusion, and transformation of nurses that were ill[21].

With regard to management of services or products, it was studied the efficacy of validating machinery to reduce the biological and environmental risk[22]. As a component of human approach, the psychosocial rehabilitation promotes the highest quality of life with independence, autonomy, and rehabilitation (vocational, physical and social). To be achieved, it is essential that nurses understand the concepts of mental health, respect, practice of listening and reception, also they have to understand his professionalism, as well as environmental changes and establishment of exchange experiences[17-18].

But, acceptance/shelter presents as its goals: satisfaction of human needs, valorization in the performance of self care, and promotion of humanization - revealing the peculiarities of each individual in the midst of a constructive and dialogical approach[23].

Finally, the group assumes to have knowledge about characteristics of the working group and its qualification, commitment, respect, ethics, absence of bias, and team responsibility to develop the activities[19-20,24-27]. As an explicit consequence, it can be highlighted an effective and lower cost health promotion[27] and empowerment of people and communities to exercise their citizenship[28].

DISCUSSION

The term technology used in society has been present since the Industrial Revolution. The growing technification of health procedures have redirected the practices in that sector, making of it a large consumer of new technologies. Regardless of the final result, new technologies have a value in themselves[29].

Since the emergence of this terminology in the health area, technologies have been known as artifacts originated from practical needs with the participation of scientific knowledge, in order to achieve specific goals[30]. According to authors, technology is rooted in technological innovations, instant communications, overcoming frontiers of scientific knowledge and causing abrupt social modifications[11].

As a technological innovation applied to health it can be mentioned the science of computing, which among other applications, stores and evaluates health data pertaining to individuals and communities[8]. This increasing computerization can benefit users of the health care systems, as well as professionals that work in that area in administrative functions and services[10].

Technology as a profession, especially mediated by computerization, refers to building software which is a tool that help users to prepare for the technological market, through interaction with computers and integration of computer technology in nursing education. As it has been seen, electronic publications provides access to information through the use of digital media and technological resources[12].

Meanwhile, the construction of artifacts was based on functional difficulties inherent to practices of nursing care that has an impact in assistance to users. Such tools allow reflecting on the condition of citizen and self-knowledge, in order to promote the user participation as a protagonist of the process, awakening the critical awareness and the desire of autonomy[31-33].

In face of this, the concept of efficiency and quality associated with technology, originates false expectations in solving health problems, thereby distorting priorities of the sector and the education of professionals. Thus, it is urgent to assess factors such as safety, effectiveness, ethics, social impact and cost-benefit. The humanized work should be noted because the technological arsenal is being considered more important than the human being(34).

We must favor the humanization of care, because it is believed, that this type of care could have beneficial consequences for the individual, likely reducing trauma of patient and family, and directing the professional care to a less mechanistic approach[34].

The accepted meaning of technology as a product must include critical reflections on the importance of its making, purpose and beneficiaries. The machines by themselves don't have meaning, who makes them carriers of intentionality is the living work on the action, with its technological mode (production model) of acting as an expression of certain social relations and not others[35].

In face of what was found, it is clear that a number of factors that determine the conception of technologies, mentioned herein as products or artifacts, directly affects the life of individuals who act in the process of caring, as well as in the learning process, and consequently on the quality of care.

The concept of technology in order to be considered as a process, it should present well-established stages of implementation, with the possibility of being replicated and periodically evaluated. Moreover, it requires scientific justification and recognition of factors which contribute to modify the reality and expected results. Thus, technology understood as art requires mastering the knowledge of all phases for completion of a specific instrument, including its use and benefits[36].

In this sense, the qualification is a kind of process, because promotes continuing education of human resources in a systematic way, providing the necessary knowledge to use the technologies.

At the same time, management permits the application of practice based on evidence in health services, stimulating the periodic reassessment of health. Also, it was found in the publications that the validation of machinery efficacy was a type of product management[22].

The prevalence of human approach, was possibly due to the fact that the very act of caring involves implementation of such technology. This attribute included psychosocial rehabilitation, acceptance and group.

With regard to psychosocial rehabilitation, one must consider the users individuality, which orient actions to reach their real needs, based on guidelines and strategies. Thus, it should not be restricted to pure replication of systematized process, but must involve the ultimate goal of promoting physical and mental abilities[22].

Although the acceptance/shelter has been identified as a strategy of human approach, which belongs to the concept of technology as a process, we noticed a lack of systematization. That fact raised questions about the actual representation of acceptance as a technology, because when these elements were brought as representatives, the authors make no reference to its scientific basis or even any form of assessment.

The strategy group, as a form of human approach, has been widely used in clinical practice. Usually is restricted to health-disease process, without addressing the social and political dimensions. So, the potentiality of this tool is used only partially, excluding aspects of health promotion as an integral and emancipator approach[28].

Thus, technology as a process can be directed to individuals, family, community, professional or institutions. It requires scientific justification, with similar structure to the nursing process, that is, identification of underlying needs followed by implementation and planning directed at predetermined results achieved in the short or long term.

Technology as a process is a complementary resource, essential and derived from the products of technology. The deficiencies of this process are improved by means of groups that humanizes, with skills or qualification that reduce the risks to which individuals, community or professionals could be exposed - besides allowing use, maintenance and evaluation of the conceived product.

It is perceived that nursing as a science that promotes care, should take over existing technologies to improve the quality of care. Works of this nature contribute to disseminating new knowledge which, often, is still unclear for some professionals.

From this analysis, we also perceived as limitations of this study the discrete use of technology (product) aiming to promote health and, in some studies, the absence of antecedents description which are indispensable for using the concept of technology (process), and without this information the application is difficult.

Thus understanding the concept of technology facilitates its use by professionals of nursing, and supports their actions on the theoretical and methodological field. This allows the concept to be applied in its fullness, also by nurses who adopted it long ago, although in an unconscious and empirical way.

FINAL CONSIDERATIONS

The concept of technology has changed over the years; it is not possible to assign a chronological development to the presented concepts. We emphasize that products and artifacts should be understood as technologies related to knowledge, qualification and improvement of care. The process considered as a technology added new perspective to this concept, encompassing groups with their conformations and methods, whether in education or qualification. It stands out as a limitation of this study the fact that the concept of technology in nursing, in Brazil, was limited to articles available in the global data network, which may reflect the state of the art of concept as an incomplete characterization.

Considering that this literature research was restricted to analysis of technologies built and implemented, it is reinforced the need to perform more research using theories and conceptual analysis, besides a study that summarizes the existing productions on the theme: conceptual analysis of technology.

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