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## **Construction of hypermedia to support the systematization of the nursing care education**

*Construção de hipermissão para apoio ao ensino da sistematização da assistência de enfermagem*

*Construcción de hipermedia para apoyar la enseñanza de la sistematización de la atención de enfermería*

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### **ABSTRACT**

**Objective:** To describe the process of hypermedia construction to support the teaching of the Systematization of the Nursing Care (SNC).

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**Method:** Methodological research of educational technology development. The hypermedia construction stages were conducted from February 2015 to March 2016 and integrated theoretical studies, focus group with professors and educational technology development process in the light of the referential Theory of Significant Learning.

**Results:** Hypermedia consists of interactive content and shows a splash screen with a concept map that guides a free way of learning about four structuring aspects in the SNC learning: concept, history and benefits; ethical-legal aspects; operationalization; and nursing process: steps and technical integration in nursing.

**Conclusions:** It was concluded that it is essential that the educational technologies are built from a pedagogical rationale to support your incorporation into educational environments.

**Keywords:** Teaching materials. Educational technology. Education, nursing. Technological development.

### **RESUMO**

**Objetivos:** Descrever o processo de construção de hipermissão para apoiar o ensino da Sistematização da Assistência de Enfermagem (SAE).

**Métodos:** Pesquisa metodológica de desenvolvimento de uma tecnologia educacional. As etapas de construção da hipermissão ocorreram de fevereiro de 2015 a março de 2016 e integraram estudos teóricos, realização de grupo focal com docentes e processo de desenvolvimento da tecnologia educacional à luz do referencial da Teoria da Aprendizagem Significativa.

**Resultados:** A hipermissão é composta por conteúdo interativo e apresenta uma tela inicial com um mapa conceitual que orienta um caminho livre de aprendizado sobre quatro aspectos estruturantes na aprendizagem da SAE: conceito, histórico e benefícios; aspectos ético-legais; operacionalização; e Processo de Enfermagem: etapas e integração do técnico em enfermagem.

**Conclusões:** Concluiu-se que é fundamental que as tecnologias educacionais sejam construídas a partir de uma fundamentação pedagógica que sustente sua incorporação nos ambientes de ensino.

**Palavras-chave:** Materiais de ensino. Tecnologia educacional. Educação em enfermagem. Desenvolvimento tecnológico.

### **RESUMEN**

**Objetivo:** Describir el proceso de construcción de hipermedia para apoyar la enseñanza de la Sistematización de Atención de Enfermería (SAE).

**Método:** Investigación metodológica de desarrollo de tecnología educativa. Los pasos de construcción de la hipermedia se realizaron de febrero de 2015 a marzo de 2016 e integraran estudios teóricos, grupos de enfoque con docentes y proceso de desarrollo de la tecnología educativa a la luz de la teoría de aprendizaje significativa.

**Resultados:** Hipermedia consiste en contenido interactivo y muestra una pantalla de bienvenida con un mapa conceptual con guía acerca de cuatro aspectos de estructuración en el aprendizaje de la SAE: concepto, historia y beneficios; aspectos ético-legales; consolidación; y proceso de enfermería: pasos e integración del técnico en enfermería.

**Conclusiones:** Se concluyó que es esencial que las tecnologías educativas se construyan desde una racionalidad pedagógica para apoyar su incorporación en ambientes educativos.

**Palabras clave:** Materiales de enseñanza. Tecnología educacional. Educación en enfermería. Desarrollo tecnológico.

## INTRODUCTION

The competence to work in a systematized way in the nursing area is present in the Curricular Guidelines of both the Higher Education Course and in the Nursing Technician course<sup>(1-2)</sup>. The Systematization of the Nursing Care (SNC) is the methodology indicated by the Federal Nursing Council since 2002<sup>(3)</sup>, but it is not yet a reality in the care practice, which reflects the need to review the training process for practice, especially in the Technical Courses.

The SNC is understood as a work methodology used in the organization of the nursing knowledge and care provided to the user, in an intentional, systematic, dynamic, interactive, flexible and theory-based manner<sup>(4)</sup>.

Since 2002, through the Resolution No. 272, the Federal Nursing Council (COFEN - “Conselho Federal de Enfermagem”, in Portuguese language) has determined the ethical-legal character of the SNC, understanding it as a key tool for the recognition of nursing as a profession with solid scientific bases. It thus elucidated that it should be consolidated in every public and private health institution<sup>(3)</sup>, which, in practice, was not evidenced throughout Brazil.

Therefore, in another attempt to implement the SNC, in 2009 COFEN promulgated the Resolution No. 358, in which it reaffirms the Nursing Process (NP) as basilar in the defense of the contribution of nursing in the health care of the population and increase of the professional recognition of the nursing team<sup>(5)</sup>.

It is important to point out that this last legal document advanced in the incorporation of the attributions of the members of the nursing team – and not only of the nurse – including the nursing technician as an important actor in this process<sup>(5)</sup>.

It is recognized, therefore, that among the challenges for the real consolidation of the SNC in the Brazilian health services is the need for its effectiveness to result from a team work, integrating the nursing professionals of the different levels, aspect that needs to be worked on from the nursing students' training process<sup>(6)</sup>.

It is important to emphasize, also, that historically it is recognized in the literature that the discussions about the SNC neglected the essentiality of the technical professional in

nursing and, in general, this content was not worked on in the training process of these professionals<sup>(7)</sup>.

It is in this panorama that the need to think about teaching strategies that contribute to active and effective teaching of SNC in the different educational levels of nursing is highlighted.

In this context, it is necessary to emphasize that, in the contemporaneity, one experiences the society of the cyber culture and cyberspace, defined as a new space of human interaction, of establishing a network of computerized memories, by which communication and information become a computerized sphere<sup>(8)</sup>.

The cyber culture society is characterized as collaborative, hyper-textual, deprived of physical presence and supported by web 3.0 interfaces. The cyberspace enables the self-learning, facilitates interactivity and encourages the exchange of information and knowledge<sup>(8)</sup>. In these spaces, permeates the so-called generation of digital natives<sup>(9)</sup>.

From these evolutions is the importance of the academic environment and of the professor as mediator of the knowledge to be constructed. In the meantime, the pedagogical act needs to be analyzed and revised in a structural way in its epistemological conceptions, in curriculum reformulation, and especially in didactic approaches<sup>(10)</sup>.

In this scenario, the blended learning and the flipped classroom stand out, pedagogical approaches that represent not only a combination of online and offline teaching methods, but also a combination of learning theories, with the proposal of self-directed and flexible activities, which translate into incentives for active learning<sup>(11-12)</sup>.

In order to do so, professors must take up new and differentiated positions, in order to promote collaborative learning, context in which the educational hypermedia can be presented as enriching didactic strategies.

Such resources are understood as educational technologies, term that refers to the use of technological resources as a tool to improve the quality of teaching<sup>(13)</sup>.

Among the hypermedia, the Virtual Learning Object (VLO) stands out in this manuscript, understood as a media tool for education, which enables the development of a resource to be used in both face-to-face and distance education, because it allows the establishment of situations of effective learning in one or several areas of knowledge<sup>(14)</sup>.

The VLO is a digital resource with multimedia support and reusable hypermedia language that enables interactive learning through animations or simulations. This is any didactic material, since it is used in a technology-based teaching/learning process<sup>(14)</sup>.

In the current context of educational resources supported in technology, it is unquestionable that they present themselves as a demand to be understood and developed by educational institutions, with the purpose of guaranteeing a process of construction and validation in which pedagogical aspects are understood as fundamental.

Among the methodological referentials that can guide the production and validation of educational technologies, the psychometrics stands out<sup>(15)</sup>. It describes the imperative rigor and the steps necessary to produce instruments appropriate to the purpose desired by the researcher through three interdependent processes: theoretical, empirical and analytical procedures<sup>(15)</sup>.

In this article, the theoretical procedures are highlighted, which comprise from the theoretical study to subsidize the construction of the instrument to its actual manufacturing<sup>(15)</sup>. Therefore, the process of building a VLO to support the SNC teaching is emphasized.

Thus, given the relevance of describing experiences of hypermedia development based on the theoretical-methodological rigor required; of the current demand for the adequacy of the teaching process to the field of technological innovations; and from the literary point of view that the academic formation, especially of nursing technicians, is one of the obstacles to the real consolidation of the SNC<sup>(6)</sup>, the research question of this study is: what contents and pedagogical strategies should make up a VLO to support the teaching of the SNC?

The objective is to describe the process of hypermedia construction to support the teaching of the Systematization of the Nursing Care.

## **METHODS**

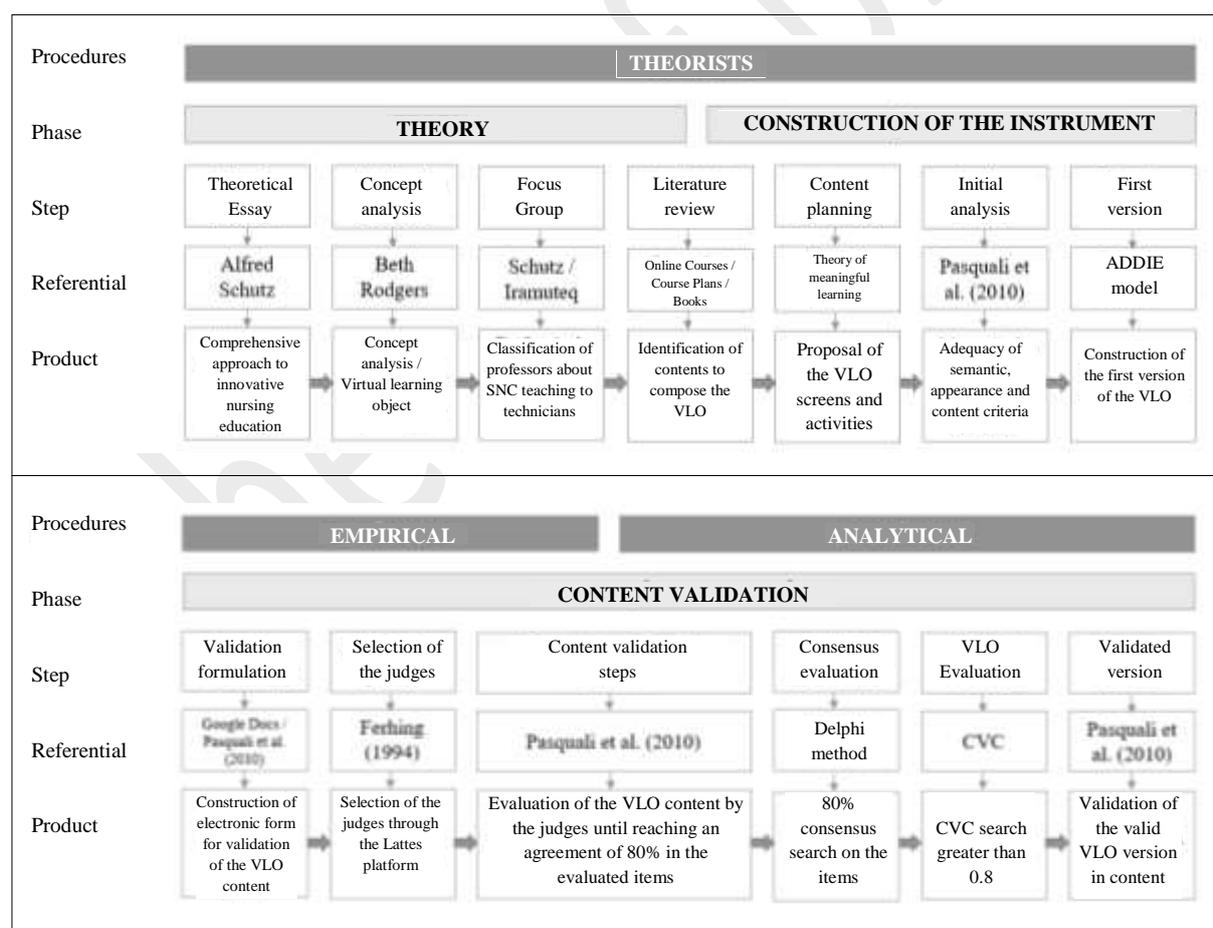
It is a methodological research for the development of an educational technology, resulting from a doctoral thesis defended in the scope of the Postgraduate Program in Nursing of the Federal University of Rio Grande do Norte (UFRN)<sup>(16)</sup>. The construction phases of the VLO were conducted from February 2015 to March 2016.

The hypermedia development team was composed by: professors with expertise in higher education and technical nursing and in the use of educational technologies from the Research Laboratory of Care, Safety, Technologies in Health and Nursing (LABTEC) of the

Nursing Department of UFRN, Brazil, and the Higher School of Nursing in Coimbra (ESEnfC), Portugal; and by professionals in the area of system analysis and development.

The process of constructing and validating the VLO was delineated from adaptations of the psychometric model<sup>(15)</sup> from the steps: 1) theoretical procedures to identify the contents that composed the proposed teaching instrument; 2) empirical procedures, when the validation of the VLO content with nursing experts was delineated; and 3) analytical procedures, when the validation was analyzed using the Delphi technique, in order to confirm or refute the validation of the proposed VLO (Figure 1).

Each step followed methodological procedures appropriate to the scope they intended. In this manuscript, the component steps of the theoretical procedures will be explained, once its aim is to describe the process of the VLO construction. The steps and results of the hypermedia validation process can be consulted in a detailed publication of these aspects<sup>(17)</sup>.



**Figure 1** – Flow diagram of the construction and validation process of the VLO content  
Source: Salvador, 2016<sup>(16)</sup>.

In the context of the development of the VLO to support the teaching of the SNC in the Theory phase (Figure 1), it was relevant studies for theoretical deepening about the innovative teaching of nursing, the VLO concept, research with professors to investigate the interface of the nursing technical education with the Systematization of Care, as well as a review of relevant educational content on the study topic to be included in the version of the virtual object.

In the Construction of the Instrument phase, in the scope of the Instructional Design, the Analysis, Design, Development, Implementation, Evaluation (ADDIE) model of educational content development and its learning objects was used, which serves as the basis for the process of developing instructional material<sup>(18)</sup>. And as a pedagogical theory of contribution to educational conceptions, the VLO was delineated in the light of Significant Learning Theory (SLT)<sup>(19)</sup>.

In all the stages, it was followed the international ethical precepts (in line with the Code of Ethics of the World Medical Association - Declaration of Helsinki) and national ethical principles (established by the Resolution 466/2012, of the National Health Council), so that the proposal of the study was appraised and approved by the Ethics and Research Committee, through Opinion No. 925.408, of 12/18/2014, CAAE nº 39640914.8.0000.5537.

## **RESULTS AND DISCUSSION**

### **Theory Phase**

The theoretical pole of the process of an instrument construction has as north the theory question, which must base any scientific enterprise<sup>(15)</sup>. Thus, to seek the theoretical basis of the element to be developed is to make explicit the theory about the construct studied, as well as operationalize it in the items that will make up the instrument<sup>(15)</sup>.

In summary, the construction of the technological resource must be based on solid theoretical bases, in search of the best and most current evidence on the studied object. Thus, the Theory phase has as scope to guarantee the pertinence of the items that will compose the resource to the construct they represent<sup>(15)</sup>.

When thinking about the development of an educational technology, this step becomes even more decisive, because it will involve essential aspects of the definition of the pedagogical approach in light of which the hypermedia will be constructed, the contents and the teaching and learning strategies that will integrate it.

Thus, the first step covered in the construction of the VLO was the search for reflections about innovative nursing teaching and what elements are basis for this process. For this, a theoretical essay guided by social phenomenology was developed, whose objective was to reflect on the main conceptions of the Schutzian phenomenology and its contribution to the innovative teaching of nursing.

As the first stage of reflection on the theoretical pole of the VLO, the theoretical essay contemplated a philosophical understanding of innovative nursing teaching, involving fundamental aspects about the teaching and the student role in this process and how the pedagogical actions should be consolidated, an aspect that was relevant so that, in this extended context, the theoretical reflections were focused on the understanding of the VLO concept.

The second stage covered in the VLO construction process was a concept analysis, whose main purpose in the hypermedia construction process was to understand, in essence, the characteristics of the VLO, which was essential for its correct development process.

The necessity of this study was due to the finding of obstacles in the use of the terms VLO and Virtual Learning Environment (VLE) in the literature, which could contribute to misuse and consequent inadequate understanding of these different technological resources.

It was thus possible to understand VLO as a digital resource of limited size that can be reused within different pedagogical activities and strategies, concept from which the pedagogical theory, the contents and the activities that would compose the hypermedia were thought.

The first two stages of the VLO construction process allowed a deep understanding of the educational technology that was intended to be developed, a fundamental element for the achievement of the other phases.

The third step sought to reflect on how the SNC training in technical training should be carried out (what contents should, therefore, compose such educational technology), since the built VLO proposes to support such teaching, which is based on a finding that the training aspect of nursing professionals needs to be reformulated with regard to this theme<sup>(7)</sup>.

In the meantime, a focus group was held with professors of the Nursing Technical Course of a public university in the Brazilian Northeast. The results of this stage reinforced the importance of thinking about tools that could support the inclusion of the SNC in training at a technical level.

It was reaffirmed the importance and the possibilities of contribution of the VLO to support the teaching of the SNC to the nursing technicians and listed the aspects that should guide the construction of hypermedia: concept; history; legal aspects; and stages of effectiveness of the Nursing Process.

In order to strengthen the choice of content that would compose the educational technology, the fourth stage of the VLO construction process was outlined, which consisted of a review of online courses on the SNC, of books on the subject and of technical level Course Plans.

Thus, in line with the results raised from the focus group with the professors, they were listed as structuring contents that would compose the hypermedia to support the SNC teaching: concept, history and benefits of the SNC; ethical-legal aspects of the SNC operationalization; and Nursing Process: stages and integration of the nursing technician.

In addition, the SLT was chosen to subsidize the development and use of the VLO. From the representational, conceptual and propositional learning, the SLT understands that the most important factor that influences learning is what the student already knows, an aspect called prior knowledge or subsumption. In this sense, the student needs to establish relationships of similarity or difference between new information and those already incorporated<sup>(19)</sup>.

For meaningful learning to take place, three interdependent conditions are required: 1) attitude of the learner, from the understanding that the human being learns only when he is willing to learn, to use his personal effort in this process; 2) presence of relevant ideas in the cognitive structure of the learner, that is, the identification of the students' previous knowledge should be the starting point for the act of teaching; e 3) potentially meaningful learning material<sup>(19)</sup>.

In the meantime, the incorporation of technological tools into teaching can be subsidized in the principles of SLT, so that the VLO translates into the third necessary condition for meaningful learning<sup>(19)</sup> – a potentially significant didactic material – since it seeks the creation of diversified learning situations, with a stimulus for interactive, continuous and permanent learning.

Based on these pedagogical assumptions, the SLO was delineated, with the aim of constructing a course of interactive contents that would promote student reflection and be translated into a support for flexible and autonomous learning.

From this process, the second phase of the theoretical pole was initiated: the Construction of the Instrument.

### **Instrument Construction Phase**

Based on the theoretical-methodological assumptions highlighted, the SLO was built according to the ADDIE model<sup>(18)</sup>. Chart 1 presents the components of each phase of the ADDIE model and their relationship to the component steps of the VLO development and validation process to support the SNC teaching.

<b>ADDIE phase</b>	<b>Component elements</b>	<b>Stage of the study</b>
Analysis	Survey of needs, context analysis, preliminary study of course content, projection of expected results.	Theoretical procedures: Theory phase
Planning	Course design, respecting the learning objectives, the context and characteristics of the learners, definition of the course structure (syllabus, detailing of activities and contents), bibliographic references, media selection and pedagogical approach.	
Development	Production of the course, obeying the planning guidelines.	Theoretical procedures: Construction phase of the Instrument
Implantation	Material tests and the implantation of the material produced.	Empirical and analytical procedures
Evaluation	Formative assessment, which is present in each phase of the ADDIE Model, and the summative evaluation, consisting of tests applied to the material produced. Revisions may be required during this phase.	

**Chart 1** – Relation of the phases of the ADDIE model and stages of the development and validation of the VLO

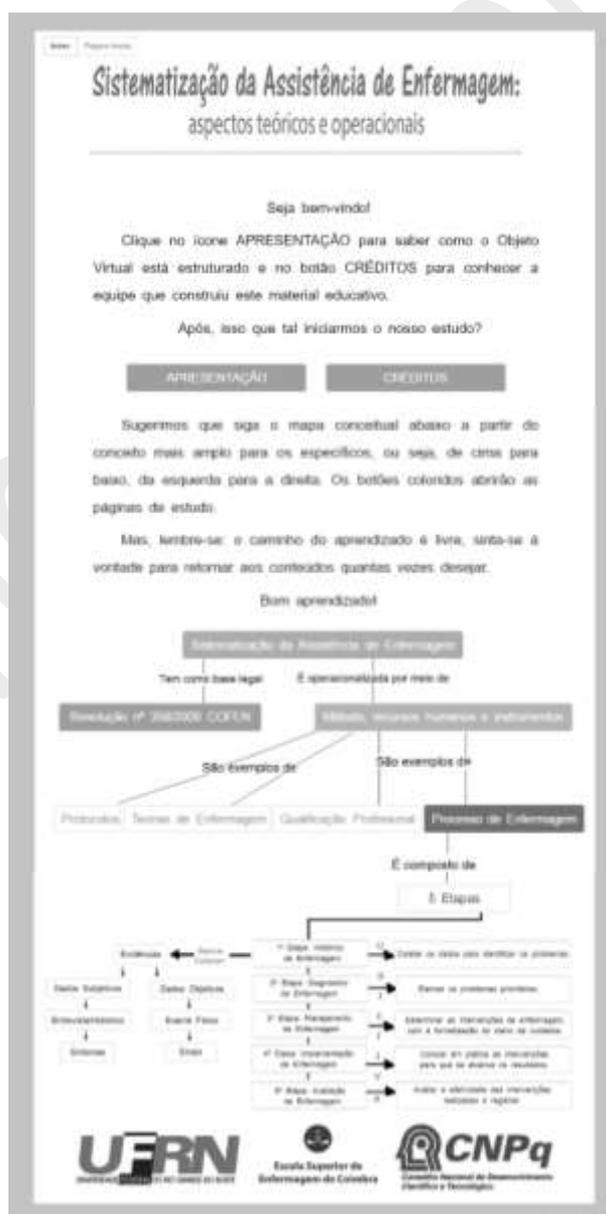
Source: Salvador, 2016<sup>(16)</sup>.

Thus, with the support of professionals in the area of analysis and development of systems, the VLO was built.

The following technologies were used for the construction of the hypermedia: Hyper Text Markup Language (HTML) 5, a markup language aimed at building websites; Cascading Style Sheets (CSS), a language responsible for defining the structure of the page, as to style, colors, position and other elements of standardization of the learning object; Flash MX, a Macromedia company software with great animation features for creating interactive object

features; and Corel Draw, an image editing software created by the Corel Corporation that was used in the image processing and graphic design of the object.

The VLO presents an initial screen (Figure 2) in which it proposes, from a conceptual map, a free path of learning about four structuring aspects in SNC learning: 1) Systematization of the Nursing Care: concept, history and benefits; 2) Ethical and legal aspects of the Systematization of the Nursing Care; 3) Operationalization of the Systematization of the Nursing Care; and 4) Nursing Process: stages and integration of the nursing technician.



**Figure 2** – VLO home screen interface with the conceptual map  
 Source: VLO screen. Available on: <http://www.saeufm.rf.gd/?i=2>.

On the homepage, you have access to links to all the seven screens that make up the VLO (Chart 2).

Screen	Objective	Component Items
Homepage screen	Display the Virtual Object with Navigation Instructions	Initial text with welcome Browsing instructions Conceptual map with schematization of worked concepts and access buttons to content screens
Presentation screen	To provide information on the development and composition of the Virtual Object	Initial text with presentation of the thesis project of development and validation of the Virtual Object Information about the target audience, purpose and contents of the Virtual Object
Credits screen	To present institutions and team responsible for the development of the Virtual Object	Information about the production, funding and construction team institutions
Content screen 1 Systematization of the Nursing Care: concept and benefit	Learning objective: To understand the concept and importance of the Systematization of the Nursing Care (SNC)	Title Learning objective Interactive text with hyperlinks Concept synthesis Reading tips Proposal of reflection activity
Content screen 2 Ethical and legal aspects of the Systematization of the Nursing Care	Learning objective: Identify the historical and ethical-legal aspects that involve the SNC	Title Learning objective Interactive text with hyperlinks Concept synthesis Reading tips Proposal of reflection activity
Content screen 3 Operationalization of the Systematization of the Nursing Care	Learning objective: To understand the difference between the concepts of SNC and Nursing Process	Title Learning objective Interactive text with hyperlinks Concept synthesis Reading tips Proposal of reflection activity
Content screen 4 Nursing Process: stages and integration of the nursing technician	Learning objective: To understand the phases of the Nursing Process and the importance of the nursing technician participation in the SNC	Title Learning objective Interactive text with hyperlinks Concept synthesis Reading tips Proposal of reflection activity

**Chart 2** – Screens that compose the VLO to support SNC teaching  
Source: Salvador, 2016<sup>(16)</sup>.

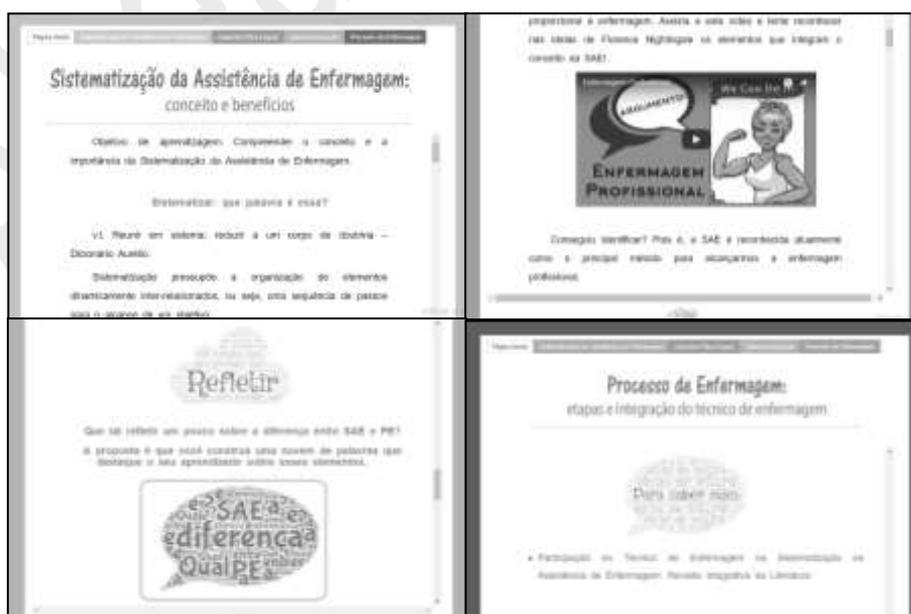
In the Presentation screen, there is a brief presentation of the development process of the VLO and it is emphasized that its use is encouraged in the blended teaching scope, that is, as a support to the SNC classroom teaching.

As a target audience, it is pointed out that the Virtual Object was developed in its essence for students of the nursing technical course. However, learning is encouraged for students and nursing professionals of any academic level.

It is presented, then, still in the Presentation screen: the aim of the hypermedia - to provide educational material to support the teaching of SNC to students and nursing professionals of any academic level; the contents and elements that compose it.

The Credits screen displays the institutions and names of those responsible for the content and development of the VLO.

As for the content screens, their access is from the conceptual screen of the Home Screen (Figure 2) and each page is composed of interactive content, added to the items: “To know more: reading tips”, with the availability of links of articles and videos to deepen the learning; and “Reflect to learn more”, with proposals for individual reflection activities with the support of educational media, in order to present to the students new ways of learning and to mean what was discussed (Figure 3).



**Figure 3** – Interface of the VLO content screens to support the SNC teaching  
Source: VLO screen. Available on: <http://www.saeufn.rf.gd/?i=2>.

By describing the component stages of the VLO construction process, we try to highlight the complex process of developing an educational technology: a field that needs to be thought in an interdisciplinary way, in the light of a theoretical-methodological rigor that is based on the fundamental principles of interactive and collaborative learning<sup>(9,20)</sup>.

The theoretical pole in the process of construction of the VLO proved to be a fundamental step for the adequacy of the built instrument to the construct in which it is inserted and to the educational objective to which it is proposed.

This is because, within the scope of technological educational resources, it is imperative that a theoretical contribution be sought for the incorporation of these strategies into teaching environments, which must be understood and consolidated from its conception.

Consonant with such perspective, it is pointed out that there is no impact of technology on education; there are tools that are available and there are educators who can use these tools in one way or another<sup>(8)</sup>.

In this way, education does not lose its centrality with the technologies, because the pedagogical intent is what will define the impact of the use of technology<sup>(8)</sup>. Thus, the preparation of the professor is highlighted as a basilar challenge, since technologies can both alter the professors' methodology and consolidate traditionalism in their classes, so that the professors' previous training to deal with these variables is a decisive factor<sup>(9)</sup>.

In this context, what is important in the use of interactive technologies is the pedagogical approach that the professor has and not the technology itself, this is because the technological tools are able to qualify teaching practices through a vision of co-participation between teacher and student, mediated by interactivity and creativity.

In summary, it is highlighted that the development of educational resources in the light of pedagogical theories and based on a necessary methodological rigor consists in a response to the current demand of innovative teaching. It is relevant in this process the involvement of a multidisciplinary team in order to ensure that technical and pedagogical assumptions are met in the process of construction of educational technology<sup>(20)</sup>.

Thus, the VLO construction process described was challenging. It required pedagogical and methodological conceptions that guided the development of the educational resource, in addition to the support of professionals in the area of systems development.

Such processes should be seen as contemporary challenges of being a teacher, who needs to appropriate this knowledge in order to use and develop educational technologies appropriate to the learning objectives proposed.

## **FINAL CONSIDERATIONS**

The steps taken to construct the virtual learning object to support the SNC teaching to nursing technicians were described.

The process of construction of educational technology is seen as complex, in which the theoretical pole was a fundamental foundation for technical and pedagogical principles to be consolidated, in order to have relevance of the built resource with the construct in which it is inserted and thus contribute to the effectiveness of its educational objectives.

It was emphasized the necessary pedagogical reflection on the incorporation of educational technologies in teaching environments, a space in which the teacher's preparation is a key factor.

The support from a systems analyst and development professional was imperative. It was evidenced that the construction of an educational technology requires a multiprofessional team, with the guarantee that the technical and pedagogical principles are consolidated.

The use of SLT as a pedagogical contribution has proved to be adequate and pertinent for the construction of educational technology based on the precepts of a dynamic and active process of teaching and learning, extremely necessary to respond to the current demands of nursing education spaces.

It is expected that the methodological process described will be thought and rethought as a possibility for the development of adequate technological resources in its content, its appearance, its usability and its pedagogical presuppositions.

The use of VLO is encouraged from the perspective of the blended learning and the flipped classroom, reason why it is proposed that the educational technology should be a support for the teaching and learning process, both in the context of continuing education and in-service education.

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