

Validation of virtual learning object to support the teaching of nursing care systematization

Validação de objeto virtual de aprendizagem para apoio ao ensino da sistematização da assistência de enfermagem

Validación de objeto virtual de aprendizaje como apoyo a enseñanza de atención sistematizada de enfermería

Pétala Tuani Candido de Oliveira Salvador¹, Camila Maria dos Santos Mariz², Allyne Fortes Vítor¹, Marcos Antônio Ferreira Júnior¹, Maria Isabel Domingues Fernandes³, José Carlos Amado Martins³, Viviane Euzébia Pereira Santos¹

¹ Universidade Federal do Rio Grande do Norte, Postgraduate Program in Nursing. Natal, Rio Grande do Norte, Brazil.

² Universidade Federal do Rio Grande do Norte, Health Sciences Center, Department of Nursing. Natal, Rio Grande do Norte, Brazil.

³ Escola Superior de Enfermagem de Coimbra, Scientific-Pedagogical Unit of Medical-Surgical Nursing. Coimbra, Portugal.

How to cite this article:

Salvador PTCO, Mariz CMS, Vítor AF, Ferreira Jr MA, Fernandes MID, Martins JCA, et al. Validation of virtual learning object to support the teaching of nursing care systematization. Rev Bras Enferm [Internet]. 2018;71(1):11-9. DOI: <http://dx.doi.org/10.1590/0034-7167-2016-0537>

Submission: 11-10-2016 Approval: 03-03-2017

ABSTRACT

Objective: to describe the content validation process of a Virtual Learning Object to support the teaching of nursing care systematization to nursing professionals. **Method:** methodological study, with quantitative approach, developed according to the methodological reference of Pasquali's psychometry and conducted from March to July 2016, from two-stage Delphi procedure. **Results:** in the Delphi 1 stage, eight judges evaluated the Virtual Object; in Delphi 2 stage, seven judges evaluated it. The seven screens of the Virtual Object were analyzed as to the suitability of its contents. The Virtual Learning Object to support the teaching of nursing care systematization was considered valid in its content, with a Total Content Validity Coefficient of 0.96. **Conclusion:** it is expected that the Virtual Object can support the teaching of nursing care systematization in light of appropriate and effective pedagogical approaches.

Descriptors: Educational Technology; Teaching Materials; Validation Studies; Nursing Processes; Technical Education in Nursing.

RESUMO

Objetivo: descrever o processo de validação de conteúdo de um Objeto Virtual de Aprendizagem para apoio ao ensino da sistematização da assistência de enfermagem aos técnicos em enfermagem. **Método:** estudo metodológico, de abordagem quantitativa, desenvolvido segundo referencial metodológico da psicometria de Pasquali e realizado de março a julho de 2016, a partir de duas etapas Delphi. **Resultados:** na etapa Delphi 1, oito juízes avaliaram o Objeto Virtual; na etapa Delphi 2, sete. As sete telas do Objeto Virtual foram analisadas quanto à adequabilidade de seu conteúdo. O Objeto Virtual de Aprendizagem para apoio ao ensino da sistematização da assistência de enfermagem foi considerado válido em seu conteúdo, com Coeficiente de Validade de Conteúdo total de 0,96. **Conclusão:** espera-se que o Objeto Virtual possa apoiar o ensino da sistematização da assistência de enfermagem à luz de abordagens pedagógicas adequadas e efetivas.

Descritores: Tecnologia Educacional; Materiais de Ensino; Estudos de Validação; Processos de Enfermagem; Educação Técnica em Enfermagem.

RESUMEN

Objetivo: Describir el proceso de validación de contenido de un Objeto Virtual de Aprendizaje para apoyar la enseñanza de la sistematización de la atención de enfermería a técnicos en enfermería. **Método:** Estudio metodológico, de abordaje cuantitativo, desarrollado según referencial metodológico de la psicometría de Pasquali, realizado de marzo a julio de 2016, a partir de dos etapas Delphi. **Resultados:** En la etapa Delphi 1, ocho jueces evaluaron el Objeto Virtual; en la etapa Delphi

2, siete. Las siete pantallas del Objeto Virtual analizaron la adecuabilidad de su contenido. El Objeto Virtual de Aprendizaje para apoyo a la enseñanza de la sistematización de la atención de enfermería fue considerado válido en su contenido, con Coeficiente de Validez de Contenido total de 0,96. **Conclusión:** Se espera que el Objeto Virtual pueda respaldar la enseñanza de la sistematización de la atención de enfermería a la luz de abordajes pedagógicos adecuados y efectivos.

Descriptores: Tecnología Educativa; Materiales de Enseñanza; Estudios de Validación; Procesos de Enfermería; Graduación en Auxiliar de Enfermería.

CORRESPONDING AUTHOR

Pétala Tuani Candido de Oliveira Salvador

E-mail: petalatuani@hotmail.com

INTRODUCTION

Educational technologies represent a set of tools and applications that allow the inclusion and strengthening of new teaching strategies, many of which have been defined in new curricular structures in the last two decades⁽¹⁾.

In the worldview, educational technologies are understood as tools that need to be incorporated into education systems as a response to a learning demand for which traditional teaching is already insufficient.

For instance, the conclusions of the European Council on the modernization of education explicitly include the need to promote the adoption of student-centered approaches, the diversification of study methods and the effective use of educational technologies, which are strategies considered essential to consolidate a flexible teaching method as an active learning promoter⁽²⁾.

In this context, teaching without technology alone no longer attends to learning objectives. In the field of health education, there is an increasing concern, since traditional education suffers from some limitations that may compromise the effectiveness of the learning process.

On one hand, in traditional education systems, students generally behave as passive; on the other hand, a high variability in the learning process is generated during the clinical sessions, which makes it difficult to homogenize students' acquisition of knowledge and practice. Moreover, this fact could determine the subsequent variability of care performed by health professionals when they are already inserted in the health system⁽³⁾.

Considering this, educational technologies appear as a mechanism to cope with these limitations, with the proposition of an active teaching/learning process, based on simulations of the most diverse levels. Thus, it is pointed out that technology is on the way of teaching to become ubiquitous in education, with growing evidence that it has a significant positive effect on student learning when it is properly infused and integrated⁽²⁻⁵⁾.

In other words, educational technologies are no longer an option, but a necessity, according to the literature⁽⁶⁾. As a way forward, they bring new challenges to all involved in the teaching environment: a new student, called "student 3.0," demands a new teacher^(1,7). In turn, these technologies need a technical and pedagogical contribution that can supply the incorporation of technologies through a pedagogical approach as without it, the technology is not considered an educational tool⁽⁸⁾.

Thus, the consolidation of educational technologies must be guided by a fundamental triad: the paradigm shift of educational institutions; the adaptation of content and curricula;

and the relevant production of teaching materials adapted to the new technological demands^(1,7).

The necessary production and validation of teaching materials based on educational technologies is emphasized in this panorama. It is a complex process that must involve a multiprofessional team and be conducted in the light of pedagogical and technical approaches to ensure the effectiveness of the produced material^(3,8-9).

Among teaching materials based on educational technologies, the Virtual Learning Object is highlighted as a digital resource with multimedia support and hypermedia language that can be reused and has the means for interactive learning with animations or simulations. It is a range of didactic materials used in a technology-based teaching/learning process⁽¹⁰⁻¹¹⁾.

In this perspective, the research in question integrates a research project whose scope was to construct and validate a Virtual Learning Object to support the teaching of nursing care systematization to nursing professionals.

Therefore, in this context, our study is presented, whose hypothesis is: the content of the proposed Virtual Learning Object is valid to support the teaching of nursing care systematization to nursing professionals.

OBJECTIVE

To describe the content validation process of a Virtual Learning Object to support the teaching of nursing care systematization to nursing professionals.

METHOD

Ethical aspects

The ethical precepts established by Resolution no. 466/2012 of the National Health Council were followed. The proposal of the study was approved by the Ethics and Research Committee.

Design, study location and period

It is a methodological study, with a quantitative approach, developed according to a methodological framework adapted from the psychometry of Pasquali et al.⁽¹²⁾ It should be emphasized that content validation aims to verify the relevance of the items to the construct they represent, which should be done according to the evaluation of expert judges⁽¹²⁾.

The content evaluation of the Virtual Learning Object occurred from March to July 2016, from two-stage Delphi procedure. The Virtual Object consists of seven screens: initial; presentation; credits; and four pages of content (Chart 1).

Chart 1 – Screens that compose the Virtual Learning Object to support the teaching of Nursing Care Systematization to nursing professionals

Screen	Objective	Composing Items
Initial screen	Present the Virtual Object with navigation instructions	Initial text with welcome Navigation Instructions Conceptual map with schematization of the concepts and access buttons to content screens
Presentation screen	Provide information on the development and composition of the Virtual Object	Initial text with presentation of the thesis project of the Virtual Object development and validation Information about the target audience, objective and contents of the Virtual Object
Credits screen	Present institutions and team responsible for the development of the Virtual Object	Information from production and financing institutions and development team
Content screen 1 Nursing Care Systematization: concept and benefit	Learning objective: To understand the concept and importance of Nursing Care Systematization (SAE)	Title Learning Objective Interactive text with hyperlinks Synthesis of concepts Reading tips Proposal of the activity
Content screen 2 Ethical-legal aspects of Nursing Care Systematization	Learning objective: To identify the historical and ethical-legal aspects that involve SAE	Title Learning Objective Interactive text with hyperlinks Synthesis of concepts Reading tips Proposal of the activity
Content screen 3 Operationalization of Nursing Care Systematization	Learning objective: To understand the difference between the concepts of SAE and the Nursing Process	Title Learning Objective Interactive text with hyperlinks Synthesis of concepts Reading tips Proposal of the activity
Content screen 4 Nursing Process: stages and integration of nursing professional	Learning objective: To perceive the phases of the Nursing Process and the importance of nursing professional participation in SAE	Title Learning Objective Interactive text with hyperlinks Synthesis of concepts Reading tips Proposal of the activity

Note: SAE – *Sistematização da Assistência de Enfermagem* (Nursing Care Systematization)

Population and sample

Judges were selected through the analysis of their curricula submitted to the Lattes Platform to participate in the validation process of the Virtual Object. The following search strategy was used in this database: Search mode (subject [title or production keyword])

– Nursing Care Systematization; in the bases – PhDs and other researchers; Education/Degree – Master’s; And Professional background: General Area – Health Sciences/Area – Nursing.

In order to select the judges, the curricula were analyzed according to Fehring criteria⁽¹³⁾, with a minimum score of five points for the selection of experts in the construct area (Chart 2). Next, the authors sought the e-mail of the selected judges from their own curricula, from institutions’ websites in which they worked or from published articles.

However, for studies based on the Delphi technique, sampling is not predictable and there is no ideal number of participants⁽¹²⁾. However, theoretical frameworks of instrument validation procedures suggest a number from six to twenty judges⁽¹²⁾.

Thus, based on the criteria that at least six judges are required to compose the content validation stage⁽¹²⁾, 40 experts were pre-selected because of the significant number of losses due to the non-response of the judges – an aspect that was already reported in other studies, indicating response rates for electronic questionnaires around 15%⁽¹⁴⁻¹⁶⁾.

Chart 2 – Adaptation of the expert punctuation system of Fehring’s content validation model⁽¹³⁾

Fehring criteria (1994)	Points	Adapted criteria	Adapted points
Master’s in nursing	4	Master’s in Nursing (Criteria required)	0
Master’s in nursing – Dissertation with relevant contents of the clinical area	1	Master’s with dissertation on SAE	2
Research (with publication) in the diagnostics area	2	Research in the SAE area	3
Article published in the area of diagnostics in an influential journal	2	Article published in the SAE area in an influential journal	2
PhD in diagnosis	2	PhD with dissertation on SAE	4
Clinical practice of at least one year in the area of nursing in a clinic	1	Experience as teacher of Technical Nursing Course of at least six months	2
Certificate in clinical medical area with proven clinical practice	2	Certificate of specialization in the area of technical education	1
Maximum score	14	Maximum score	14

Note: SAE – *Sistematização da Assistência de Enfermagem* (Nursing Care Systematization)

Research protocol

For the 40 experts selected, the authors sent an invitation e-mail with the presentation of the research and its objectives and the Informed Consent Form (TCLE). In this first stage, 14 judges accepted to participate in the study. The TCLE was sent as a mechanism to guarantee the ethical precepts of the research.

Eleven judges sent the signed TCLE. An e-mail with instructions for the process of evaluation of the Virtual Learning Object was sent to them. In the Delphi 1 stage, eight judges evaluated the Virtual Object; in Delphi 2, seven judges filled out the evaluation tool.

The data collection instrument was built using the electronic tool *Google Docs*, and it consists of three pages: 1) characterization of the judges, with guarantee of their anonymity; 2) analysis of the pertinence of the content of each screen of the Virtual Object, with the evaluation of the items according to the options Adequate, Partially Adequate or Inadequate, with open space for "comments or suggestions for inadequacies"; and 3) evaluation of the Virtual Object as a whole, according to Pasquali's criteria⁽¹²⁾.

Analysis of results and statistics

Data were analyzed with descriptive statistics, using absolute and relative frequencies. The item with more than 80% agreement between the judges (rated as Adequate) and a Content Validity Coefficient (CVC) > 0.8⁽¹²⁾ was considered valid.

RESULTS

Eight judges participated in the final sample, with predominance of women (7, 87.5%); with the mean age of 48.8 ± 12.7 years; and with a PhD degree (5; 62.5%). All the evaluators

had experience in teaching, with a mean time of 14.0 ± 12.7 years, in the following academic levels: technical education (4; 50.0%); undergraduate (6; 75.0%); and graduate (6; 75.0%). The judges taught on more than one academic level simultaneously; seven (87.5%) of them had experience in care, with a mean of 12.1 ± 8.2 years.

Table 1 shows the result of the evaluation of the Virtual Learning Object screens in Delphi 1 and 2 stages.

In the first evaluation stage, only the Credits Screen was considered valid in its content, with judges agreeing on the appropriateness of the item = 87.5% and CVC = 0.96. Therefore, the experts' suggestions for all screens were evaluated for their suitability. The Virtual Object has been modified in order to improve its content according to the judges' suggestions. Chart 3 shows the changes made after the Delphi 1 stage.

The modified Virtual Learning Object was submitted to the new evaluation stage (Delphi 2). From this evaluation round, all screens were considered valid in their content, with judges agreeing on adequacy greater than 80% and CVC > 0.8 (Table 1).

Regarding the evaluation of the content validation criteria of the Virtual Object as a whole, Table 2 presents the results obtained in Delphi 1 and 2 stages.

It is understood that, after the adjustments made from the Delphi 1 stage, the Virtual Learning Object to support the teaching of nursing care systematization was considered valid in its content, with a total CVC of 0.96.

Table 1 – Judgment of the Virtual Learning Object items in the Delphi 1 and Delphi 2 stages (n = 8 in the Delphi 1 Stage and n = 7 in the Delphi 2 Stage), Natal, Rio Grande do Norte, Brazil, 2016

DELPHI 1 STAGE							
Item	Adequate		Partially adequate		Inadequate		CVC
	n	%	n	%	n	%	
Initial screen	3	37.5	5	62.5	-	-	0.79
Presentation screen	5	62.5	3	37.5	-	-	0.88
Credits screen	7	87.5	1	12.5	-	-	0.96
Content screen 1	5	62.5	3	37.5	-	-	0.88
Content screen 2	3	37.5	4	50.0	1	12.5	0.75
Content screen 3	3	37.5	4	50.0	1	12.5	0.75
Content screen 4	3	37.5	4	50.0	1	12.5	0.75
DELPHI 2 STAGE							
Item	Adequate		Partially adequate		Inadequate		CVC
	n	%	n	%	n	%	
Initial screen	6	85.7	1	14.3	-	-	0.95
Presentation screen	6	85.7	1	14.3	-	-	0.95
Credits screen	7	100.0	-	-	-	-	1.00
Content screen 1	7	100.0	-	-	-	-	1.00
Content screen 2	6	85.7	1	14.3	-	-	0.95
Content screen 3	6	85.7	1	14.3	-	-	0.95
Content screen 4	6	85.7	1	14.3	-	-	0.95

Note: CVC – Content Validity Coefficient

Chart 3 – Judges' suggestions on items considered partially adequate and inadequate in Delphi 1 stage, Natal, Rio Grande do Norte, Brazil, 2016

Item	Modified aspects	Non-modified aspects/ Explanation
Initial screen	Modifications/corrections of the text: to be initiated with welcome; the navigation guidelines and presentation of the conceptual map were improved; grammatical corrections were performed; Modifications/corrections in the image of the conceptual map: step 5 of the Nursing Process was included; the buttons that present the content pages were differentiated by colors to facilitate oriented navigation in the VLO; The UFRN logo was modified.	The letter size was not increased, but it is suggested that the user works with zoom, which allows this functionality.
Presentation screen	Presentation: the information that it is suggested to use the VLO in the blended learning teaching mode was included; Objective: it was modified for general purpose and the specific objectives for each page of content were transposed; Contents: the contents that compose the VLO were highlighted; Item "Reflect upon this to learn more": it was emphasized that the suggestions of activities are not summative evaluations, but rather stimuli to learning; Grammatical corrections were performed.	The letter size was not increased, but it is suggested that the user works with zoom, which allows this functionality.
Credits screen	The UFRN logo was modified; The authors' training background was added.	Nothing to declare
Content screen 1	The learning objective was added; Content: content optimization was conducted, with reduced presented information and increased text dynamicity; Item "Reflect upon this to learn more": tools for infographic construction were reduced and video tutorials added in Portuguese; Grammatical corrections were performed; An image (post-it) with a summary of what was presented on the page was added at the end of the content; Bibliographic references have been reallocated to the bottom of the page and links to online access have been added; Design: The background color matches the Home Page button, and a top navigation bar was added in the VLO.	Nothing to declare
Content screen 2	The learning objective was added; Content: content optimization was conducted, with the reduction of presented information and the increase in the dynamicity of the text, besides highlighting the contribution of ABEn in the process of struggle for SAE; Item "Reflect upon this to learn more": the tools of construction of HQ were replaced by one in Portuguese and the video tutorial was added in Portuguese; Grammatical corrections were performed; An image (post-it) with a summary of what was presented on the page was added at the end of the content; Bibliographic references have been reallocated to the bottom of the page and links to online access was added; Design: background color matches Home Page's conceptual map button and a top navigation bar was added in the VLO.	The historical course was maintained with reductions only in content and increased dynamism of the text, as it is aimed, in this page, that the student understands how the legislations referring to SAE have evolved in the course of history.
Content screen 3	The learning objective was added; Content: content optimization was conducted, with reduced presented information and increased text dynamicity; Item "Reflect upon this to learn more": reduced tools to construct word clouds and tutorial videos were added in Portuguese; Grammatical corrections were performed; An image (post-it) with a summary of what was presented on the page was added at the end of the content; Bibliographic references have been reallocated to the bottom of the page and links to online access was added; Design: background color matches Home Page's conceptual map button and a top navigation bar was added in the VLO.	The discussion about the differences between SAE and the Nursing Process was maintained, with due references to the literature that presents this distinction. The authors' understanding that the confusion the use of terms without distinction may be an element capable of constituting an obstacle to the consolidation of SAE, insofar as the professionals do not understand it in its essence.

To be continued

Chart 3 (concluded)

Item	Modified aspects	Non-modified aspects/ Explanation
Content screen 4	The learning objective was added; Content: content optimization was conducted, with reduced presented information and increased text dynamicity; Item "Reflect upon this to learn more": tools for infographic construction were reduced and video tutorials added in Portuguese; Grammatical corrections were performed; An image (post-it) with a summary of what was presented on the page was added at the end of the content; Bibliographic references have been reallocated to the bottom of the page and links to online access was added; Design: background color matches Home Page's conceptual map button and a top navigation bar was added in the VLO.	Nothing to declare

Note: VLO – Virtual Learning Object; UFRN – Universidade Federal do Rio Grande do Norte (Federal University of Rio Grande do Norte); SAE – Sistematização da Assistência de Enfermagem (Nursing Care Systematization); ABEn – Associação Brasileira de Enfermagem (Brazilian Nursing Association); HQ – História em Quadrinhos (Comics)

Table 2 – General evaluation of the judges about the Virtual Learning Object in the Delphi 1 and Delphi 2 stages (n = 8 in the Delphi 1 Stage and n = 7 in the Delphi 2 Stage), Natal, Rio Grande do Norte, Brazil, 2016

DELPHI 1 STAGE							
Critério	Likert scale						CVC
	1 (Inadequate)		2 (Partially adequate)		3 (Adequate)		
	n	%	n	%	n	%	
Behavioral	-	-	4	50.0	4	50.0	0.83
Objectivity	-	-	4	50.0	4	50.0	0.83
Simplicity	1	12.5	3	37.5	4	50.0	0.79
Clarity	-	-	5	62.5	3	37.5	0.79
Relevance	-	-	1	12.5	7	87.5	0.96
Precision	1	12.5	3	37.5	4	50.0	0.79
Variety	-	-	4	50.0	4	50.0	0.83
Modality	-	-	4	50.0	4	50.0	0.83
Typicality	-	-	1	12.5	7	87.5	0.96
Credibility	-	-	2	25.0	6	75.0	0.92
Range	-	-	3	37.5	5	62.5	0.88
Balance	-	-	3	37.5	5	62.5	0.88
DELPHI 2 STAGE							
Critério	Likert scale						CVC
	1 (Inadequate)		2 (Partially adequate)		3 (Adequate)		
	n	%	n	%	n	%	
Behavioral	-	-	1	14.3	6	85.7	0.95
Objectivity	-	-	1	14.3	6	85.7	0.95
Simplicity	-	-	2	25.6	5	71.4	0.90
Clarity	-	-	-	-	7	100.0	1.00
Relevance	-	-	-	-	7	100.0	1.00
Precision	-	-	3	42.9	4	57.1	0.86
Variety	-	-	-	-	7	100.0	1.00
Modality	-	-	1	14.3	6	85.7	0.95
Typicality	-	-	-	-	7	100.0	1.00
Credibility	-	-	-	-	7	100.0	1.00
Range	-	-	-	-	7	100.0	1.00
Balance	-	-	1	14.3	6	85.7	0.95

Note: CVC – Content Validity Coefficient

DISCUSSION

From the two Delphi stages, all screens of the Virtual Object were considered valid in their content, with judges agreeing on adequacy greater than 80% and $CVC > 0.8$, corroborating the methodological reference of the psychometry used⁽¹²⁾.

The content validation of educational technologies constitutes a fundamental stage, with the purpose of verifying the relevance of the teaching material components to the construct they represent⁽¹²⁾.

Among the validation methods, the Delphi technique is highlighted in the literature because it allows consulting a group of judges who are experts in the subject of the material. Unlike other research strategies, its objective is not to deduce a simple answer or to reach a consensus only, but to obtain quality answers and opinions for a given question presented to a panel of experts⁽⁶⁾.

In this study, the authors highlight the significant experience of the judges participating in the validation stages, who had much experience in teaching and nursing care, on different academic levels of nursing.

It is considered that the analysis of the experts was fundamental to obtain a valid Virtual Learning Object in its content. The improvements suggested in the Delphi 1 stage guided the improvement of the Virtual Object, especially related to the dynamism required for the content proposed in an educational technology, for the conciseness and clarity of digital texts are decisive elements for a pleasant and meaningful learning⁽¹⁷⁾.

The dissemination of the use of educational technologies is stimulated by its innumerable advantages, which include offering students an easy understanding of the subject studied, considering individual rhythm and active learning. However, while these advantages are recognized, educational technologies need to be evaluated to ensure their quality⁽¹⁷⁾.

Therefore, it is valid to highlight the pedagogical base in light of which the Virtual Object was developed, an essential element for the incorporation of educational technology in the teaching/learning environments. Thus, it reinforces the idea that although many advantages are associated with educational technologies mediated by computers or similar devices, the use of information technology in the educational system should be a complementary tool that helps, but never replaces, teachers⁽¹⁷⁾.

In this perspective, the use of the presented Virtual Object is encouraged by the concept of the *blended learning* and the *flipped classroom*. Both are 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, translated into incentives for active learning⁽¹⁸⁻¹⁹⁾, in an integration of in-person and distance activities.

Teachers should take on new and different approaches in order to promote collaborative learning, a space in which the Virtual Learning Object presents itself as an enriching didactic strategy. Thus, an on-site space becomes a dynamic environment of reflections and discussions, based on distance learning, with the support of the Virtual Object.

The necessary teaching preparation for the integration of the Virtual Object in the teaching/learning spaces is indicated, based on a fundamental pedagogical approach.

The Technological Pedagogical Content Knowledge Model (TPACK) outstands among the theoretical frameworks to provide support on how a technology should be properly integrated in the classroom. TPACK describes the necessary connection of three areas of knowledge to the work with educational technologies: curricular, pedagogical and technical⁽⁷⁾.

In this sense, the curriculum needs to be understood, with the definition of the subject or with the content for the technological implementation, and this includes tracing the objectives to be achieved. The pedagogical component should ensure that the development of technology takes place in light of learning theories, with faculty support, while the technical aspect comprises the necessary training for the use of technological resources, selection criteria and proposed uses for technology, which involves not only the teachers, but all components of the educational institution⁽⁷⁾.

The process of developing and validating educational technologies is a fundamental and complex step that requires an appropriate pedagogical and technical approach, as without it one risks to produce technological material that is free of effective educational objectives. Research⁽²⁰⁻²¹⁾ corroborates this assertion by pointing out that the success of an educational technology is directly related to its adequate development process.

A study conducted in Taiwan aimed at establishing a comprehensive and multidimensional model to evaluate the success of blog-based learning systems, pointed out the relationship between six success variables: system quality, content quality, educational context, users' satisfaction, system usage, and user performance. Specifically, this study confirms that the quality attributes of educational technology positively affect user satisfaction, influencing performance and learning⁽²⁰⁾.

From another perspective, a research conducted in Spain, with the objective of formulating a theoretical model to identify the factors associated with the welfare of teachers, when faced with innovative educational processes mediated by the use of educational technologies, denoted the influence of three axes for the motivation of teachers⁽²¹⁾.

The first axis consists of projects and values of the teachers themselves, while the second refers to the favorable conditions for innovation to be successful, which involves both the teachers' skills and the mood and culture of the educational institution. In turn, the third axis has a personal and subjective character, as it encompasses an emotional effect of the use of educational technologies, it produces satisfaction and emotions that finally lead the teachers to well-being⁽²¹⁾.

It is evident from this research that the incorporation of educational technologies in educational environments involves two primary aspects: on one hand, a process of development and validation of educational material with adequate technical, pedagogical and methodological input, and, on the other hand, the incorporation of validated educational technology with a necessary preparation on behalf of the teachers and the teaching institution as a whole. Thus, the validation of an

educational technology should be a frequent and continuous process, due to the constant innovations and technological improvements experienced⁽²²⁾.

As a limitation of the study, in contrast, the low number of responses of the experts outstands. However, it is noteworthy that the sample of judges was constituted of number considered adequate by the methodological reference used.

It also highlights the subjectivity of the options for evaluating the content of the Virtual Object – Adequate, Partially Adequate and Inadequate – as a limiting aspect of the study. The methodological framework used suggests an agreement of more than 80% to consider an item valid, which does not specify whether, for this accounting, only the assessments determined as Adequate in their fullness should be considered.

In addition, judges' evaluation of a Partially Adequate item consisted of a clearly subjective process, with notes of adequacies that did not influence the content of the Virtual Object, the focus of the analysis in our study.

In order to make this evaluation process more objective, the item that presented more than 80% agreement between the judges (evaluated as Adequate) and a Content Validity Coefficient

(CVC) > 0.8 was considered valid. This last method of analysis allows a clear and cohesive evaluation.

The authors hope that the valid Virtual Object in its content can support the teaching of nursing care systematization to nursing technicians in light of adequate and effective pedagogical approaches.

CONCLUSION

The hypothesis of this study was confirmed: the content of the proposed Virtual Learning Object is valid to support the teaching of nursing care systematization to nursing technicians.

As the next stage of the study, the need to validate the appearance and usability of the Virtual Object with the public for which it is intended, the students, is emphasized.

FUNDING

This research was funded by Conselho Nacional de Desenvolvimento Científico e Tecnológico – CNPq Brasil (Process no. 201320/2015-0 – SWE).

REFERENCES

1. Fonseca D, Martí N, Redondo E, Navarro I, Sánchez A. Relationship between student profile, tool use, participation, and academic performance with the use of Augmented Reality technology for visualized architecture models. *Comput Human Behav*. 2014;31:434-45.
2. Gamis-Sánchez V, Gallego-Arrufat MJ. Modelo de análisis de metodologías didácticas semipresenciales en educación superior. *Educación XX1*. 2006;19(1):39-61.
3. Veredas FJ, Ruiz-Bandera E, Villa-Estrada F, Rufino-González JF, Morente L. A web-based e-learning application for wound diagnosis and treatment. *Comput Methods Programs Biomed*[Internet]. 2014[cited 2016 Nov 30];116(3):236-48. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/25015566>
4. Shih CL, Chuang HH. The development and validation of an instrument for assessing college students' perceptions of faculty knowledge in technology-supported class environments. *Comput Educ* [Internet]. 2013 [cited 2016 Nov 30];63:109-18. Available from: <https://doi.org/10.1016/j.compedu.2012.11.021>
5. Henrie CR, Halverson LR, Graham CR. Measuring student engagement in technology-mediated learning: a review. *Comput Educ*[Internet]. 2015[cited 2016 Nov 30];90:36-53. Available from: <https://doi.org/10.1016/j.compedu.2015.09.005>
6. Decman M. Modeling the acceptance of e-learning in mandatory environments of higher education: The influence of previous education and gender. *Comput Human Behav*. 2015;49: 272-81.
7. Fonseca D, Redondo E, Villagrasa S. Mixed-methods research: a new approach to evaluating the motivation and satisfaction of university students using advanced visual Technologies. *Univ Access Inf Soc*[Internet]. 2015[cited 2016 Nov 30];14:311-32. Available from: <http://dx.doi.org/10.1007/s10209-014-0361-4>
8. Sousa CS, Turrini RNT. Creating and validating educational material for patients undergoing orthognathic surgery. *Asian Nurs Res*[Internet]. 2012[cited 2016 Nov 30];6(4):166-72. Available from: [http://www.asian-nursingresearch.com/article/S1976-1317\(12\)00068-0/fulltext](http://www.asian-nursingresearch.com/article/S1976-1317(12)00068-0/fulltext)
9. Maia ER, Lima Júnior JF, Pereira JS, Eloi AC, Gomes CC, Nobre MMF. Validação de metodologias ativas de ensino-aprendizagem na promoção da saúde alimentar infantil. *Rev Nutr*[Internet]. 2012[cited 2016 Nov 30];25(1):79-88. Available from: <http://www.scielo.br/pdf/rn/v25n1/a08v25n1.pdf>
10. Tubelo RA, Branco VLC, Dahmer A, Samuel SMW, Collares FM. The influence of a learning object with virtual simulation for dentistry: a randomized controlled trial. *Int J Med Inform*[Internet]. 2016[cited 2016 Nov 30];85:68-75. Available from: <https://www.ncbi.nlm.nih.gov/m/pubmed/26601728/>
11. Fonseca LMM, Del'Angelo N, Reis MA, Dupas G, Beretta MIR, Scochi CGS. Impact of the use of a digital learning object in the teaching of clinical assessment of preterm infants: a comparative study. *Procedia Soc Behav Sci*[Internet]. 2012[cited 2016 Nov 30];46:1192-7. Available from: <https://doi.org/10.1016/j.sbspro.2012.05.273>

12. Pasquali L. Instrumentação psicológica: fundamentos e práticas. Porto Alegre: Artmed; 2010.
13. Fehring RJ. The Fehring model. In: Carrol-Johnson RM, Paquete M. Classification of nursing diagnoses: proceeding of the tenth conference. Philadelphia, EUA: Lippincott Company; 1994. p. 55-62.
14. Góes FSN, Fonseca LMM, Camargo RAA, Oliveira GF, Felipe HR. Educational technology "Anatomy and Vital Signs": evaluation study of content, appearance and usability. *Int J Med Inform*[Internet]. 2015[cited 2016 Nov 30];84(11):982-7. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/26228651>
15. Freitas LV, Teles LMR, Lima TM, Vieira NFC, Barbosa RCM, Pinheiro AKB, et al. Exame físico no pré-natal: construção e validação de hiperídia educativa para a Enfermagem. *Acta Paul Enferm*[Internet]. 2012[cited 2016 Nov 30];25(4):581-8. Available from: http://www.scielo.br/pdf/ape/v25n4/en_16.pdf
16. Teles LMR, Oliveira AS, Campos FC, Lima TM, Costa CC, Gomes LFS, et al. Development and validating an educational booklet for childbirth companions. *Rev Esc Enferm USP*[Internet]. 2014[cited 2016 Nov 30];48(6):977-84. Available from: <http://www.scielo.br/pdf/reeusp/v48n6/0080-6234-reeusp-48-06-0977.pdf>
17. Fonseca LMM, Aredes NDA, Leite AM, Santos CB, Lima RAG, Scochi CGS. Evaluation of an educational technology regarding clinical evaluation of preterm newborns. *Rev Latino-Am Enfermagem*[Internet]. 2013[cited 2016 Nov 30];21(1):1-8. Available from: <http://www.scielo.br/pdf/rlae/v21n1/v21n1a11.pdf>
18. Park Y, Yu JH, Jo IH. Clustering blended learning courses by online behavior data: a case study in a Korean higher education institute. *Internet Higher Educ*[Internet]. 2016[cited 2016 Nov 30];29:1-11. Available from: <http://dx.doi.org/10.1016/j.iheduc.2015.11.001>
19. Elledge R, McAleer S, Thakar M, Begum M, Singhota S, Grew N. Use of a virtual learning environment for training in maxilla facial emergencies: impact on the knowledge and attitudes of staff in accident and emergency departments. *Br J Oral Maxillofac Surg*[Internet]. 2016[cited 2016 Nov 30];54(2):166-9. Available from: <http://dx.doi.org/10.1016/j.bjoms.2015.12.002>
20. Yi-Shun W, Hsien-Ta L, Ci-Rong L, Chian W. A model for assessing blog-based learning systems success. *Online Inf Rev*[Internet]. 2014[cited 2016 Nov 30];38(7):969-90. Available from: <http://www.emeraldinsight.com/doi/full/10.1108/OIR-04-2014-0097>
21. Pablos-Pons JD, Colás-Bravo P, González-Ramírez T, Martínez-Vara del Rey CC. Teacher well-being and innovation with information and communication technologies; proposal for a structural model. *Qual Quant*[Internet]. 2013[cited 2016 Nov 30];47(5):2755-67. Available from: <https://doi.org/10.1007/s11135-012-9686-3>
22. Hohlfeld T, Ritzhaupt AD, Barron AE. Are gender differences in perceived and demonstrated technology literacy significant? it depends on the model. *Educ Technol Res Dev*[Internet]. 2013[cited 2016 Nov 30];61(4):639-63. Available from: <https://www.learntechlib.org/p/153792/>