

Development of educational hypermedia to teach an arterial blood pressure measurement procedure

ELABORAÇÃO DE UMA HIPERMÍDIA EDUCACIONAL PARA O ENSINO DO PROCEDIMENTO DE MEDIDA DA PRESSÃO ARTERIAL

ELABORACIÓN DE UNA HIPERMEDIA EDUCATIVA PARA LA ENSEÑANZA DEL PROCEDIMIENTO DE MEDICIÓN DE LA PRESIÓN ARTERIAL

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ABSTRACT

Arterial blood pressure measurement is an essential conduct to evaluate the condition of the cardiovascular system. Digital teaching environment is a powerful tool for the teaching-learning process, because it adds meaning and concreteness to the content to be learned, and it can be useful to instruct this procedure. The objective of this study was to create educational hypermedia for teaching arterial blood pressure measurement, and to describe the steps of that creation process. The pedagogical framework of Robert Gagné was used; and the construction followed the model proposed by Price. The final product presents videos, photos, animations and simulations that demonstrate and teach the procedure. Although hypermedia construction has been difficult to use, it can positively enhance the teaching of nursing procedures.

DESCRIPTORS

Blood pressure determination
Educational technology
Hypermedia
Education, distance

RESUMO

A medida da pressão arterial é um procedimento imprescindível na avaliação do sistema cardiovascular. O ambiente digital de aprendizagem tem-se constituído em uma poderosa ferramenta do processo de ensino aprendizagem, pois acrescenta significado e concretude aos conteúdos que precisam ser aprendidos, podendo ser útil para o ensino deste procedimento. O objetivo deste trabalho foi construir uma hipermissão educacional para o ensino da técnica de medida da pressão arterial e descrever as etapas do processo de construção. O referencial pedagógico adotado foi o de Robert Gagné; para a construção, segue-se o modelo proposto por Price. O produto final apresenta vídeos, fotos, animações e simulações demonstrando e ensinando a realização do procedimento. Embora a construção da hipermissão tenha sido complexa, sua utilização pode incrementar positivamente o ensino de procedimentos de enfermagem.

DESCRITORES

Determinação da pressão arterial
Tecnologia educacional
Hipermissão
Educação a distância

RESUMEN

La medición de la presión arterial es un procedimiento imprescindible en la evaluación del sistema cardiovascular. El ambiente digital de aprendizaje se ha constituido en una poderosa herramienta del proceso de enseñanza-aprendizaje, ya que incrementa el significado concreto de los contenidos que habrán de aprenderse, pudiendo resultar útil para la enseñanza de este procedimiento. El trabajo objetivó construir una hipermedia educativa para la enseñanza de la técnica de medición de la presión arterial, y describir las etapas del proceso de construcción. Se adoptó el referencial pedagógico de Robert Gagné; para la construcción se siguió el modelo propuesto por Price. El producto final se constituye de videos, fotos, animaciones, simulaciones, mostrando y enseñando la realización del procedimiento. A pesar de que la construcción haya resultado compleja, su utilización puede favorecer positivamente la enseñanza del proceso de enfermería.

DESCRIPTORES

Determinación de la presión sanguínea
Tecnología educacional
Hipermedia
Educación a distancia

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INTRODUCTION

Learning the blood pressure measurement technique has been a constant concern in the nursing context, as health professionals routinely perform this procedure in their daily practice, especially nursing professionals. It is a simple and non-invasive procedure, which any health team member can accomplish, provided that (s)he is well-trained. Respecting the steps of the technique is fundamental to avoid possible errors that can compromise the obtained levels, interfering in clinical assessment and causing patient damage, as they are prescribed inadequate treatments or deprived of necessary treatments.

Blood pressure measurement is the diagnostic method the Brazilian Arterial Hypertension Society⁽¹⁾ recommends to identify Arterial Hypertension and should be accomplished during all health assessments. Arterial hypertension is characterized by an increase in pressure levels which, in the long term, damages the cardiovascular system. The most common manifestations are cerebrovascular diseases, coronary diseases, kidney failure, peripheral vascular failure. Besides the high social costs, these entail a high financial cost for patients and the health system. In Brazil, in 2003, 27.4% of deaths were due to cardiovascular diseases, reaching 37% when excluding deaths by badly defined diseases and violence. These data are confirmed in the 2001 Brazilian Health Statistics Yearbook, in which diseases of the circulatory apparatus represent the main cause of deaths in the country (32%) and in all regions, followed by external causes (15%), tumors (15%) and diseases of the respiratory apparatus (11%)⁽¹⁻²⁾.

It is also verified that, for different reasons, blood pressure often is not measured correctly. A review of concepts that give meaning to the accomplishment of the technique, systematically addressing the steps of the procedure, can constitute an important strategy to revert this situation, help graduated health professionals and contribute to the education of new professionals, particularly future nurses.

Teaching undergraduate nursing students and keeping them up-to-date has been a great challenge for the academy, for which the digital learning environment has represented an important support tool. Digital learning environments are computer systems available on the Internet to support activities, mediated by information and communication technologies.

The learning environment is a virtual technological environment that permits the development of the teaching-learning process, where information can be presented in different forms, such as portals, databases, virtual libraries, distance courses, museums or others. The virtual en-

vironment permits and explores interaction and exchange among participants and, when mediated by didactical strategies, can represent a learning facilitator. The integration of different media, languages and resources creates perspectives for the development of a pleasant, effective and interactive educational process.

It should be highlighted that the digital learning environment should contain specific educational activities that are structurally different from in-class situations, and therefore require models adapted to that reality. Simply transposing the model used in-class to the digital environment would mean underusing it, discarding its best characteristics.

To achieve an effective teaching-learning process in this context, learning should be made significant to students, using the resources available in the digital environment. It is important for available materials to be prepared and set in the context of the environment they are inserted in. Selecting the pedagogical media is extremely important in a virtual learning environment, but it should be taken into account that the most relevant is the quality of the message, and not the means used to send it⁽³⁾.

Teaching undergraduate nursing students and keeping them up-to-date has been a great challenge for the academy, for which the digital learning environment has represented an important support tool.

For health professionals and students, using software and the digital learning environment as a tool to support teaching has offered positive contributions. This strategy can facilitate the acquisition and understanding of technical and scientific information, available almost in real-time, improving and even modifying practice, in function of a continuous improvement and recycling process, which can even lead to a direct change in the *care mode*⁽⁴⁾. Thus, increasing interest is perceived in the use of these resources for teaching health professionals, as literature appoints⁽⁵⁻¹⁰⁾.

A comparative study on nursing students' academic performance when using a tutorial software on "Basic human needs" compared 30 nursing students' performance, divided in two groups, in which one received education using the traditional teaching method and the other the same information through the computerized method. The results demonstrated that the mean general performance increased from 38.75% to 55%. In group 1, performance was concentrated around 37.50% while, in group 2, it corresponded to 57.50%, demonstrating that the computerized method enhanced individualized learning, respecting students' individual rhythm and characteristics⁽¹¹⁾.

When considering the difficulties health professionals face to perform blood pressure measurement through the indirect method, using auscultation, and the good results achieved through the use of educational tools planned and structured for the digital learning environment, an educational hypermedia was created on blood pressure measurement. Thus, this manuscript aims to provide an objective,

systematic and comprehensive description of the planning, construction and assessment of the created material.

THE HYPERMEDIA CONSTRUCTION

Next, the construction and assessment process of an educational hypermedia will be presented, for use in a digital learning environment, with a view to teaching the blood pressure measurement procedure through the indirect method, using the auscultation technique.

Robert Gagné's⁽¹³⁾ pedagogical framework was adopted to guide the content elaboration, which describes the conditions that enhance the learning of a specific skill. The three-phase model proposed by Price⁽¹⁴⁾ was followed to construct the hypermedia. The final product included four topics, grouping 08 modules, presenting all questions involved in the accomplishment of the blood pressure measurement procedures, discussing physiological aspects, methods and the measurement technique. The created hypermedia used audio and video resources, two-dimensional animations, pictures, illustrations and simulations.

The construction of the hypermedia was divided in three phases. The first, characterized by initial planning, involved the assessment of learning needs on the topic, when the instruction method used is defined. Therefore, targets need to be set, the population and necessary tasks for learning on the theme need to be analyzed and the targets the educational material should achieve need to be specified. The second phase, instructional planning, establishes the cognitive strategies, which are fine-tuned in each phase of the process. Finally, the assessment of the constructed material terminates the construction process of the hypermedia.

Gagné's pedagogical framework describes five learning phases and nine external events that can influence learning. In the *Blood pressure measurement* hypermedia, these nine learning events are addressed through videos, animations, pictures and sounds, functioning as cognitive operators⁽¹⁵⁾. The function of using illustrations and animations in the hypermedia is to serve as *Cognitive Operators*, aimed at attracting attention, creating clues to recall and facilitate learning, as observed in Figure 1.



Figure 1 - Screens from the educational hypermedia *Blood Pressure Measurement*

To stimulate motivation, the *Blood pressure measurement* hypermedia presents a simple and standardized basic structure. Titles are highlighted in a larger font and different colors for each title. Images are frequently used and selected due to their relevance for the theme. Aims are informed for each new module and short reminders on previously addressed topics are used as an important resource to stimulate recall. In each hypermedia module, specific aims were set, as observed in Table 1.

In the hypermedia on blood pressure measurement, images and pictures were constantly used in a context, serving as tools to guide learning. In the *blood pressure measurement technique* module (Figure 2), pictures and animations reflect the real situation of the blood pressure measurement procedure, making students experience the measurement process step by step, highlighting details and important care during its accomplishment.

Table 1 - List of aims of *Blood Pressure Measurement* educational hypermedia topics

Topic/Module	Aims
1 – Blood Pressure	Conceptualize blood pressure. List and describe blood pressure control mechanisms. Describe the arterial hypertension concept. List and describe arterial hypertension complications.
2 – BP measurement methods	Describe the historical trajectory of the blood pressure measurement technique, relating it with the current technique. Acknowledge and distinguish among different blood pressure measurement methods. Know when and what method to choose for specific situations.
3 – BP measurement technique	Describe and perform the blood pressure measurement procedure through auscultation. Identify the different phases of the Korotkoff sounds. Choose and assess the equipment needed to perform the procedure. Identify special situations and face them to perform the measurement procedure. Identify and avoid procedure accomplishment errors.
4 – Exercises	Perform a multiple-choice test with a ratio of 90% or more of correct answers. Perform simulation exercises with a ratio of 90% of correct answers, that is, two simulation exercises with 90% of correct answers, that is, two errors of up to 4mmHg for 20 readings (10 systolic and 10 diastolic pressure).

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animations reflect the real situation of the blood pressure measurement procedure, making students experience the measurement process step by step, highlighting details and important care during its accomplishment.

**Figure 2** - Screens from the educational hypermedia *Blood Pressure Measurement Technique*

Also, exercises and questionnaires were used as a mechanism to intensify content recall, besides the freedom to move across different items in the hypermedia. Learning is transferred when students are invited to deepen their knowledge by reading papers and contents on the theme, available at the end of each module. Another form of transferring learning happens when students accomplish simulation exercises, such as the auscultation of sounds that determine systolic and diastolic pressure levels, included in the hypermedia. The learning environment selected to offer the hypermedia included tools that provide immediate feedback on posted exercises, responding to the most recent event in the learning process.

DISCUSSION

The digital environment makes room to integrate different learning theories, putting them side by side, com-

plementing and making the best of each, enhancing the teaching-learning process. Various theoreticians are cited and used as references for the development of educational tools for the virtual environment, but none of them encloses the possibilities the environment opens up for the teaching-learning process.

The digital learning environment, with its countless usage possibilities and increasing number of people with computer and Internet access, is turning into a privileged space for learning, information and knowledge exchange to happen. Like most students, nursing students are highly familiar with the Internet and its tools and frequently use them⁽¹⁶⁾. Hence, the Internet and the digital learning environment constitute a powerful tool to support the teaching learning process. Their increasing use in health teaching is assessed as an important facilitator, as it adds meaning and concreteness to the contents that need to be learned, are abstract and cannot be demonstrated in

practice. Teaching students blood pressure measurement, a procedure that demands theoretical knowledge and motor skills, is an example of this difficulty. Although relatively simple from a practical viewpoint, it involves complex concepts that are difficult to explain and understand.

The learning process, defined in very well designed phases and instruction events that help in each of these phases, should guide activity planning and the choice of tools the student will interact with to achieve the intended aim. Gagné's instructional theory attempts to describe the conditions that enhance learning of a specific skill and constitutes not only a theory of learning itself (the explanation of how people learn), as it puts forward students as the focus of the process, as they are the main responsible for their learning process.

This information set interestingly adapts to the *technology-mediated education* context. Digital learning environments, with different activities, can be structured to trigger learning events, which can occur without the constant presence of a teacher, which stimulates searching, analysis and reflection, besides trigger a critical and reflexive process in students.

The use of information technology, as a tool to support the teaching-learning process in nursing, is recent, but different initiatives have contributed to change this picture, as the benefits and possibilities it offers are already perceived in the academic context.

The use of animations, illustrations and audio have turned the hard task of creating hypermedia into something pleasant and seemingly effective, according to the students' assessments and comments. Nevertheless, developing animations and illustrations that can remove from the imaginary and give form and color to abstract situations demanded time and research, besides great knowledge on the animation tool that was used. Thus, its full potential could be explored, creating animations that would truly affect the learning of concepts related to the blood pressure measurement technique. Also, the careful production of animations and illustrations seems to have offered positive results, according to assessments by an expert committee. Undergraduate students who assessed the material affirmed that the environment is motivating and pleasant and that animations facilitate the understanding of phenomena they used to find confusing. This ability to present information in a richer and more detailed way, besides its flexible use, makes hypermedia into an important tool in the teaching-learning process⁽¹⁷⁾.

The creator needed to make pictures series, always in a contextualized environment, then select and edit the images, make the video, design the pages. She needed to master these skills and also have profound knowledge on the entire theoretical contents addressed. The time spent

to construct the hypermedia was long, approximately 14 months of work. This fact arouses the following question: would faculty, with their considerable hour loads, be able and willing to follow this same route? To what extent would this be productive?

Studies have researched on the competencies needed for teachers to act as learning object designers and developers, using high-level authorship tools like Flash for example. They concluded that, with the necessary training, teachers are able to develop their educative materials, but the time spent was long for teachers who are less experienced in computer use⁽¹⁸⁾.

In combination with the context in which the hypermedia was created, the theme it addressed is highlighted. The choice of the "Blood pressure measurement" theme was justified by the kind of assessment it permits. It should be accomplished in any health assessment, as it is the minimum one expects to be done in the context of a person's cardiovascular assessment. In addition to this scenario, there is the fact that the blood pressure measurement procedure through the indirect method and auscultation technique is not always done correctly⁽¹⁹⁾, once again justifying that all health professionals should go through periodical recycling, which can be achieved through digital means.

CONCLUSION

The initial goal of this research was achieved, which was the construction of a hypermedia for teaching blood pressure measurement through the indirect method, applying the auscultation technique. Although the strategy is promising, results suggest the need to create multiprofessional teams, with digital designers, web designers, programmers and pedagogues who support teachers in the construction of this material.

The researchers expect that the constructed tool will be made available, disseminated and used by health students and professionals concerned with the performance and technical skills, and that it can significantly contribute to the dissemination of the correct blood pressure measurement technique. Thus, it can contribute to the improvement of care delivery to the population.

It is also highlighted that this paper can help anyone interested in the construction of similar teaching strategies, in function of the description of the hypermedia construction process, serving as a guide for other researchers and faculty who want to follow this route. The research is not finished yet, as the impact on the learning of the technique needs to be assessed. In other words, now the efficacy of the tool needs to be tested by putting it in practice.

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