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Construction process of a Virtual Learning Environment in Adult Cardiopulmonary Resuscitation

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***Abstract*—** *There are still considerable variability in survival rates regarding Cardiopulmonary Arrest (CA) that cannot be attributed exclusively to the patient characteristics. The lack of knowledge about the theme by professionals and academics is a graduation consequence. This way, graduating professionals able to operate front CA situations is believed to be a primordial attitude to increase patients' survival chances. To do so, there are digital strategies that can be used, one of them is the Virtual Learning Environment. Thus, this paper's objective is to develop a virtual interactive educational proposal about cardiopulmonary resuscitation care on adults. This is an applied research, which led to the development of a technological product – the elaboration of an educational proposal applied to Virtual Learning Environment. Then, it took place the cyclic phases of conception and planning, development and implementation, according to procedures and evidence reported on previous studies. The Virtual Learning Environment was called "Training in Basic Life Support (BLS)", and has seven modules: "Historical Aspects", "Basic Life Support", "Epidemiology", "Concepts", "Anatomy and Physiology", "Algorithms", "Simulation and Questions". The illustrations, formatting and layout were built by integrating both language programming technologies: PHP and JavaScript. The results of the evaluation, made by the academics, about the VLE usage pointed that opportunities to self-learning were created and the available resources in the environment were useful to support learning. It's necessary to comprehend and incorporate the Virtual Learning Environment as an efficient educational tool, and get aware of this knowledge as a strategy to add up new experiences and values to teachers' practice.*

I. INTRODUCTION

Despite significant advances in care for victims of cardiorespiratory arrest (CA), there is still considerable variability in survival rates that cannot be attributed exclusively to the patient characteristics. In order to increase the chances of survival of CA victims, allowing these individuals to receive high quality care, training in Cardiopulmonary Resuscitation (CPR) must use educational principles supported by researches that turn scientific knowledge into practice[1].

It is reported that professionals and academics from the health area do not possess satisfactory scientific knowledge, either theoretical or practical, regarding CA/CPR. This lack of knowledge, partially, is a

consequence of the graduation, in which the approaches of that theme, when occurred, are just a few and superficial, so, insufficient to provide the solid knowledge acquirement to the action in front of a CA victim[2]. This way, thinking about the graduation of professionals able to operate front CA situations is believed to be a primordial attitude to improve the quality of assistance, increasing patients' survival chances[2,3].

For that, there are Digital Information and Communication Technologies (DICT) strategies that turn possible innovations on the educational process, articulation between theory, practice and research. These technologies can be applied from the starting teaching of the student until one's insertion at the profession, as well as at the continuous professional development, determining a new pedagogical practice[4].

Some studies have shown that technological resources applications, such as Moodle, apps, social networks, forums and Virtual Learning Environments (VLE), provide the acquirement of information and cognitive skills to carry out Nursing procedures, increasing safety and self-confidence about the acting.

Considering the exposed, it was intended to develop an educational proposal about CA assistance in adults, applied at a VLE, which will become available to public and private Higher Education Institutions and to the whole society. This theme was chosen considering the scarcity of didactical material about the subject on this perspective, and the necessity of nurses to be trained, through specific knowledge, safety, abilities and skills, to act in emergency situations that offer life risk. It's believed that, through VLE, it's possible to add meaning to undergraduate nurses' daily practice, stimulate autonomy, such as promote professional actualization.

Due to the existence of numerous possibilities and potentialities of different technological resources, planning and analysis of new ways to teach and learn are important, from the establishment of clear educational goals and the abilities and competence on cognitive, psychomotor and attitudinal spheres, suiting the use of computer to objectives proposed to teaching. Therefore, the objective of this study was to develop an interactive virtual educational proposal about cardiopulmonary resuscitation in adults.

II. METHOD

Applied research, which led to the development of a technological product, regarding the elaboration of an educational proposal applied to Virtual Learning Environment. To reach it, it took place the cyclic and interactive phases of conception and planning, development and implementation, suggested by various researches[5,6,7].

This paper is part of the dissertation "Teaching of Basic Life Support to Students of Nursing Graduation Course", linked to the Post-Graduation Program Stricto Sensu, Professional Master Degree in Health on Amazon Teaching, from the University of Para State (UEPA). The project was submitted to the Research Ethics Committee from the Nursing Graduation Course of UEPA, Certificate of Presentation to Ethics Appreciation: 62000616.2.0000.5170, with approval number 1.897.505, on 01/25/2017.

III. RESULTS

Conception and planning

Construction of the educational technology: website/VLE – The elaboration of educational technologies, by own comprehension, demands scientific evidences; definition of the educational technology objective, goals, selection of the target-public to whom the technology's destined, type of material (guideline, folder, flyer, manual, app, blog, website etc.), themes, illustrations and language; demands action planning(8). From this, it was built a Virtual Learning Environment named "Training in Basic Life Support (BLS)", highlighting the track among texts and pictures and the outcome (final version). It is found hosted on the link: https://profmaiconnogueira.wixsite.com/capacitacaosbv

Concerning the scientific evidences to the VLE construction, the search arose from the studies of Bellan (2006)[11] and Gonçalves et. al (2010)[4], as the state of art about Teaching of Basic Life Support in Nursing Graduation, allowing the target-public to be decided. To define the type of technology, a search and reading of scientific articles related to the theme was made, listing some papers that were close to the studied subject[5,6,7,9,10]. This result was crucial to define the type of tech technology and its production.

Development

Track among texts – the scenario provided by the DICT, through the transformation of various communication ways into digital information, offers the pedagogic option by the virtual environment, optimizing, that way, the relation between Nursing professors and their students, in the means that this new setting turns possible a reflection about educational practices[5].

By this sight, the investigation of content to be inserted in the technology started with the diagram construction of themes chosen by the author to VLE

elaboration, what is meaningful to be presented (Figure 01).

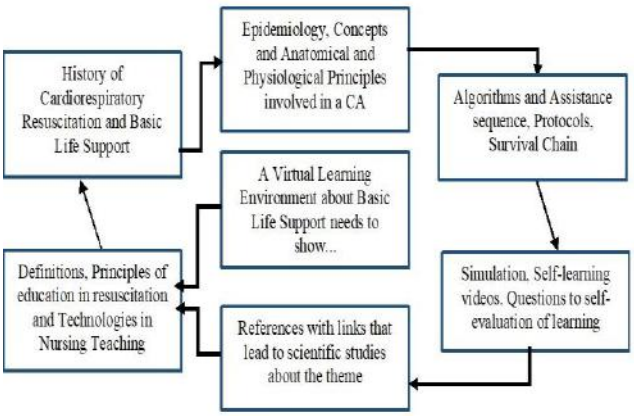

Fig.1: Diagram – themes on author's experience to the VLE elaboration

Source: Personal Collection, Belem, Para, 2021.

Such reasoning, based on professional experience and sustained by current scientific literature, subsidized the construction of "VLE – Training in Basic Life Support (BLS)", according to the recommendations of the International Liaison Committee On Resuscitation (ILCOR) and the scientific consensus of American Heart Association (AHA, 2020). The contents approached in the educational technology were selected by relevance to guide BLS Teaching, in accordance to the educational principles of Resuscitation Science Consensus proposed by AHA (2020)[1].

Track among images – VLE's illustration is a thought-provoking stage, considering that the interpretations are diverse. The track about the images occurred from the main themes definition, getting started by the cover pictures (Homepage/ Figure 02).

Fig.2: Representative figure of Teaching Environment in BLS Image selected to represent the Teaching Environment of CA maneuvers – cover (Homepage).

Source:
https://profmaiconnogueira.wixsite.com/capacitacaosbv

Fig.3: Algorithm of assistance on BLS, responsiveness evaluation.

Source: Personal Collection, Belem, Para, 2021.

Fig.4: Algorithm of assistance on BLS, pulse verification and chest compressions

Source: Personal Collection, Belem, Para, 2021.

Fig.5: Algorithm of assistance on BLS, breathing evaluation and permeabilization of airways

Source: Personal Collection, Belem, Para, 2021.

Fig.6: Algorithm of assistance on BLS, ventilation technique e use of the Automated External Defibrillator (AED).

Source: Personal Collection, Belem, Para, 2021.

Fig.7: Algorithm of assistance on BLS, position of recovery.

Source: I Guideline of Cardiopulmonary Resuscitation and Emergency Cardiovascular Cares from Brazilian Cardiology Society[12].

Within the VLE, some images were inserted, which represent teaching/training environment, algorithms, survival chain, chest compression techniques, permeabilization of airways, ventilation, use of AED, airways devices and safety position.

Implementation

The educational technology/VLE – final version – The educational technology has seven modules: "Historical Aspects", "Basic Life Support", "Epidemiology", "Concepts", "Anatomy and Physiology", "Algorithms", "Simulation and Questions" – in what the student will be able to obtain individualized learning, being possible to access each module in independent manner, forwarding and going back whenever needed.

The images of VLE are photographs taken by the authors themselves, at the Nursing School Magalhães Barata, University of Para State, during classes of the curricular component "Nursing at Urgency and Emergency" and courses ministered about BLS, after authorization of image usage from the involved people. Other images were chosen from the internet (sources identified under each illustration).

The illustrations, formatting and layout were the result of an effort from a computer engineer, who did the website construction. The VLE was developed by integrating technologies as web programming languages PHP: Hypertext Preprocessor (PHP)[13] and JavaScript[14].

IV. DISCUSSION

In Brazil, Nursing has used VLE in its courses, as it is shown by the literature review in thematic areas of medicine administration, wounds treatments, Basic and Advanced Life Support and material sterilization. At the international scenario, VLE is used by this profession too and, recently, Blackboard.5 supported Nursing students learning in a module of Human Anatomy and Physiology[9]. From that, it was decided to create a free easy to use VLE, which would satisfy the needs of Nursing undergraduates.

The results of the evaluation made by the academics about this intervention pointed that opportunities to self-learning were created and the available resources in the environment were useful to support learning, ensuring bigger knowledge and ability to the students. These results are similar to other health areas, which have used VLE and its resources too – to reduce the number of formal classes' hours, increase students' enthusiasm by the use of multimedia materials and provide interactive learning[9].

To assure the quality of educational technological information put in this VLE, the recommendations evidenced in the literature were followed, in which is highlighted the need to make researches in formal reliable sources, such as: books, technic articles and interviews with professionals of the area, besides photographical registers, recordings and direct observations of the reality wanted to intervene[8].

Moreover, PHP is one of the most used languages on the Web. The main difference, compared to other languages, is the capacity that it has to interact with the Web world, transforming totally the websites that have static pages. Another important PHP characteristic is that, besides being free, is an open source code software[15]. Also it is a server-side scripting language, which can be embedded in HyperText Markup Language (HTML) or used as standalone binary (although the former use is much more common)[16].

Otherwise, the programming language JavaScript (JS) is part of the triad of technologies that all web

developers must know: HTML to specify the content, Cascading Style Sheets (CSS) to specify the presentation, and JS to specify the behavior of web pages. All three languages working together to make the implementation more interactive and responsive. Also, the overwhelming majority of modern websites use JavaScript, and all modern web browsers (on desktops, game consoles, tablets and smartphones) include JS interpreters, making it the most ubiquitous programming language in history[17]. These eases were fundamental to the VLE creation and application success, demonstrating, this way, the importance of seeking new non-formal learning methods.

Other interesting functionality to mention here is a responsive web design [18], built with HTML and CSS allows a website to "just work" across multiple devices and screens. It enables the layout and capabilities of a website to respond to their environment (screen size, input type, and device / browser capabilities). The VLE supports this modern solution that has been used since 2012 over the internet[17].

In this context, to improve the product quality, it's suggested the hiring of professionals from: informatics, data processing, publicity and advertising areas. These are recommended to layouts' adequacy, diagram creation and publishing. The knowledge about specific softwares will contribute to improve the final quality and give a professional aspect to the intellectual production[8].

Thus, we observed that in the technological development scope, the good quality material, correct usage of tools and students' interest reveal the efficacy. It's believed that this initiative has the potential to bring even more satisfactory new results to Nursing undergraduates, also to contribute to the scientific community in development of new studies of comparison between the conventional and non-conventional methods of learning about Basic Life Support.

V. CONCLUSION

Making part of the construction of a Virtual Learning Environment, organizing, planning and proposing activities, opens up new possibilities of professional growth. Otherwise, it presents challenges to the development of thought and written abilities expressions, and to the insertion of new technologies at Nursing teaching, inciting new experiences search to such teaching modality.

In reference to teaching and researching, it arises from this study as a valid educational technology, based on the international consensus of Science of Resuscitation from AHA 2020, innovative and ready to be used. The expectation, at this scope, is that the VLE – "Training in Basic Life Support (BLS)", awakes higher education managers, professors and students to a more rigorous look regarding the importance of BLS inclusion in the curricular components within Nursing Graduation Courses – in a more consistent way, caring about the current epidemiologic reality, in an innovative methodological perspective.

It's considered that, in the present educational context, there is a demand of opinion builder professionals. This way, needs of new practices of teaching-learning are emerged, by the use of didactic and technological resources, stimulating and favoring betterment and training of nurses, yet making possible the autonomous learning.

At this perspective, it's evidenced the necessity of comprehending and incorporating a virtual learning environment as an efficient educational device, and to get aware of this knowledge as a strategy to add up new experiences and values to professor's practice. The present paper is believed to be able to contribute with the innovation of nursing teaching, from the virtual educational proposal about a matter of great academic, scientific and social relevance.

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