

ASSESSMENT OF THE DIGITAL EDUCATIONAL TECHNOLOGY “VITAL SIGNS AND ANATOMY” BY STUDENTS OF VOCATIONAL NURSING EDUCATION

AVALIAÇÃO DE TECNOLOGIA DIGITAL EDUCACIONAL “SINAIS VITAIS E ANATOMIA” POR ESTUDANTES DA EDUCAÇÃO PROFISSIONALIZANTE EM ENFERMAGEM

EVALUACIÓN DE LA TECNOLOGÍA DIGITAL EDUCATIVA “SEÑALES VITALES Y ANATOMÍA” POR ESTUDIANTES DE GRADO EN ENFERMERÍA

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ABSTRACT

This is a methodological study on the evaluation of the digital educational technology, “Vital Signs and Anatomy”, by students of vocational nursing education as regards the quality of the content, interface, and usability of the system. Twenty-one students enrolled in vocational nursing education, who had already completed 50% of the course, participated in this study. All items were regarded as suitable for more than 90% of the evaluators. Students expressed some suggestions, which were considered for the improvement of this technology. It can be concluded that the developed product is suitable to be made available for use in nursing education, inserted in the pedagogical framework of problematization and meaningful learning stemming from the evaluation of the technology’s main users, the nursing student.

Keywords: Nursing; Educational Technology; Professional Education; Vital Signs.

RESUMO

Estudo metodológico, o qual seguiu os preceitos éticos acerca da tecnologia digital educacional “sinais vitais e anatomia”. A tecnologia foi avaliada por estudantes da educação profissionalizante em Enfermagem quanto à qualidade do conteúdo, interface e usabilidade do sistema. Participaram do estudo 21 estudantes da educação profissionalizante em Enfermagem que já tinham completado 50% do curso. Todos os itens foram considerados adequados por mais de 90% dos avaliadores. Os estudantes expressaram algumas sugestões, as quais foram consideradas para a melhoria da tecnologia. Considera-se que o produto desenvolvido está adequado para ser disponibilizado no ensino de Enfermagem inserido no referencial pedagógico da problematização e da aprendizagem significativa, a partir das avaliações dos principais usuários, os estudantes de Enfermagem.

Palavras-chave: Enfermagem; Tecnologia Educacional; Educação Profissionalizante; Sinais Vitais.

RESUMEN

Estudio metodológico que siguió los preceptos éticos sobre la tecnología digital educativa “Señales vitales y Anatomía”. Los estudiantes de grado en enfermería con el 50% del curso completo evaluaron la calidad del contenido, la interfaz y la usabilidad del sistema. Todos los puntos fueron considerados adecuados por más del 90% de los alumnos; hubo también sugerencias para mejorar la tecnología. Según la evaluación de los principales usuarios (los estudiantes de enfermería) el producto desarrollado es apropiado para la enseñanza de enfermería en el referente pedagógico de la problematización y del aprendizaje significativo.

Palabras clave: Enfermería; Tecnología Educacional; Educación Profesional; Signos Vitales.

INTRODUCTION

Mid-level vocational education is an entrance door for many individuals in the work market, and must meet both the needs of the student and the stipulations established by the regulatory agencies of the Brazilian educational system. Therefore, the higher education institution must be aligned with the principles set forth within the Brazilian Vocational Education Guidelines and Framework Law (LDB) and the National Curriculum Guidelines for the Vocational Education of Technicians, which include the education of professionals who meet the competencies of the area in question.

In Nursing, in addition to the premises cited above, one must also take into consideration the Unified Health System (SUS), the social determinants of health, the characteristics of the communities that will receive healthcare, and the public healthcare policies in the prevention and promotion of health for both the individual and the community.

This study identified some 1,856,683 registered nurses in Brazil, of which the nurse's aides and technicians represented nearly 80% of the workforce in the field of healthcare.¹

However, the logic of education to meet the demands of the job market, many times seen through a hospital-centered and healing lens, is overshadowed by the idea of a nursing education that runs in harmony SUS. In this sense, healthcare education remains distant from the organization of sectorial management and from the critical debate surrounding systems of care framework.² Most likely, many educational institutions still educate nurse's aides and technicians through fragmented education, that is, they continue to use traditional teaching methods, centered around lecture classes, without considering the student's prior knowledge, which can entail a greater probability of mechanical or insignificant learning.³

In light of this scenario, whose teaching-learning process is quite insignificant, what arises is the opportunity to break from this teaching method by means of the computer, which, in a teaching environment, can facilitate the achievement of another main purpose described in the LDB, article 35, item IV: "the comprehension of the scientific-technological fundamentals of the productive process, relating theory with practice, in the teaching of each discipline." Also added to this is the fact that, in the present-day society, the potential use of digital technologies for training and education, especially those supported by the internet, are unquestionable. Technology has been ever-increasingly incorporated within nursing and healthcare education. Today's generation is recognized as being digital natives, who will be the end users of innumerable technological resources and who prefer to work in groups as regards collaboration for the resolution of problems.⁴

The learning measured by the computer can help students construct their own knowledge, transforming them in

a dynamic and creative manner. Nonetheless, it is the teacher's role to help students use the computer to receive information and transform it into critical thought aimed at learning in nursing. Thus, the outlook is of the collective construction of knowledge, making the constructed product produce significance³ for the target public and, to a certain extent, ensure the autonomy of the teaching-learning process for both the student and the teacher.⁵ It is important to note that the use of educational technology does not substitute the teacher's role; however, it does aid this role, given that, depending on the manner in which it is used, technology can be considered a strategy of teaching that is complementary to the learning process, rendering it more attractive and creative, thus facilitating the student's own learning autonomy.

Considering the contribution to overcome the limitations of the teaching practices in mid-level vocational education in Nursing and considering the importance of technological educational resources, the educational technology entitled "Vital Signs and Anatomy" was born, which presents a clinical case, joining the content of anatomy with the verification of vital signs in an interactive manner (sinaisvitaenf.com.br). It is also important to note that the theme for the construction of technology stemmed from the need for learning expressed by vocational education students and teachers.⁶

For the technology to achieve its purpose, i.e., end user learning, it is of utmost importance to assess the educational technology, "Vital Signs and Anatomy," through the eyes of the vocational education students in Nursing.

The assessment of a software is aimed at analyzing the quality of its products or components that allow one to minimize the difficulties encountered throughout the project and contribute to the end goal of achieving high indices of end user satisfaction.⁷

Therefore, the present study aims to assess the digital education technology, "Vital Signs and Anatomy", through the eyes of vocational education in Nursing, as regards the content, interface, and usability of the system.

METHODOLOGY

This work is a methodological study on the assessment of the "Vital Signs and Anatomy" technology, which was approved by the Ethics Committee in Research involving Human Beings, logged under CONEP report number 1440/2011.

One methodological study differs from other study designs, as it does not include all of the stages of the research process, given that the methodological researcher is interested in identifying an intangible construct and make it tangible. Basically, this type of study encompasses, among other stages, the test of a tool's reliability and validity.⁸ This investigation sought to identify operational and technical questions that can make

it difficult or even inhibit the use of the system. This stage of the development of educational technology is necessary, as operational errors can discourage the use of teaching technologies and, consequently, learning.

This study opted to invite students who had already completed 50% of the course, in such a way that the "Vital Signs and Anatomy" technology would be used considering the students' prior knowledge. The students were invited personally within the classroom and received written guidelines on how to access the "Vital Signs and Anatomy" digital technology via E-mail or Facebook®. The students were advised to first navigate in the technology and then fill out the assessment forms, which were made available online in Google Docs®. Thus, 45 students from the vocational education in Nursing were invited, of which 21 (46.6%) agreed to participate. The reasons for refusing to participate were not identified, since the students were invited to fill out the assessment form in the virtual environment itself, in other words, only those who wished to participate in the study actually navigated in the "Vital Signs and Anatomy" technology.

To assess the educational technology, three instruments were used, considering the general impression, the content, and the usability.⁹⁻¹¹ The instrument related to the overall impression consisted of five affirmations about the presentation of the content and the animations in learning the theme, indication of the use of this technology as an educational tool, limitations of the technology, and if the user would recommend the use of this technology in nursing education. As regards the content, 10 affirmative statements were drawn up about clear and concise information, the logical presentation of the content, the simulation of reality, the reading level of the texts, satisfactory interactions in the technology, a captivating presentation, correct grammatical usage, stimulus for learning, learning based on the user's prior experience, and the enabling of the students' retention of the content in their memories.

As regards usability, the principles of interface ergonomics, which is defined as man's scientific knowledge and its application in the construction of tools that facilitate one's overall performance or the conditions that directly affect a work scenario in its technical, economic, or social aspects. The criteria used in this study included readiness, legibility, grouping per location, consistency, user control, immediate feedback, error correction, and error messages. Readiness deals with the mechanisms that allow the user to become familiar with the alternatives in the context in which they can be found; legibility refers to the lexical characteristics of the information presented on the screen that can hinder or facilitate the reading of this information, such as the brightness of the characters or the spacing of paragraphs; grouping refers to the visual organization and location of the items of

information; consistency refers to the standardization of the codes, denominations, formats, and procedures in the conception of the interface, which should be maintained identical in identical scenarios; user control allows one to evaluate if the user is able to interrupt, cancel, suspend, and continue an action; immediate feedback refers to the answers provided by the system to the user's actions, including from the simple pressing of a key to a list of commands; error correction allows the users to correct their own errors; and, finally, the error message refers to the clarity of the messages as regards the nature of the error committed and the actions that should be taken to correct it.¹³

These instruments contained affirmative statements about the technology, and the user was asked to check one of the options from a Likert-like scale: "strongly disagree", "disagree", "I don't know", "agree", and "strongly agree".

To analyze the data, descriptive statistics, along with the description of frequencies, were used. The technology was considered validated if each item of appearance and content obtained in more than 70% of the agreements ("agree" or "strongly agree") from the reports.^{9,13,14} To verify the agreements among the evaluators, the total number of agreements ("agree" and "strongly agree") were processed and divided by the sum of the total possible number of agreements ("agree" and "strongly agree") and disagreements ("disagree" and "strongly disagree").

RESULTS

Among the participants, 18 (85.7%) were female, with an average age of 28 years; 17 students (81%) were working, 04 of them (19%) in the healthcare field. All reported having computer knowledge, with frequent internet access, the use of social networks, and the use of internet to search for subjects related to nursing; 04 students (19%) did not have computers with internet access at home.

As regards the overall impression of the interface (Table 1), all of the users agreed with all of the items. About the content (Table 2), 91.5% of the students reported that they agreed with the "Vital Signs and Anatomy" educational technology.

As regards usability, the following criteria were assessed: readiness, legibility, grouping by location, consistency, user control, immediate feedback, error corrections, and error messages. All of the criteria received an agreement ("agree" and "strongly agree") of 100% among the students, except for error messages (95%), legibility (95%), and immediate feedback (90%).

Only one suggestion to improve the sound volume regarding pulmonary auscultation and another to use more neutral tones in the opening screen of the "Vital Signs and Anatomy" technology were registered.

Table 1 - Assessment of the overall impression of educational technology by students of vocational education in Nursing, Ribeirão Preto, SP – Brazil, 2013

Base	Strongly disagree	Disagree	Agree	Strongly agree	I don't know
1. The presentation of the technology's content helps to learn the subject.			57%	43%	
2. The animations help to learn the subject.			52%	48%	
3. The technology is suitable for use as an educational tool.			57%	43%	
4. The limitations of the technology do not exceed its use in Nursing education.			57%	43%	
5. I recommend the technology for use in Nursing education.			43%	57%	

Table 2 - Assessment of the content of the educational technology by students of vocational education in Nursing, Ribeirão Preto, SP – Brazil, 2013

Base	Strongly Disagree	Disagree	Agree	Strongly agree	I don't know
1. The information is clear and concise.		5%	71%	24%	
2. The content presents a logical organization.		5%	57%	38%	
3. The system simulates reality well.			48%	52%	
4. Easy to read texts.			48%	52%	
5.10. Interaction during the simulations of clinical cases is satisfactory.		9,5%	40,5%	50%	
6.11. Presentation of the content captivates the user's attention.			67%	33%	
7. Correct gramatical usage.			52%	43%	5%
8. The technology stimulates learning.			62%	38%	
9. The technology allows for learning based on the user's prior experience.			43%	47%	10%
10. The technology facilitates the retention of the content in the student's memory.			48%	52%	

DISCUSSION

The technological transformations that have occurred in society have sparked changes in the daily lives of the population, created new habits, facilitated life, shortened distances, and accelerated the rhythm of knowledge.¹² Hence, society has become ever-increasingly dependent on technology in various social sectors, among which is Nursing education.

The incorporation of technologies has become an increasingly common practice in the world of education, bringing with it the possibility of making education more creative and flexible, and allowing even greater interaction among students, teachers, and the community.^{9,13,14}

The use of educational technology has been driven by certain advantages, such as the facility of understanding a studied content,¹⁵ respecting the student's learning time,¹⁶ allowing the student to practice as many times as necessary, and providing the possibility of feedback.^{15,16}

In Nursing education, technological support can lead the student to a significant learning, since computer interactions facilitate reflection and critical thinking. Added to this is

the fact that the computer can stimulate the construction of knowledge, conversation, articulation, collaboration, and reflection, which facilitates significant learning.¹⁷

Thus, it is understood that the technologies developed to teach Nursing must be implemented and assessed as regards their possibilities to bring about changes and learning.

One study reported that the motivation of students during the technical course in Nursing was related to the lack of didactics and the teaching strategies that focused too heavily on lectures.¹⁸ The use of the computer as a resource for teaching the abstract content of nursing by means of multimedia input and simulations can aid in the teaching-learning process.^{18,19} Though these advantages are recognized, educational technologies still need to be assessed to guarantee the quality of the program.¹⁹

The assessment process is understood as involving students of vocational education, which is essential to improving educational technology. It is believed that this process serves to consolidate the importance of technology for technical teaching practices, stimulating the students to use other forms of learning and absorbing information. The participation of the

students can provide support for pedagogical practices and propose a redefinition of the construction of knowledge, when deemed necessary.

As regards the participants of the study, it was found that the majority were workers. Many times the students who seek vocational education in Brazil are already working double and triple work shifts.²⁰

In the selection of students, this study took care to consider the student's prior knowledge, in an attempt to allow the group of evaluators to best take advantage of their education, and not simply to assess the product developed by our research group. If this analysis is not performed, there arises the possibility that the student may not be able to relate the educational technology's content to their own education, in other words, they would be unable to interpret and analyze the results, thus leading to mechanical learning.¹²

In the same sense, the development of an educational technology should not be considered a simple task, and demands the commitment and involvement of a multidisciplinary team, from the initial phases of the project to its distribution to the end user.

The data from the study showed a 100% agreement with the interaction with the "Vital Signs and Anatomy" technology. In this sense, the educational technology, by proposing to work with interaction, and, to a certain extent, playfulness, can provide conditions that indicate the interests and motivation of the students towards the success of the learning experiences when supported in models that allow for a flexible reality.^{6,16}

Nevertheless, before students can interact with the educational technology, they must first receive an explanation about how the technology works and receive clarification as to the goals that it intends to achieve. For this reason, upon accessing the virtual environment, an initial menu is presented with information that range from the goals of the tool to the way in which it should be used, in an attempt to offer the end user more confidence when working with the technology, respecting user control, one of the key principles of usability.

Testing the usability of a computer system is an important characteristic in the assessment process, as this criterion can positively/negatively affect the product's use; if the end user realizes that the system is too difficult to use, he/she may give up or have difficulty in understanding the displayed content.¹¹⁻¹³

Some studies in Nursing have already been published that assess the usability of technologies developed for teaching practices. Even if some of these studies did not define the usability of the technology, all of the studies assessed at least some of the criteria described above.^{9,13,14,19,21}

Through the analysis of prior studies that chose to assess the content, interface, and usability of educational systems, some similarities with the results from the present study could

be observed. The assessment studies of educational technology proposed to validate the adequacy of the content,^{9,14,21} the adequate interface,^{9,13,14,19,21} a new way to learn,^{19,21} important aspects for Nursing education,^{13,14} as well as interactions that simulate reality and run in line with the ergonomic criteria and richness of the visual and auditory resources.

The content of the educational technology was developed through textbooks used for teaching as well as by means of a discussion group made up of faculty members who give classes on anatomy and Nursing fundamentals. Though dealing with digital educational technology, the content must be up-to-date and pertinent to the political, social, and economic insertion of teaching within the community.

The interface of the "Vital Signs and Anatomy" technology was drafted in such a way as to allow for free navigation and to allow the user to have access to the content that he/she deems most suitable in an attempt to stimulate one's motivation to learn. In the development of technologies, the layout of the interface must provide an intuitive interaction, in addition to encouraging discovery and exploration, providing the user with the understanding of the site to which he/she is being conducted, as well as the reason why, making the user feel that he/she is in control, one of the main principles of usability.⁵

Regarding the use of simulations, such a teaching strategy has become more and more common, due to the importance of the exercising of a critical-reflective reasoning, promoting the enhancement of critical thinking among nursing students and nursing professionals, who, during their vocational work, can refine and synthesize their abilities to think.^{9,22} The simulations also aid in the anticipation of the procedures and situations that would be lived only in the academic practice, diminishing the fear and the insecurity of the student when faced with the real life situation.²²

In this manner, the simulation of cases has become an important resource for the Nursing student to view real life situations within hospital practices, in an interesting and challenging manner, respecting one's own rhythm of learning, in addition to providing the ethics of nursing care.^{9,22}

The participants agreed that the use of animated resources, such as videos, sounds, and animations, help the user to understand the information, thus facilitating significant learning.²³ The visual and interactive advantages that the technological resources offer, including colors, making scientific articles available, interaction with colleagues and faculty members, immediate or fast answers, figures, videos, and simulations, highlight their importance.²² Such elements are compatible with the way the virtual environment is conducted, as they are related to the legibility of the educational technology when proposing to conduct the interaction of the user with the computer in an agreeable manner and to facilitate learning. For the system to

emphasize the visual advantages of the technological resources, a multidisciplinary program development team (designers, programmers, and specialists in specific content) are necessary in an attempt to guarantee the interaction, user-friendly navigation, and high quality graphics that provide the users with the flexibility to conclude the necessary tasks.²²

Another investigated aspect in this study deals with immediate feedback, which constitutes a strong advantage in digital educational technologies, since the student receives feedback on his/her reflection and action immediately or quickly, allowing for one’s own self-assessment and regulation of the learned content or that which needs further study. In addition, interactivity is increased and reflects one’s comprehension of the content.^{9,11,19}

Free navigation in the “Vital Signs and Anatomy” technology seeks to give value to the students as active members of their teaching-learning process, upon considering possible experiences that may have occurred prior to having access to the teaching tool, a fact which respects the student’s speed of learning, an aspect that is highly valued in computer-mediated learning. In this sense, other issues will arise, and the students will be stimulated to reflect and to question themselves within their own reality, making them creative individuals, with autonomy and capable of transforming their own knowledge. Such commentaries correspond to the ergonomics criterion of compatibility, as it formulates an agreement between the user’s preferences and habits, and the executed tasks.

Although no specific opinion regarding adaptability as one of the criteria of ergonomics has arisen, the educational technology is available in a virtual learning environment (www.sinaisvitaenf.com.br), which can be accessed free of charge anywhere, allowing students to exercise their autonomy, advantages provided by this type of educational tool, thus representing an important resource for the educational process.

FINAL CONSIDERATIONS

The content of this educational technology was created from the expressions from end users, which can collaborate the goal to achieve significant learning.

The assessment of educational technology makes it possible to affirm that the system attended to the expectations of the end users, allowing them to use an adequate resource tool as regards the aspects linked to both content and technical questions.

When developing educational technologies, one must be committed to conducting periodic assessments and modifications in an attempt to improve the system developed from both the technical and content aspects

Learning in an online environment, based on the problematization and adoption of self-learning strategies, may well

favor the education of critical individuals with the capacity to reflect on real life situations in a virtual environment.

It could be concluded that the results obtained in this study can contribute to the adoption of educational practices inherent within the use of new information technologies in an attempt to improve the educational quality of Nursing education.

It is hoped that the technology can add knowledge to the student as well as be used by the teacher as a pedagogical resource, in turn facilitating the comprehension of abstract contents.

This study therefore recommends the use of technologies developed for Nursing education, as well as the assessment of the students’ learning and motivation.

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