

ORIGINAL ARTICLE

BUILDING AND VALIDATING A DIGITAL APPLICATION FOR THE TEACHING OF SURGICAL INSTRUMENTATION

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ABSTRACT

Objective: To build and validate an application on teaching of basic surgical instrumentation to nursing students.

Method: Methodological study conducted between May and September of 2016, at a public university in Piauí, Brazil. Analysis, design, development and evaluation stages were conducted based on the Galvis-Panqueva benchmark. Content and appearance validation was performed by 22 judges, and 60 nursing students selected by convenience sampling were the target audience that evaluated the instrument.

Results: The application was named Surgical Instruments and is hosted on the Googleplay platform, available for use on the Android operating system. It had a global Content Validity Index of 0.9 for content and 0.8 for appearance. The target audience rated the application as excellent for motivation, style and content items, averaging 76.3%.

Conclusion: The application has proved to be valid for use as an auxiliary teaching tool on the subject surgical instrumentation.

DESCRIPTORS: Educational technology; Nursing education; Surgical instruments; Surgical center nursing; Nursing.


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CONSTRUÇÃO E VALIDAÇÃO DE APLICATIVO DIGITAL PARA ENSINO DE INSTRUMENTAÇÃO CIRÚRGICA

RESUMO

Objetivo: construir e validar aplicativo sobre ensino de instrumentação cirúrgica básica para acadêmicos de enfermagem.

Método: estudo metodológico, desenvolvido entre maio e setembro de 2016, em universidade pública do Piauí, Brasil. Seguiram-se as etapas de análise, desenho, desenvolvimento e avaliação, com base no referencial de Galvis-Panqueva. A validação de conteúdo e aparência foi realizada com 22 profissionais, e a avaliação com o público-alvo correspondeu a 60 acadêmicos de enfermagem.

Resultados: o aplicativo foi nomeado de Instrumentais Cirúrgicos e está hospedado na plataforma Google play, disponível para uso no sistema operacional Android. Apresentou Índice de Validade de Conteúdo global de 0,9 quanto ao conteúdo e 0,8 quanto à aparência. O público-alvo avaliou o aplicativo como excelente, quanto aos itens de motivação, estilo e conteúdo, com média de 76,3%.

Conclusão: o aplicativo mostrou-se válido para utilização como ferramenta auxiliar de ensino sobre o assunto instrumentação cirúrgica.

DESCRIPTORIOS: Tecnologia educacional; Educação em enfermagem; Instrumentos cirúrgicos; Enfermagem de centro cirúrgico; Enfermagem.

CONSTRUCCIÓN Y VALIDACIÓN DE APLICACIÓN DIGITAL PARA ENSEÑANZA DE INSTRUMENTACIÓN QUIRÚRGICA

RESUMEN

Objetivo: construir y validar aplicación asociada a la enseñanza de instrumentación quirúrgica básica para académicos de enfermería.

Método: estudio metodológico, desarrollado entre mayo y septiembre de 2016, en universidad pública de Piauí, Brasil. Se realizaron las etapas de análisis, proyecto, desarrollo y evaluación, con base en el referencial de Galvis-Panqueva. La validación de contenido y apariencia se hizo con 22 profesionales, y la evaluación con el público objetivo correspondió a 60 académicos de enfermería.

Resultados: el nombre de la aplicación es "Instrumentais Cirúrgicos" y ella está en la plataforma Google play, disponible para uso en el sistema operacional Android. El Índice de Validade de Contenido global fue de 0,9 cuanto al contenido y 0,8 cuanto a la apariencia. El público objetivo evaluó la aplicación como excelente, cuanto a los criterios motivación, estilo y contenido, con promedio de 76,3%.

Conclusión: la aplicación fue eficaz para utilización como herramienta auxiliar de enseñanza acerca del asunto instrumentación quirúrgica.

DESCRIPTORIOS: Tecnología educacional; Educación en enfermería; Instrumentos quirúrgicos; Enfermería de centro quirúrgico; Enfermería.

INTRODUCTION

The use of Information and Communication Technologies (ICT) as an auxiliary tool in the teaching-learning process has been effectively building knowledge and developing manual skills in various areas and levels of education⁽¹⁾.

Nursing has collaborated in the production of these technologies in educational areas, through the use of devices for mediating teaching and learning methodologies used by educators and students in the various educational processes, such as formal-academic education and formal-continuing education; assistive devices, with equipment for mediating care processes applied by professionals to clients-users of health systems in primary, secondary and tertiary care; and management, with artifacts for mediation of management processes, used by professionals in services and units of the different health systems⁽²⁾.

Educational technologies, in particular, need to be more and more innovative, as besides theoretical knowledge, professional training requires critical, reflexive and flexible thinking, as well as the ability to transform social reality based on the available resources⁽³⁾.

Technology is present in the routine of the different areas of Nursing. However, some areas have been more successful than others, e.g. perioperative care. Surgical procedures have been improved with the introduction of minimally invasive techniques, robotic surgeries, which use extremely sophisticated machinery to assure greater surgical assertiveness and a lower risk of infection⁽⁴⁾.

It is necessary to introduce new materials in the teaching-learning process of nurses in the area of surgical instrumentation, because at the undergraduate level, students do not feel comfortable to perform surgery-related procedures, as well as to handle instruments that aid the surgical team to perform these procedures.

The choice of the theme is justified by the doubts and difficulties raised and by the lack of educational tools of the mobile software type, as an additional resource for undergraduate education, as well as by the need for knowledge about the subject, since nursing students reported gaps in this regard, as they are not familiar with the routine of the surgical center.

In view of the abovementioned, it is necessary to ensure that undergraduate students are able to perform surgical instrumentation activities, safely and properly. Therefore, it is urgent to promote new learning strategies about surgical instrumentation in order to enhance professional development, using technology as an ally and a promising resource.

The present study aimed to improve, through an application, nurses' training in surgical instruments, to facilitate and arouse the curiosity and attention of the students. Thus, the specific objective of the study was building and validating an application on the teaching of basic surgical instrumentation to nursing students.

METHOD

Methodological study that proposed the creation of an application for the teaching of basic surgical instrumentation for nursing students.

The present study was conducted between May and September of 2016. The stages for the operationalization of the study were performed according to Galvis-Panqueva benchmark, due to its consistency with the objectives of the study. Thus, the stages of this study were namely construction (analysis, design and development) and validation (evaluation)⁽⁵⁾.

In the analytical stage, the theme, objectives, target audience, content to be created and infrastructure technology were defined. The theme surgical instrumentation was selected because of the difficulties reported by students regarding the memorization of basic instruments of general surgeries and their functions. Then, a review of the specialized literature was conducted to determine the content of the application.

As for the design, instructional design, navigation structure (in the form of an application), with free download for Android platform, and interface were established to ensure interaction, autonomy and ease in all commands. The development – an effective step of the implementation, was carried out by a software engineer, under the supervision of the researchers.

Content validation was carried out by 11 nurses and appearance validation, by 11 information technology experts identified at the Lattes Platform and who were contacted by e-mail. An odd number of experts was selected in each area, following the recommendation of another study with a similar approach ⁽⁶⁾.

The inclusion criteria were: obtaining three points according to the following items: for nurses - doctorate in nursing (4 points), professors with master's degree in nursing education (3 points), development of technologies for nursing education (2 points), nursing professor (1 point); and for information technology professionals – PhD in computer science and having developed software (4 points), master's degree in computer science and having developed software (3 points), graduated in computer science and having developed software (2 points), graduated in the field of information technology (1 point).

It should be noted that among all the nurses and information technology professionals who met these requirements, the first 11 judges from each area who agreed to participate in the study formed the group of experts for the validation stage.

The download link for the application and an evaluation form with questions regarding suitability of the proposal, objectives, organization, layout, writing, appearance, and motivation toward the educational material were sent to the judges responsible for the evaluation.

Likert scale was used, and the responses were as follows: 1 (disagree) to 5 (totally agree). After the completed forms were received, the responses were transferred to a database, in the Statistical Package for the Social Sciences (SPSS), and organized in tables, with absolute frequency demonstration and measurement of Content Validity Index (CVI). Items that obtained a score higher than 0.78 were considered approved, according to literature findings for validation studies with more than six specialists ⁽⁷⁾. Then, adjustments were made and the final version was made available.

Regarding validation by the target audience, 60 nursing students were selected by convenience sampling to compose the sample population, and these individuals should meet the following inclusion criteria: attend the Nursing course discipline Surgeries and Emergencies in a Brazilian public higher educational institution and have a mobile phone that use Android operating system. There were no sample losses during the study.

The participants of the study were those students who were present in the classroom at the time of data collection, which was divided into two moments. First, presentation of the application and recommendation of use for one week; and second, a week later, when the participants were supposed to answer a structured questionnaire with 11 multiple-choice questions, in which technology was approached in three aspects: motivation, style and content.

In order to evaluate the importance of the proposed items (questions), Likert scale was used, which was validated through pre and post-tests, and the following categories were considered: bad, partially good, good, very good and excellent. The item was considered well evaluated when agreement between the respondents was greater than or equal to 70% in the very good and/or excellent items ⁽⁶⁾.

The data were organized into tables and analyzed by means of descriptive and inferential statistics, according to the proposal of the stage of the study.

The study was submitted to the Research Ethics Committee of Universidade Federal do Ceará and approved according to protocol no 983,129.

RESULTS

Of the 11 experts in the nursing field who evaluated the application, seven had a PhD degree and four had a master's degree and were nursing professors. Table 1 shows the distribution of evaluations performed by nursing experts with questions related to the adequacy of the proposal, objectives, organization, layout, writing, appearance and motivation towards the educational material.

Table 1 - Content validation of the application according to evaluation by nursing experts. Picos, PI, Brazil, 2017

Items	D	PD	PA	A	TA	CVI
The application is appropriate for the intended purpose	-	-	-	3	8	1
The application makes it easy to learn the concepts used and their purposes	-	-	4	2	5	0.6
The application provides help in all aspects	-	-	2	6	3	0.8
The application is helpful and the method is not tiresome	-	-	-	5	6	1
The content of the application corresponds to the existing content in nursing literature	-	-	-	-	11	1
The application is attractive to nursing students	-	-	-	3	8	1

* D: Disagree; PD: Partially Disagree; PA: Partially Agree; A: Agree; TA: Totally Agree; CVI: Content Validity Index.

The overall CVI was 0.9 in the evaluation by the judges (nurses), and most of the items reached a CVI greater than 0.78, i.e., no additional adjustments were required. The ones that reached the best score were adequacy of the proposal; ability to provide help in a non-tiresome way; quality of content; and attractiveness, with CVI = 1 each.

As for the item on facilitation of learning, the CVI reached was 0.6. According to the judges, this parameter could only be evaluated after a pre-test and post-test study with different groups.

Regarding the experts in the field of information technology, three were masters and eight had only graduated from college. However, they met the requirement development of software, and the overall CVI was 0.8.

Table 2 – Appearance validation of the application, according to evaluation by technology information experts. Picos, PI, Brazil, 2017

Items	D	PD	PA	A	TA	CVI
Downloading of the application is easy	-	-	-	1	10	1
The language used in the application is easy to understand	-	-	3	5	3	0.7
The features used in the application are adequate	-	-	4	5	2	0.6
Features used in the application are comprehensive	-	-	2	5	4	0.8
The application interface is attractive	-	-	-	3	8	1
The application is easy to handle	-	-	2	7	2	0.8
The application is helpful and not tiresome	-	3	-	3	5	0.7

* D: Disagree; DP: PD: Partially Disagree; PA: Partially Agree; A: Agree; TA: Totally Agree; CVI: Content Validity Index.

According to the data presented in Table 2, the best classified items were related to download and interface, which reached CVI = 1 each. The item that evaluated the correct use of resources in the application obtained CVI equal to 0.6, and the judges recommended the implementation of new shortcuts and interactivity between the screens, which was done by the application development team.

The evaluation of the application was performed by 60 nursing students, 45 women and 15 men, aged between 18 and 22 years (± 2.1). As shown in Table 3, the bad and partially bad items did not score, even though they appear in the collection instrument.

Table 3 – Numerical distribution and percentage of the evaluation of the application by students for motivation, style and content. Picos, PI, Brazil, 2017

Variables	Good	Very good	Excellent
Motivation			
Interface of the application is attractive	3	5%	18
It's easy to download the application on a mobile on the Android operating system	1	1.7%	5
In general, the application is easy to handle	10	16.7%	13
The application provides effective help	5	8.3%	5
Style			
The language used in the application is easy to understand	14	23.3%	6
Interface of the application is attractive	7	11.7%	34
Overall, how do you rate the application?	10	16.7%	12
Content			
The application assists in the learning process of surgical instruments	1	1.7%	8

The application optimizes the knowledge about the nomenclatures of the surgical times and their respective instruments	-	-	-	-	60	100%
The application improves the understanding of the use of surgical instruments	-	-	-	-	60	100%
The application assists in preparing for the practical assessments	-	-	4	6.7%	56	93.3%

Regarding motivation, the subitems were evaluated as excellent by most students, and download and the ability to provide effective help were the best evaluated, with 54 (90%) and 50 (83.4%) of the answers, respectively. The style was evaluated in all subitems as good, very good or excellent, but regarding interface, which refers to the general appearance of the screens of the application, 34 (56.6%) judged it very good, though they said that improvements could be made. Regarding the content, the prevalent evaluation was excellent for optimization of knowledge about the surgical instruments and their respective use: 60 (100%) each.

DISCUSSION

The emergence of computing technologies in the educational process innovates the teaching-learning relationship, adapting to the needs of contemporary educational models. Nursing professionals are aware of this process and found that the application of technological innovations to clinical practice has been beneficial to nurses and patients. According to them, there is evidence that these skills, when properly used, can have a significant impact on patient care^(6,8-9).

The use of applications as a teaching tool in the health area is quite innovative, and can arouse interest and greater motivation to learn, since mobile devices that host these applications are used by 45% to 85% of health professionals. In fact, these applications are more frequently accessed than books and journals⁽¹⁰⁾.

In this technological scenario, the introduction of educational technologies in learning allows access to information outside the academic environment. The information provided is accurate, particularly regarding nursing practices, and materials and applications about the practice of some procedures or techniques are available⁽¹¹⁾.

Thus, the importance of the innovation promoted by these health professionals, regarding the implementation of new methodologies and technologies is recognized, as because they bring people of different cultures and knowledge closer together in order to improve learning⁽¹²⁾.

The use of an online environment is beneficial for educators, in what concerns the autonomy to create proposals of different teaching tools, making these teaching spaces unique. Thus, the educators have complete freedom to work with their students in the best possible conditions, optimizing the teaching-learning process, according to the principle that the more the technology is used, the more likely it is to be improved and adapted⁽¹³⁾.

Regarding technological resources, their benefits to the nursing field are noticeable. Also, the relationship between nursing/information technology gains space in the academic environment, since computers and mobile devices play a key role on the educational health scenario and have a positive impact on society. These technologies will certainly benefit the patient and rationalize work⁽¹⁴⁾ as is the case of the currently developed application.

Experts in information technology applied to the Nursing field report the importance of the use of technological resources by professors and nursing students, in order to ensure the use of more and more inclusive and interactive technologies in the teaching-learning process. Thus, professors can explore the use of computers, tablets, digital slates and smartphones to stimulate students to reproduce situations that they have not experienced yet⁽¹⁵⁾.

Therefore, it is urgent to build and make available more virtual resources for teaching in the nursing area, so that the students can translate into reality a higher level of knowledge about health and develop cognitive and technical skills.

Moreover, the implementation of the Surgical Instrumentation application was based on the developed model⁽¹³⁾ considering three dimensions: cognitive presence, social presence and teaching presence. The first dimension corresponds to what students can construct and confirm, based on informed reflection and analytical discourse. Social presence is the ability of members of a community to project themselves socially and emotionally, according to the medium of communication used. Finally, teaching presence is defined as the combination of the cognitive presence and the social presence, with emphasis on direction, design and facilitation, so that relevant and worthwhile learning outcomes can be obtained⁽¹³⁾.

The information conveyed by resources provided by computers, the Internet and other communication networks is evidently richer in form and more diversified in content than information transmitted by traditional means of teaching. Therefore, according to the objective, the content, and the students' characteristics, several resources can be adopted by the educators.

Moreover, some studies demonstrated the effectiveness of the use of technological resources, such as Moodle, applications, social networks, forums and virtual learning environments, which allow the acquisition of knowledge and cognitive skills that will contribute to improve nursing procedures, increase safety and self-affirmation by nursing students. The use of these new teaching methodologies, based on advanced technologies, brings positive results that improve the nurses' practice, providing more effective care and promoting the well-being of the patients⁽¹⁶⁾.

It should be stressed that applications and other computer-based modalities of teaching are not necessarily the best and only suitable teaching methods, since the use of educational technologies, even if appropriate, does not guarantee the effectiveness of learning, which depends on how contents are transmitted (they must be accessible) and to what extent are students interested in learning⁽¹²⁾.

In this regard, a study focused on the achievement of positive results with the use of educational applications by students that interaction of the students with relevant studies was possible. The use of this teaching modality is recommended for nursing students, in order to facilitate learning, as it is an easy to use medium, as well as because of its accessibility⁽¹⁶⁾. Therefore, the advantages of the applications are obvious, as they can save time and provide reliable results, as long as they are used in association with other teaching-learning modalities.

Another study elucidated the construction of a mobile application that promoted interoperability between iOs, Android, Symbian, BlackBerry and webOs operating systems, consisting of an application aimed at educating health professionals and patients, through the application framework, PhoneGap that allows creation of mobile applications using web standards. Hyper Text Markup Language (HTML), Cascading Style Sheets (CSS) and JavaScript were also used. This application provides information on vaccination, such as vaccine components, indications, contraindications and route of administration. It resulted in an excellent degree of usability of educational software⁽¹⁰⁾.

In another study on educational software compatible with devices available for use on Android operating system, construction was targeted at higher education students and

aims to improve the students' understanding of issues related to vital signs including temperature, respiratory rate, blood pressure, frequency heart rate, pain and body mass index (BMI). The authors used Galvis-Panqueva methodology⁽¹⁷⁾ because it is consistent with the objectives of their study. Similarities were found between the construction of the software in the referred study and the application developed for surgical instrumentation in this study, namely: their methodologies are similar, and both studies have the same purpose of using such applications to complement the traditional teaching model.

Another study that deserves mention concerns the building of software for the teaching of the urinary catheterization delay procedure for nursing students, using a technological application model (not state-of-the-art), namely, multimedia developed through computer software Office script 3.0® and Flash®. This application differs from the two others previously cited because of its poor interaction, reduced mobility, need to be connected to a PC for access and reduced portability. However, pre-and post-intervention tests demonstrated the efficiency of this multimedia in the acquisition of knowledge and skills⁽¹⁵⁾.

It is not only a matter of promoting technological changes, since this process also involves cultural aspects that motivate educators and students to rethink their roles, their relationship, the most appropriate content, the expansion of courses and curricula, evaluation systems, the ways to teach and learn, and the goals to be achieved. Therefore, educators become tutors that will ensure that the learning management systems generate positive impacts on the teaching-learning process⁽¹³⁾.

Based on the aforementioned, it can be said that the social transformations produced by the direct influence of the internet and the web can facilitate the development of studies and works in co-participation networks, creating a society that uses data that can be built and stored in several spaces and accessed by the most diverse users separated by wide geographic distances⁽¹²⁾.

Thus, the development of applications for the teaching of basic nursing skills is clearly a contemporary trend, and universities, educators and students, as well as nurses who perform direct care activities, are supposed to become familiar with these methodologies, in order to improve professional development, by investing in safer care.

One limitation of this study is the absence of a comparative evaluation of the application with other teaching methodologies on the same subject. Thus, its effectiveness in relation to other current teaching methodologies cannot yet be stated.

CONCLUSION

The application proved to be a valid tool for use in the teaching of surgical instrumentation for nursing students. It may improve the traditional teaching model, as it can be easily used in routine activities, because the contents of the databases can be accessed by professionals while offline.

In view of the students' difficulties regarding the technique, terminology and concepts of surgical instrumentation, interactive and innovative strategies must be urgently adopted in nursing teaching, in order to reduce the stagnant practice of memorization. It is believed that this application will provide safety to the students, because it is an educational material that disseminates a great deal of information on the subject, and this technology may be extended to nurses who provide direct care to patients who wish to use it.

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