ORIGINAL ARTICLE

Construction and evaluation of educational software on urinary indwelling catheters*

CONSTRUÇÃO E AVALIAÇÃO DE SOFTWARE EDUCACIONAL SOBRE CATETERISMO URINÁRIO DE DEMORA

CONSTRUCCIÓN Y EVALUACIÓN DE SOFTWARE EDUCACIONAL SOBRE CATETERISMO URINARIO DE DEMORA

Ana Carolina Cristino Lopes[1], Andréia de Andrade Ferreira[2], Jussara Alaíde Leite Fernandes[3], Ana Beatriz Pinto da Silva Morita[4], Vanessa de Brito Poveda[5], Adriano José Sorbile de Souza[6]

ABSTRACT

Since this is an era in which information is open concerning the benefits it brings, the field of nursing informatics earns its moment. The objective of this study was to design educational software for teaching and learning the technique of urinary indwelling catheterization and compare the acquisition of knowledge regarding the technique before and after the implementation of the educational software. This is a descriptive study using a quantitative approach. The pedagogical foundations for designing the software were the theories of Piaget and Vygotsky. The teaching-learning process was evaluated through a questionnaire consisting of 10 multiple choice questions which the 60 participants completed before and after using the software. The results showed the software made significant contributions after its application, thus being very useful in the teaching-learning process.

KEY WORDS

Urinary catheterization.
Education, nursing.
Nursing informatics.
Educational technology.

RESUMO

Tratando-se de uma era na qual a informação constitui abertura concernente aos benefícios que dela advêm, o campo da informática em enfermagem ganha seu momento. Este estudo teve como objetivo construir um software educativo para o ensino-aprendizado da técnica de cateterismo urinário de demora e comparar a apreensão do conhecimento sobre a técnica de cateterismo urinário de demora antes e após a aplicação de um software educativo. Pesquisa descritiva de abordagem quantitativa tendo como fundamentação pedagógica na construção do software as teorias de Piaget e Vygotsky. Posteriormente, avaliou-se o processo ensino-aprendizagem através de um questionário composto por 10 questões de múltipla escolha, anterior à utilização do software, e o mesmo teste após o manuseio do software, resolvidos por 60 alunos participantes. Os dados obtidos demonstraram significativa contribuição do software após a aplicação do mesmo, sendo bastante útil no processo ensino-aprendizagem.

DESCRITORES

Cateterismo urinário.
Educação em enfermagem.
Informática em enfermagem.
Tecnologia educacional.

RESUMEN

Tratándose de una era en la cual la información constituye una apertura en lo que concierne a los beneficios que de ella provienen, el campo de la informática en enfermería gana su momento. Este estudio tuvo como objetivo construir un software educativo para la enseñanza-aprendizaje de la técnica de cateterismo urinario de demora y comparar la comprensión temática sobre la técnica de cateterismo urinario de demora antes y después del uso de software educativo. Investigación descriptiva de abordaje cuantitativo, tuvo como fundamentación pedagógica en la programación de software las teorías de Piaget y Vygotsky. Posteriormente, se evaluó el proceso enseñanza-aprendizaje a través de un cuestionario compuesto por 10 preguntas de múltiple elección anterior al uso del software y el mismo test luego del uso del software, resuelto por los 60 alumnos participantes. Los datos obtenidos demostraron una contribución significativa del software luego de su utilización, demostrando su valor en el proceso de enseñanza-aprendizaje.

DESCRIPTORES

Cateterismo urinario.
Educación en enfermeria.
Informática aplicada a la enfermería.
Tecnología educacional.

* Extracted from the monograph: "The construction and applicability of a software program for teaching the indwelling urinary catheter technique", Completion of the Undergraduate Nursing Program, *Faculdades Integradas Teresa D' Ávila de Lorena*, 2008.

[1] Undergraduate student, *Faculdades Integradas Teresa D' Ávila de Lorena,* Nursing Program. Lorena, SP, Brazil. carol_cristino@hotmail.com [2] Undergraduate student, *Faculdades Integradas Teresa D' Ávila de Lorena,* Nursing Program. Lorena, SP, Brazil. andreiaenfermagem1@yahoo.com.br [3] Undergraduate student, *Faculdades Integradas Teresa D' Ávila de Lorena,* Nursing Program. Lorena, SP, Brazil. jualleite@yahoo.com.br [4] RN. MSc in Nursing Care. Professor, *Faculdades Integradas Teresa D' Ávila de Lorena*. Lorena, SP, Brazil. anabeatrizmorita@uol.com.br [5] RN. Doctoral student in Nursing. Professor, *Faculdades Integradas Teresa D' Ávila de Lorena*. Lorena, SP, Brazil. vbpoveda@yahoo.com.br [6] Professor, *Faculdades Integradas Teresa D' Ávila de Lorena*. Lorena, SP, Brazil. adriano.sorbile@gmail.com

Received: 12/10/2008
Approved: 06/24/2010

Portuguese / English: www.scielo.br/reeusp

INTRODUCTION

We are currently experiencing a period of new ideas and information transmitted through several means of communication, from a widespread of external locations to those inside our own home, and ,are totally aware of what happens in our region, country and in the world, through digital technology that represents great innovation.

Advancements do not stop and currently advancements, innovations and discoveries are not expected to take years but only months. At every minute, a new example of hardware, software, or new concept in the computer field is established; transformation is rapid and constant.

As stated by one study[1], the Computer Revolution contributes to expanding our mental capacity. We observe that technological advancements have changed many fields in modern life since all organizations use some form of technology to operate and perform tasks. In the healthcare field, specifically, biomedical and information technology has significantly influenced the ability to engage significant problems currently faced by health care providers. New and complex challenges related to the implementation, use, evaluation and development of new technologies are imposed on the nursing field.

Currently, nursing supports and improves itself with new knowledge that accrues from technology; however, the basic essence of nursing practice has not changed. Given the fact we are in an era in which information represents an opportunity from which one can benefit, the field of nursing informatics is gaining momentum[2].

Computers contribute to improving education, the quality of professors and administrators in institutions that provide health services. This author warns about the impact of this new technology development on society, asking for health professionals to devise new roles to be performed. Hence the awareness of health professionals and consequently the achievement of nursing professionals in the face of this technology, will result in the reorientation of the final product with a view to benefit patients, reduce costs and optimize work[3].

Educational informatics serves as an extra instrument to support the work of educators and functions as a didactic means. At this level, the educator can explore the computer to simulate situations that permit students to practice or experience abstract or real situations for which they are either not prepared or have not yet seen[4].

With new technological concepts, several software programs have emerged that permit the use and application of computer technologies. These educational programs are especially developed to be used and implemented in the education field with a specific clientele, and specific content, strategies, and didactic and psychopedagogical approaches.

Being aware of the development of informatics technology and the experience in the health and nursing fields reinforced the idea to associate the possibilities of informatics with the teaching of indwelling catheters technique. Being students ourselves, we realized that students are very insecure in relation to this technical and practical procedure.

Assuming that the theoretical content of Semiology is essential to the education of nurses in terms of mastering technical matters, especially of the indwelling urinary catheter given that it is a constant and complex procedure, the need to use technological resources by nursing professors and students was apparent, highlighting the Communication/Information Technologies, especially those related to computer and virtual language.

Additionally, scholars applying informatics to nursing in articles show the importance of using this resource in teaching nursing, confirming a positive tendency in relation to the use of interactive technologies in the teaching-learning process[5-6].

Multimedia through its virtual language can provide students of Nursing Semiology simulations concerning the proposed technique in an ordered and appropriate manner.

Among the various modalities that are now included within the universe of virtual language, we emphasize the use of Interactive Multimedia as a key instrument for the didactic-pedagogical process. Multimedia through its virtual language can provide students of Nursing Semiology simulations concerning the proposed technique in an ordered and appropriate manner[6].

One study[7] stressed the importance of this method in the requisites 'interaction' and 'dynamics' of teaching offered by multimedia with its virtual language as a didactic-pedagogical resource in the teaching of Semiology in Nursing and also its importance for the teaching-learning process and the need to make virtual resources available for courses where students need to visualize content to better assimilate knowledge.

Inserting an indwelling catheter requires a technique utilizing great manual dexterity, since it accounts for various cases of hospital-acquired urinary tract infection[8]. The urinary tract infection (UTI) is the most frequent cause of bacterial infection in inpatients and the leading cause of septicemia in hospitals, the most common pathogen of which is *Escherichia Coli*, from 65% to 100% of UTI[9].

After a single in-and-out catheterization, the occurrence of bacteriuria was 2%, and 48 hours after insertion of an indwelling catheter, such as the Foley catheter, in open drainage, significant bacteriuria was at 98%. Therefore, caution is needed when performing this procedure and whether there is an actual need to use it has to be taken into account[10].

Authors[9] state that nurses are the main actors in the control of hospital-acquired infections given their connection with all the remaining professionals in the various fields, the characteristics of their education and unique and educational skills. They develop epidemiological surveillance and report hospital-acquired infections, provide guidance and propose standards and routines for control hospital-acquired infections in all fields.

It is known that in order to develop an educational method, the use of a pedagogical reference is necessary and therefore we used the theories of Piaget and Vygotsky to create the software. Piaget's theory assumes that human beings go through a series of ordered and predictable changes that separate the cognitive processes into two parts: learning and development. For Piaget, learning refers to the acquisition of a particular response, learned in the light of experience, which may or may not be gained in a systematic manner[11], while development would be learning *per se*, responsible for the formation of knowledge.

When Piaget espoused ideas of assimilation and accommodation, he made clear that just as there is no assimilation without accommodation (past or present), there is no accommodation without assimilation. This statement from Piaget means that the environment does not simply lead to the registration of impressions or copies, but triggers active adjustments[12].

Aiming to clarify these statements, when ones says that there is no assimilation without accommodation one means that assimilation of new perceptual, motor or conceptual information will occur primarily on preexisting schemes, which are settled in earlier stages. When one says that there is no accommodation without assimilation, one also means that perceptual, conceptual or motor information is accommodated given its assimilation into the existing cognitive system. It is in this context that Piaget talks about "accommodation schemes of assimilation"[12].

Vygotsky did not build a pedagogical model, but a theory of knowledge of human development that has implications for teaching. Thus, the dimensions of his theory-use of individualized resources that enable the students themselves to command, review acquired knowledge and make connections with new knowledge, to mediate the learning process by organizing the context and preparing the didactic material necessary to facilitate and direct the process. The dimensions of Vygotsky's theory-use of individualized resources also stimulate self-development and the self-control of learning, exercise playful culture and account for sensory stimulation that permeated all the steps to build software[12-13]. His central issue is the acquisition of knowledge by the subject's interaction with the environment. Vygotsky's conceptions about the process of forming concepts refer to relations between thought and language, cultural issues that are part of the process in which individuals construct meanings, the internalization process and the role of schools in imparting knowledge[13].

But both are constructivist in their conceptions of intellectual development. That is, they argue that intelligence is built on mutual relationships of human beings with their environment[14]. Therefore, the proposal to build educational software for the technique of indwelling urinary catheter is intended to support teaching and learning strategies.

OBJECTIVES

- Construct educational software for supporting the teaching-learning process of inserting an indwelling urinary catheter;

- Compare acquisition of knowledge on the technique of inserting an indwelling urinary catheter before and after the application of an educational software program.

METHOD

This is a descriptive study with quantitative approach. Once the software was developed for teaching the indwelling urinary catheter technique, it was used by 2nd year students of a nursing school located in the interior of São Paulo, anonymity was ensured for the institution. All 2nd year students in the nursing program were included in the study. Even students who had already attended the course or worked as nursing technicians or auxiliaries, in addition to those who had no coursework in the field, should all have attended the course Human Anatomy and Physiology and at the time of data collection not have learned this procedure.

The technique used to develop the software is based on the technique described by three authors[15]. The pedagogical reference of Piaget and Vygotsky, who developed the conception that intelligence is constructed based on reciprocal relationships of human beings with their environment was adopted.

The chosen topic includes numerous references and various ways of implementation. Therefore, the selection of content initially required the exploration of information and practice of different authors used in the indwelling urinary catheter insertion technique. Based on this search in the literature, an updated technique[15] was chosen based on how it describes the indwelling urinary catheter technique.

After the institution formally approved the study, the project was submitted to and approved by the Ethics Research Committee (protocol n.68/2007).

At the time of data collection, the undergraduate nursing students had been assured of their confidentially, were informed about the study's objectives, that they were free to withdraw from the study at any time without any harm, had the right to clarify any doubts, and were also informed there would be no financial burden[15]. Data collection was initiated after the students agreed to participate and signed free and informed consent forms.

The students were randomly divided into three groups, which were named Group 1, Group 2 and Group 3. Students were identified by letters to facilitate accommodating them in the computer laboratories, since each laboratory had 20 computers; it would be impossible to accommodate them at the same time given the number of participants. Thereafter, data collection proceeded, including demographic variables such as age, gender, vocational course, nursing practice, and year of graduation from nursing assistant or technician programs, and professional experience in the field.

Afterwards, a Test of Knowledge concerning the indwelling catheter insertion technique was applied. The test contained ten multiple choice questions, which addressed the cases in which indwelling urinary catheters are used, the length of catheter insertion in the female urethra canal, the point at which sterile gloves should be put on, the content used to inflate the cuff, determining where it is fixed on men, the placement point for the fenestrated field, precautions to be observed after insertion of the catheter, and the final number of readings taken based on the technique described by Silva. As we used the same test on two occasions, these were named Knowledge Tests I and II. That is, the students handled the software and afterwards Knowledge Test II was applied.

The results were entered into a Microsoft Excel spreadsheet and are represented in tables and charts. Statistical tests were applied with the guidance of a statistician when necessary.

RESULTS AND DISCUSSION

The developed software aimed to present information on the indwelling urinary catheter insertion technique through an interactive resource to be used as an auxiliary tool in the learning process of students of various courses in nursing programs. Its use can also be extended to professors and nurses in training situations/improvement/recycling practice for the indwelling urinary catheter.

The theories of Piaget and Vygotsky were used as theoretical framework, which state that education is organized with the primary purpose of promoting learning and human development. This justifies the constant concern of nurses tasked with the complex nature of these processes. There is an observable growing interest in recent decades in resuming analysis that views this framework as a promising way to tackle the difficult issue of Brazilian nursing education. Thus we depart from the assumption that it is in and through social interactions that human beings not only access knowledge accumulated by their ancestors, but also in doing so, become subjects.

In this sense, social interactions in general, and particularly those that occur in schools, have been indicated as a way through which one can enhance the learning and developmental process, making the impact of school on the subject's trajectory more productive.

As for the pedagogical practice necessary to build the software we highlight the value and function of social environment in development and learning within Piaget's constructivist interactionism and Vygotsky's• socio-interactionist theory.

The following difficulty is highlighted: limited research conducted by nurses in the informatics and new technologies field. As a consequence, most of information found was in studies conducted in the education and informatics fields, hence, little was found that concomitantly addressed new technology and nursing.

Development of software

The software was based on the technique described in 2004[15], adopting the theories of Piaget and Vygotsky, who formulated the idea that intelligence is built on mutual relationships of the human beings with their environment.

It was developed between February and May 2008. The computer programs Office Script 3.0 and Flash were used. The researchers and two technicians in the field of informatics participated in the project. Images were taken from personal photo archives for the procedure materials, and the image of the nurse was built by one of the computer technicians who participated in the study.

Over nearly three weeks, information about the research objectives, nature of the content, the profile of users and the technology that would be employed in the software development was exchanged. Once these topics were decided upon, the questionnaire to assess the software was developed.

Software

Initially, the decision was that the software would be developed as a prototype that would later enable its implementation and clients would be able to evaluate it. The researchers and a programming expert would initially participate in the development process, however, during the software development, the need of analyses that would enable the final user to execute the software and the need to know the percentage of correct answers were acknowledged and a data processing technician joined the team.

The software development followed the steps: objective development, selection of a pedagogical framework, establishment of goal and content selection, and, finally, the development of the system and its applicability to the teaching process.

The software provides a brief introduction of the issue to be addressed, as shown in Figure 1, it describes the techniques[15] for indwelling urinary catheterization in men and women, which is later required when the technique is performed. There is a problem requiring one to gather material that is arranged among other material that is not a component of the technique in the form of a figure legend. Then the individual correctly aligns the sequence of steps to per-

form the technique in accordance with the description of the authors[15] in the format of text boxes randomly scattered. At the end the system provides a range of correct answers with a 10% error tolerance. The user has to score between 90% and 100% to get a passed-the-test message from the active nurse, which makes a thumbs up and a happy face. If the user's score is below 90%, the system informs the individual that they failed the test with the active nurse showing thumbs down and a sad face, which highlights the need to acquire more knowledge to perform the procedure.

Figure 1 - Software homepage - Lorena, SP, Brazil - 2008

The software was evaluated through a questionnaire composed of 12 multiple choice questions addressing the topic, which was applied before and after using the software to demonstrate the efficiency of its applicability as a didactic tool.

A population of 60 2nd year nursing students from a nursing school in the interior of Sao Paulo, SP, Brazil evaluated the software. The participants had not attended classes on the described technique, while among these 34 individuals had not attended any course in the nursing field, seven had attended courses in the nursing field but did not work in the field, and 19 individuals had attended courses in the nursing field and also worked in the field.

The results were obtained through a questionnaire addressing the technique that was composed of ten multiple choice questions, which were answered by the study population, before and after using the software.

Data were statistically analyzed through histograms, weighted arithmetic means, and standard deviation on each sample before and after using the software.

The results obtained through the knowledge test addressing the indwelling urinary catheter technique applied before and after using the software are presented.

Study of the population prior to the use of software

Figure 2 (N=7) shows that the individuals who attended the course and did not work in the field obtained better indexes of correct answers in relation to the other studied groups. The number of correct answers obtained by the group who attended the course and worked in the field (N=19) reveals a real need to recycle knowledge, since the index of correct answers was 6.74, corresponding to 67% of the total, a level insufficient for implementing the indwelling urinary catheter technique, which has great potential for causing urinary tract infection. Based on the obtained data, the average values of correct answers were computed with their respective standard deviations. The analyses' results are represented using the following notation (Average±Standard deviation). Hence, the result was 6.26±1.46 for the entire population (N=60) in test 1, which showed low variability as evidenced by the standard deviation obtained.

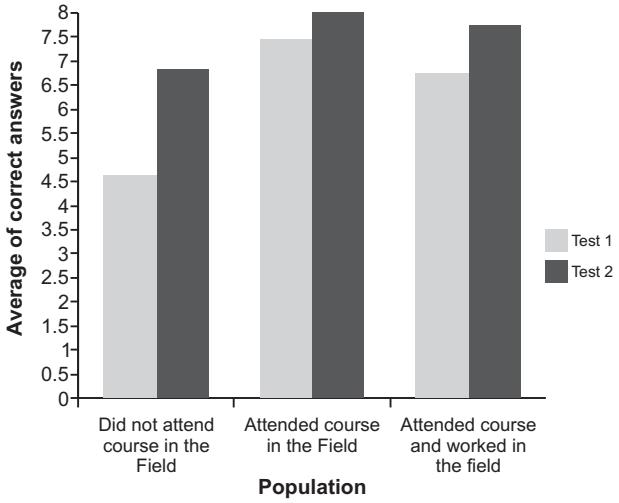

Figure 2 - Representation of the percentage of correct answers according to the characteristics of the studied population - Lorena, SP, Brazil - 2008

The results were: 6.74±1.87 obtained by those who attended the course and worked in the field (N=19), 7.43±1.29 by those who attended the course but did not work in the field (N=7), and 4.62±2.16 for those individuals who did not attend the course (N=34). Contrary to what was expected, those who attended courses in the nursing field and also worked in the field obtained lower levels of correct answers in relation to those who only attended courses, showing that practical experience is not a factor that significantly contributes to the acquisition of new information and/or knowledge; after graduation, the search for information to update knowledge is often abandoned.

Study of the population after the use of software

Figure 2 also shows that the results obtained in test 2 were also significant since the index of correct answers was 7.52, approximately 75% for all the studied individuals (N=60), which reveals that a single experience with the software enabled individuals to acquire a good level of knowledge. All the groups presented a higher index of correct answers in relation to test

1. The group that did not attend the course displayed a greater variability in the number of correct answers, its percentage varying from 4.62, close to 46%, to 6.82 or around 68% of correct answers, which demonstrated that the resource is quite feasible for education and highlights how useful a visual didactic tool is for the acquisition of knowledge in addition to the expositive and monotonous class usually employed.

The number of readings of the text addressing the indwelling urinary catheter technique was also analyzed and indicated that 28 individuals out of the entire population of 60 students read it only once, an excellent result.

The average values of correct answers were also computed with their respective standard deviations for each studied population and the following results were found: 7.74±1.29 for those who attended the course and worked in the field (N=19), 8.00±1.00 for those who attended the course but do not work in the field (N=7) and 6.56±1.29 for individuals who did not attend a course in the field (N=34). Hence, all the groups increased their number of correct answers, which demonstrates that the software is applicable for the learning process of placing the indwelling urinary catheter.

The group of individuals who did not attend courses in the field (N=34) obtained excellent acquisition of knowledge, which corroborates Vygotsky and Piaget's conceptions that assert that knowledge is constructed during reciprocal relationships between human beings and their environment[14].

It also displayed the utility of the educational software, which according to the author

> includes all programs that can be used for some pedagogically defensible educational purpose, by professors and students, whatever the nature or purpose for which it was created.

Therefore, the developed system is consistent with the author's thinking because it qualifies as educational software, as seen in the tests[16].

Table 1 - Characterization of 2nd year undergraduate students from a nursing school in the interior of São Paulo according to data - Lorena, SP, Brazil - 2008

Variables		Students								Statistical treatment (p<0,05)		
		Did not attend vocational course		Attended vocational course		Attended vocational course and worked in the field		Total				
		N	%	N	%	N	%	N	%			
Gender	Male	3	8.8	1	14.2	1	5.2	5	8.3	Between those who attended course and those who attended course and work in the field: χ^2=0.317	Between those who attended course and those who did not: χ^2=0.536	Between those who did not attend the course and those who attended course and work in the field: χ^2=0.207
	Female	31	91.2	6	85.8	18	94.8	55	91.7			
	Total	34	100	7	100	19	100	60	100			
Idade (anos)	Min./max.	18/35		20/28		19/40		18/40		Mann-Whitney P=0.01	Mann-Whitney P=0.01	Mann-Whitney P=0.01
	Média	22.2		24.7		27.7		24.3				
	DP	4.3		2.9		6.0		5.3				
	Mediana	20.5		24		27		23				
Formação profissional anterior (N=26)	Auxiliar de enfermagem	3				11.5						
	Técnico de enfermagem	23				88.5						
Tempo de experiência na enfermagem em meses (N=24)	Min./max.	12/ 216										
	Média	55										
	DP	46.9										
	Mediana	39										

The statistical analysis of the cases presented in table 1 comparing the categories and students' gender did not show any relevant statistical association (p>0.05), with the level of significance at 95% (Chi-square).

The comparison performed between the categories 'students who attended courses in the nursing field and also worked in the field', 'students who attended course in the field but did not work in the field', and 'students who did not attend courses in the field', and the population's age through the Mann-Whitney text revealed that there is a relationship between the group of 'individuals who did not attend courses' and those 'who attended courses and did not work in the field'; between those 'who attended courses and worked in the field' and those 'who attended courses and did not work in the field', however, no relationship was found between the group 'who did not attend courses' and the group 'who attended courses and worked in the field'.

Finally, in order to check the software's efficiency, the number of correct answers obtained by each individual before and after using it was statistically analyzed. The result

was positive considering the software improved the number of correct answers in all the studied groups as verified in the repeated measures t-test at a level of significance of 99.99%.

It is known that much has to be done to monitor these new technologies and innovations, considering the need to effectively evaluate them prior to their use as teaching tools. Further research addressing the evaluation of educational software is needed because it is a recent field open to numerous studies[17-18].

This system on CD-ROM, in addition to facilitating access, allows users to carry it for study groups or simply review the concepts learned in the classroom, on a trip, for instance. The use of multimedia as a teaching resource in nursing, especially when stored on an interactive CD-ROM, facilitates and encourages learning through the visualization of sounds/images, drawing the attention of students of semiotics to the quality performance of the most diverse procedures, allowing them to fix in their minds the content proposed and encouraging them to want to learn and apply theoretical knowledge in practice with patients, which further reinforces the need for the software in teaching, especially in the nursing field[19]. This dynamic educational software allows students greater flexibility in the search for the information necessary for learning. Though it does not replace other sources of education, it allows quick access that results in time saved and the possibility of stepping through other information sources[20].

CONCLUSION

The use of computing resources as an effective tool in the teaching-learning process and the implementation of this resource in the educational environment has been confirmed from pre-school to universities. But we cannot delude ourselves into believing that the digital era will be the solution to existing educational problems. We must face the reality of new technologies and at the same time have our feet on the ground and understand that this new phase allows us to utilize these resources to support and stimulate the teaching-learning process.

This study demonstrates that development and learning processes suffer qualitative changes according to the Piaget's and Vygostky's interactionist perspective. The software was developed with this in mind, that is, to use it as a tool in the teaching-learning process. It was later analyzed through the tests performed before and after using the software in question, which showed significant efficacy in teaching as shown in the statistical analysis. Thus, the need to implement resources of proved applicability in learning situations in actual teaching is highlighted.

The task of building software was a challenge and, like every first experience, it brought difficulties that accrue from a lack of experience. The existing literature in the field deals solely with the development of software, almost never with its applicability. Therefore, most of the steps were based on publications of dissertations and Master's theses of nurses in the fields of informatics and the production of software programs, which were important sources of assistance in the methodological conduct of this study.

Evaluation is an ongoing and unending process. After educational software is completed and made available to users, the feedback of users can provide ideas that can be included in revised versions and improve the software. For example, the possibility of including a 'magnifying glass' option so that users with impaired vision would be able to use it was considered.

With this software, individuals who use audio-visual resources to address topics to be taught to a group have a useful work tool that facilitates the acquisition of knowledge. The software was generally well received with positive comments and relevant interest in it.

REFERENCES

1. Rees RL. Internet: understanding computers. J Nurs Admin. 1978;8(3):70-3.
2. Evora YDM. Processo de informatização em enfermagem: orientações básicas. São Paulo: EPU; 2005.
3. Vidal EM, Maria JEB, Santos GLS. Educação, informática e professores. Fortaleza: Demócrito Rocha; 2002.
4. Oliveira MRNS. Tecnologias interativas e educação. Rev Educ Deb. 1999;21(37):150-6.
5. Cassiani SHB. Um salto para o futuro no ensino da administração de medicamentos: desenvolvimento de um programa instrucional auxiliado por computador [dissertação]. Ribeirão Preto: Escola de Enfermagem de Ribeirão Preto, Universidade de São Paulo; 1998.
6. Lopes MVO. Validação de software educativo para auxílio de sinais vitais [dissertação]. Fortaleza: Faculdade de Farmácia, Odontologia e Enfermagem, Universidade Federal do Ceará; 2001.
7. Gomes AVO, Santiago LCS. A qualidade do ensino-aprendizagem em semiologia mediante o emprego da multimídia interativa. Nursing (São Paulo). 2001;9(103):1164-8.
8. Molinari KM. Avaliação da prevalência, fatores de risco e agente etiológico da infecção do trato urinário em idosos institucionalizados: um protocolo de atendimento [dissertação]. São Paulo: Escola Paulista de Medicina, Universidade Federal de São Paulo; 2004.
9. Kawagoe JY, Queiroz ML. Normas básicas para a realização de procedimentos em infecção hospitalar: prevenção e controle. São Paulo: Sarvier; 1997.

10. Starling CEF, Pinheiro SMC. Atualização terapêutica na prática diária, ensaios: manual prático diagnóstico e tratamento. Belo Horizonte: Cultiara; 1993.

11. Macedo L. Ensaios construtivistas. São Paulo: Casa do Psicólogo; 1994. p. 8-16.

12. Wadsworth B. Inteligência e afetividade da criança. São Paulo: Enio Matheus Guazzelli; 1996.

13. Vygotsky LS. El desarrollo de los procesos psicológicos superiores. Barcelona: Crítica; 1987.

14. Vygotsky LS. Uma perspectiva histórico-cultural da educação. Petropólis: Vozes; 2002.

15. Silva LD, Pereira SRM, Mesquita AMF. Procedimentos de enfermagem, semiotécnica para o cuidado. Rio de Janeiro: MEDSI; 2004. p.174-9.

16. Lucena MA. Gente é uma pesquisa: desenvolvimento cooperativo da escrita apoiado pelo computador [dissertação]. Rio de Janeiro: Pontifícia Universidade Católica do Rio de Janeiro; 1992.

17. Borges PRT. Qualidade de "*software*" educacional: critérios para validação de treinamentos multimídia utilizados em educação à distância. Tecnol Educ. 1998;26(140):11-7.

18. Lopes MVO, Araujo TL. Avaliação de alunos e professores acerca do software "Sinais Vitais". Rev Esc Enferm USP. 2004;38(4):438-47.

19. Santiago LC. A multimídia interativa como recurso didático-pedagógico para o ensino teórico-prático da semiologia em enfermagem [tese doutorado]. Ribeirão Preto: Escola de Enfermagem de Ribeirão Preto, Universidade de São Paulo; 2003.

20. Palangana CI. Desenvolvimento em aprendizagem em Piaget e Vygotsky: a relevância do social. São Paulo: Summus; 2001.

Correspondence addressed to: Ana Beatriz Pinto da Silva Morita
Rua Presidente Roosevelt, 174 - Vila Zélia
CEP 12606-290 - Lorena, SP, Brazil