

## Evaluation by nursing students in virtual learning environments for teaching endocrine physiology\*

*Avaliação, por graduandos de enfermagem, de ambiente virtual de aprendizagem para ensino de fisiologia endócrina*

*Evaluación, por graduandos de enfermería, del ambiente virtual de aprendizaje para la enseñanza de la fisiología endocrina*

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### ABSTRACT

**Objective:** To describe the evaluation of the Virtual Learning Environment of TelEduc in teaching endocrine physiology for graduates of a nursing degree course at a public university in the state of Sao Paulo. **Methods:** Cross-sectional, descriptive study with quantitative analysis of data and a sample of 44 students. To collect data, we used an instrument that included educational aspects of the virtual learning environment: content, interaction and activities, and technical aspects: response time and quality of the interface. **Results:** In the evaluation of students, data indicated that for the majority of responses obtained, the items included the following characteristics: content (84.0%), interaction (83.2%), activities (89.3%), response time (94.0%), and interface quality (95.8%). **Conclusion:** The virtual learning environment, TelEduc, proved to be an effective tool to support the teaching of Endocrine Physiology.

**Keywords:** Students, nursing; Physiology/education; Educational technology; Nursing education; Informatics in nursing

### RESUMO

**Objetivo:** Descrever a avaliação do Ambiente Virtual de Aprendizagem do TelEduc no ensino de Fisiologia Endócrina por graduandos de enfermagem de um Curso de Licenciatura em Enfermagem de uma universidade pública do interior do Estado de São Paulo. **Métodos:** Estudo descritivo, transversal com análise quantitativa de dados e com amostra de 44 alunos. Para a coleta de dados, utilizou-se um instrumento que contemplava aspectos pedagógicos do ambiente virtual de aprendizagem: conteúdo, interação e atividades e aspectos técnicos: tempo de resposta e qualidade da interface. **Resultados:** Na avaliação dos alunos, os dados apontaram que, na maioria das respostas obtidas, foi explicitado o atendimento dos itens compreendidos nas seguintes características: conteúdo (84,0%), interação (83,2%), atividades (89,3%), tempo de resposta (94,0%) e qualidade da interface (95,8%). **Conclusão:** O ambiente virtual de aprendizagem do TelEduc mostrou-se uma ferramenta eficaz para apoiar o ensino de Fisiologia Endócrina.

**Descritores:** Estudantes de enfermagem; Fisiologia/educação; Tecnologia educacional; Educação em enfermagem; Informática em enfermagem

### RESUMEN

**Objetivo:** Describir la evaluación del Ambiente Virtual de Aprendizaje del TelEduc en la enseñanza de la Fisiología Endocrina por graduandos de enfermería de un Curso de Licenciatura en Enfermería de una universidad pública del interior del Estado de Sao Paulo. **Métodos:** Estudio descriptivo, transversal con análisis cuantitativa de datos, realizado con una muestra de 44 alumnos. Para la recolección de los datos, se utilizó un instrumento que contemplaba aspectos pedagógicos del ambiente virtual de aprendizaje: contenido, interacción y actividades y aspectos técnicos: tiempo de respuesta y calidad de la interfase. **Resultados:** En la evaluación de los alumnos, los datos apuntaron que, en la mayoría de las respuestas obtenidas, fue explicitada la atención de los items comprendidos en las siguientes características: contenido (84,0%), interacción (83,2%), actividades (89,3%), tiempo de respuesta (94,0%) y calidad de la interfase (95,8%). **Conclusión:** El ambiente virtual de aprendizaje del TelEduc se mostró como una herramienta eficaz para apoyar la enseñanza de la Fisiología Endocrina. **Descritores:** Estudiantes de enfermería; Fisiología/educación; Tecnología educacional; Educación en enfermería; Informática aplicada a la enfermería

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## INTRODUCTION

In the current scenario, technology advances rapidly, driving men to be proactive towards this reality. Technology access is increasingly enhanced, so that it is difficult to do without it today<sup>(1)</sup>.

Initial projects to construct virtual learning environments for education date back to the mid 1990's, after the Internet had gone through considerable modification. When the first *World Wide Web (web)* navigator was created, the Internet ceased being an academic network and started to incorporate business activities. Using the new *web* functions, some colleges and companies worked to offer systems for use as educational environments. The *web* turned into an auxiliary resource in undergraduate and graduate programs and a tool to offer distance education. In response to this demand, *web* technologies were used to construct virtual environment, with a view to education and training activities<sup>(2)</sup>.

The virtual learning environment (VLE) is part of cyberspace, includes instructional interfaces and enhances interaction among learners. It includes tools for independent activities and offers resources for individual and group learning. These environments focus on learning. It is not acceptable to merely elaborate contents. Instead, activities need to be planned that lead to the construction of new concepts<sup>(3)</sup>.

Various virtual learning environments exist, such as: WebCt (Canada), ROODA (Universidade Federal do Rio Grande do Sul), AulaNet (PUC – Rio de Janeiro), TelEduc (UNICAMP), CoL (LARC – University of São Paulo Computer Network Architecture Laboratory) and Blackboard.5 (USA), among others<sup>(4-10)</sup>.

These virtual environments permit integrating multiple media and presenting information to students in different formats: texts, sound and images, interconnected through links. Besides, there are synchronous (chat) and asynchronous (discussions forums and electronic mail) communication tools that enhance interaction among system users<sup>(11)</sup>.

In Brazil, nursing has used VLE in its courses on medication administration, wound treatment, basic and advanced life support and material sterilization, as shown in the literature review<sup>(12-16)</sup>.

In the international context, nursing has also used VLE and, recently, Blackboard. 5 has supported nursing student learning in an Anatomy and Human Physiology course module. The results of student assessments on this intervention indicated that self-learning opportunities were created, and that the available resources were useful to support learning on Anatomy and Physiology<sup>(17)</sup>.

Other health areas have also used AVA and its resources to reduce the number of formal class hours,

increase students' enthusiasm about multimedia material use and enhance interactive learning<sup>(18-19)</sup>.

In Brazil, no publications exist that look at VLE assessment in Physiology teaching as part of nursing programs from the students' perspective.

Thus, the research question was: How do nursing undergraduates assess the VLE in Endocrine Physiology teaching?

Aware of the benefits the use of VLE provides in Physiology teaching and aiming to expand the body of knowledge on this theme in Brazil, this study aimed to describe Nursing Teaching Diploma students' assessment of the TelEduc VLE in Endocrine Physiology teaching at a public university in the interior of São Paulo State.

## METHODS

This descriptive and cross-sectional study used quantitative data analysis and was carried out in the second semester of 2007 at a Nursing College of a public university in the interior of São Paulo State.

The population comprised 53 students regularly enrolled in the Physiology course offered in the first year of the Nursing Teaching Diploma program. The sample included 44 students who complied with the following inclusion criteria: being a student in the Nursing Teaching Diploma program, agreeing to participate in the educative module on Endocrine Physiology in the TelEduc VLE by signing the Informed Consent Term (ICT) and taking the Physiology course for the first time.

The hour load of the educative module on Endocrine Physiology in the TelEduc VLE was 20 hours, and the general aim was: to develop knowledge about the physiology of the endocrine system. The module was held between 11/21/07 and 12/10/07; 10 hours of the module were used for four in-class meetings, aimed to present the TelEduc VLE, make students familiar with the tools and discuss doubts about the contents of the module classes; and the remaining 10 hours to accomplish distance activities, such as: reading and studying of class contents, recall exercises, discussion forums and cat on the clinical case of a Diabetes Mellitus patient.

Approval for the research project was obtained from the Institutional Review Board at the University of São Paulo at Ribeirão Preto College of Nursing (Protocol No 0819/2007).

To collect data, an instrument was used that had previously been applied to assess a Nursing Administration VLE, which nursing administration and research methodology faculty and one systems analyst submitted to content and face validation. The instrument addressed pedagogical aspects of the VLE, including items related to contents, interaction and activities and technical aspects, with items related to response time and

interface quality<sup>(20)</sup>. The following characteristics were assessed as part of each of these items: contents - pertinence, clarity, applicability, quantity and consistency, interaction – student-student, student-machine, student-group, student-teacher, group-teacher, activities - pertinence, clarity, applicability, quantity and consistency and educational assessment, response time – accessibility and navigation and interface quality: colors, screen space, letters, pictures and animations. The evaluator should score each of these items, with (+1) meaning that the characteristic was fully complied with, (0) partially complied with and (-1) not complied with. Evaluators should comment on and justify the scores (0) and (-1).

The researcher gave research participants two envelopes: the first contained the ICT and the second the data collection instrument, which should be answered separately. Later, she collected the envelopes, which did not contain any identification to guarantee participants' anonymity.

After coding and elaborating a data dictionary, the validation process of the collected information was used through double data entry in Microsoft Excel worksheets. After correcting typing mistakes, data were exported to and analyzed in SPSS (Statistical Package for Social Science) to calculate absolute and percentage frequencies, displayed in tables. Comments and justifications in case the evaluator chose 0 and -1 were treated through content analyses of the phrases, so as to create categories for descriptive analysis through absolute and relative frequencies.

## RESULTS

The assessment of content, interaction and activity items is shown in Tables 1 to 3.

Regarding contents, most answered obtained from students' assessments (179 – 84.0%) considered that the characteristics of pertinence, clarity, applicability, quantity and consistency were complied with. Thirty-two answers (15.0%), however, indicated that these characteristics were partially complied with and two (0.9%) that they

were not complied with.

As for characteristics partially complied with, three answers (7.0%) were related to pertinence, indicating that contents were pertinent but summarized, seven to clarity (16.7%), appointing that some parts of the contents were not understandable, mainly in the class addressing the reproductive system, four to applicability (9.5%), assessing that the contents were applicable but summarized, nine to quantity (20.9%), indicating that more contents should be offered and nine to consistency (20.9%), indicating that, sometimes, they had to consult the literature for additional information.

Regarding characteristics not complied with, one response (2.3%) was related to pertinence, indicating that the contents was very summarized and did not replace the class: and one was related to quantity (2.3%), as the contents were very summarized.

With regard to interaction, most of the answers (174 – 83.2%) considered that the student-student, student-machine, student-group, student-teacher and group-teacher characteristics were also complied with. Thirty-two answers (15.3%), however, indicated that the characteristics were partially and three that they were not complied with (1.4%).

Out of characteristics partially complied with, eight answers (19.0%) were related to the student-student characteristic, indicating that there was not much interaction among students, except during the chat; answers related to student-machine were not justified (4.8%); 11 (26.8%) answers were related to student-group, showing that there was no student-group interaction, which only occurred during the chat; 7 (15.9%) were related to student-teacher, indicating that interaction was distant and only possibly by e-mail or chat; four were related to group-teacher interaction, which only occurred during the chat (9.5%).

Regarding characteristics not complied with, one of the answers (2.4%) was related with the student-student characteristics, indicating that this only happened during the chat; one with student-machine, stating that the method was tiresome (2.4%) and one related to student-

**Table 1** – Answers on student assessment about contents, according to compliance with characteristics of pertinence, clearness, applicability, quantity and consistency. Ribeirão Preto, 2009.

Contents	Characteristics complied with		Characteristics partially complied with		Characteristics not complied with		Total*	
	No	%	No	%	No	%	No	%
Pertinence	39	90.7	3	7.0	1	2.3	43	100.0
Clarity	35	83.3	7	16.7	-	-	42	100.0
Applicability	38	90.5	4	9.5	-	-	42	100.0
Quantity	33	76.7	9	20.9	1	2.3	43	100.0
Consistency	34	79.1	9	20.9	-	-	43	100.0
Total	179	84.0	32	15.0	2	0.93	213	100.0

\* Considering only participants who answered the question

**Table 2** – Answers on student assessment about interaction, according to compliance with characteristics student-student, student-machine, student-group, student-teacher and group-teacher. Ribeirão Preto, 2009.

Interaction	Characteristics complied with		Characteristics partially complied with		Characteristics not complied with		Total*	
	No	%	No	%	No	%	No	%
Student-student	33	78.6	8	19.0	1	2.4	42	100.0
Student-machine	39	92.9	2	4.8	1	2.4	42	100.0
Student-group	29	70.7	11	26.8	1	2.4	41	100.0
Student-teacher	35	83.3	7	15.9	-	-	42	100.0
Group-teacher	38	90.5	4	9.5	-	-	42	100.0
Total	174	83.3	32	15.3	3	1.4	209	100.0

\* Considering only participants who answered the question

**Table 3** – Answers on student assessment about activities, according to compliance with characteristics of pertinence, clearness, applicability, quantity and educational assessment. Ribeirão Preto, 2009.

Activities	Characteristics complied with		Characteristics partially complied with		Characteristics not complied with		Total*	
	No	%	No	%	No	%	No	%
Pertinence	37	86.0	5	11.6	1	2.3	43	100.0
Clarity	40	93.0	3	7.0	-	-	43	100.0
Applicability	38	88.4	4	9.3	1	2.3	43	100.0
Quantity	38	88.4	5	11.6	-	-	43	100.0
Educational assessment	39	90.7	3	7.0	1	2.3	43	100.0
Total	192	89.3	20	9.3	3	1.4	215	100.0

\* Considering only participants who answered the question

**Table 4** – Answers on student assessment about response time, according to compliance with characteristics of accessibility and navigation. Ribeirão Preto, 2009.

Response time	Characteristics complied with		Characteristics partially complied with		Characteristics not complied with		Total*	
	No	%	No	%	No	%	No	%
Accessibility	40	97.6	1	2.3	-	-	41	100.0
Navigation	39	90.7	3	7.0	1	2.3	43	100.0
Total	79	94.0	4	4.8	1	1.2	84	100.0

\* Considering only participants who answered the question

group was not justified (2.4%).

The 192 (89.3%) answers obtained on students' assessment of activities considered that the characteristics of pertinence, clarity, applicability, quantity and educational assessment were complied with, but 20 (9.3%) answers considered that the characteristics were partially and three that they were not complied with (1.4%).

Out of partially attended characteristics, five answers (11.6%) were related with pertinence, indicating that little time was available to accomplish the activities, mainly regarding the exercises; three with clarity, but without justifications (7.0%); four with applicability (9.3%), mentioning that activities related to the exercises demanded little reasoning; five with quantity (11.6%), indicating that there should be less activities or more

time to perform them and three related to the educational assessment (7%), appointing that students do not manage to assess themselves clearly.

As for characteristics not complied with, one of the answers (2.3%) was related with pertinence, indicating that the exercises were only based on the support material; one with applicability (2.3%), showing that activities did not enhance much reflection and one with educational assessment (2.3%), stating that activities were good for content recall, provided that exercises were many.

Data in Tables 4 and 5 show the assessment of response time and interface quality.

Regarding the response time, most answers (79 – 94.0%) considered that characteristics were complied with, but four indicated (4.8%) that the characteristics of accessibility and navigation were partially, and one

**Table 5** – Answers on student assessment about interface quality, according to compliance with characteristics of colors, screen space, letters, pictures and animations. Ribeirão Preto, 2009.

Interface quality	Characteristics complied with		Characteristics partially complied with		Characteristics not complied with		Total*	
	No	%	No	%	No	%	No	%
Colors	36	83.7	7	16.3	-	-	43	100.0
Screen space	42	97.7	1	2.3	-	-	43	100.0
Letters	43	100	-	-	-	-	43	100.0
Pictures	43	100	-	-	-	-	43	100.0
Animations	42	97.7	1	2.3	-	-	43	100.0
Total	206	95.8	9	4.2	-	-	215	100.0

\* Considering only participants who answered the question

that they were not complied with (1.2%).

Out of characteristics partially complied with, one was related with accessibility (2.3%) and not justified, while three were related with navigation (7%), indicating that an icon to return to the page should be placed at the top of each window.

As for characteristics not complied with, one of the answers (2.3%) was related with navigation, indicating that one had to return to other pages to switch pages.

With regard to interface quality, 206 answers were provided (95.8%), indicating that characteristics of colors, screen space, letters, pictures and animations were complied with, while only nine answers (4.2%) expressed that the characteristics were partially complied with.

Out of characteristics partially complied with, seven were related with colors (16.3%), which were considered little attractive or vibrating, one with screen space, which was not justified (2.3%) and one with animations (2.3%), which indicated lack of clarity in some of them.

## DISCUSSION

Content presentation via *web* is a source of discussion<sup>(21)</sup>. The amount of contents is linked with the number of hours the student will spend to study a certain topic. That is, the number of readings, how much the student should see, hear, practice and be assessed. Everything is planned in function of time. Another aspect is that the contents should be structured in small units and communicate what is needed to achieve the initially set goals. It is the student's interaction with the contents that leads to understanding, changes in perspective and learning<sup>(22)</sup>. Besides, the simplicity of the presentation is the key to understanding. Clarity, objectiveness and accessibility are important aspects in VLE course language; thus, the goal is to offer students' accessible classes, so that they can easily learn and advance in the contents<sup>(23)</sup>.

Interaction is also desirable in a VLE course, so as to overcome physical and geographical distances between student and teacher. Most students consider

communication with the teacher essential and teachers find it desirable<sup>(22)</sup>. The intention, however, is for students to develop self-management skills in the construction of their knowledge and for teachers to mediate this process. The chat, as the main moment of interaction for students in this study who considered the interaction characteristic partially or not complied with, is an event that allows students to virtually meet with the teacher, minimizing the distance they also appointed.

The analysis of records on a usage experience of the chat tool in TelEduc VLE to support Human and Technological subjects taught at *Universidade Estadual do Rio Grande do Sul* also evidenced significant interactions during chat sessions. The teacher's interventions were sporadic. Students' conversations altered between comments and discussion on the proposed theme. The need for synchrony the resource demands seemed to involve students more, enhancing interaction among them<sup>(24)</sup>.

Students' assessment of the activities proposed in TelEduc VLE was positive, ranging from multiple choice or yes/no content recall exercises to JCROSS-words interactive exercises. On all of these, students received immediate feedback, without punishment in case of error. One author<sup>(25)</sup> reinforces students' opinion on the activities and reports that, when they are accomplished in digital environments, they permit the combination of different media and can serve as a form of reinforcement, offering students immediate feedback, registering scores or not, multiple choice, true or false, completion, leisure exercises like games or history, one single type with different difficulty levels, different types with different difficulty levels for each type.

The design of the VLE interface should be pleasant, so as to orient students and gain their attention. Regarding navigation, students should receive support to use techniques that help them to signal the information provided, through clear indications of links on the website<sup>(26)</sup>. Students can move through the contents

without having to go through countless screens several times before reaching their destination<sup>(27)</sup>. As for accessibility, it should guarantee easy web access from any computer connected to the Internet<sup>(28)</sup>.

Background colors should be clear and not cause distraction. Fonts should facilitate vision and reading. Images and/or pictures should be similar to the objects they represent and animations should offer the opportunity to present concepts interactively, which cannot be adequately expressed through static images<sup>(26)</sup>.

## CONCLUSION

According to undergraduate students in a Nursing Teaching Diploma, the TelEduc VLE in Endocrine Physiology teaching was an effective tool to support the process. Besides, the pleasant interface and easy handling of synchronous and asynchronous communication tools in the TelEduc VLE enhanced interaction among students, contents and teachers. This interaction helped students to participate in the programmed activities. The use of TelEduc VLE and its tools in Endocrine Physiology teaching also increased students' autonomy and involvement in the learning

process.

This fact points to the urgent need to reconsider the traditional teaching practices faculty use, which students have been routinely exposed to. Preparation is needed to face this challenge though! The goal is to prepare critical and reflexive students. Thus, teacher preparation should be enhanced to dare in terms of teaching methods that are more in line with these needs, so that nursing students can achieve expected competencies to act in professional practice scenarios. Physiology is a science that supports nursing actions in these contexts, demanding innovation in teaching on this topic.

Some limitations were identified, such as the insufficient hour load for Endocrine Physiology, which reduced students' time to get familiar with and adapt to the TelEduc VLE, hampering their performance in the proposed activities, such as the first content recall exercises. It is important to identify these limitations, however, mainly to elaborate a new online module. When known, they can be considered in planning.

In education, technology use is a reality, and teachers cannot deny it. Hence, as this is an unavoidable reality, teachers need to open up to and prepare themselves for this possibility.

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