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## Evaluation of a virtual learning object on diagnostic reasoning: a descriptive study

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### ABSTRACT

**Aim:** To evaluate a virtual learning object (VLO) developed to mediate the teaching of diagnostic reasoning in nursing and to be applied to the integumentary system by undergraduate nursing students. **Methods:** A descriptive study, of the methodological applied research type in production technology, was developed with 21 nursing students from a public university in Piauí in September and October 2014. A questionnaire using the Likert scale was applied and analyzed by means of descriptive statistics. **Results:** The evaluation of the students was favorable when judging that the VLO helped in computer use skills (20), provided autonomy (19), motivation (21), and pleasure (20) during learning. It also featured an easy-to-understand language (20) and useful and relevant review activities and a bibliography. **Conclusion:** The VLO proved to be potentially effective in supporting the teaching of diagnostic reasoning during evaluation of the integumentary system.

**Descriptors:** Educational Technology; Education Nursing; Nursing Diagnosis; Judgement.

## INTRODUCTION

The introduction of technological resources to assist in the learning process in nursing education has emerged in recent years, since these methods make it possible to encourage active and meaningful learning in nursing students when using tools such as virtual learning objects (VLOs). VLOs are a contemporary component of web-based learning because they change the relationship between the student and the content that will be the target of this study.

VLOs are a resource that aids the autonomous learning of the student and they can be reused in different learning contexts. The main function of VLOs is to fragment the disciplinary educational content into small parts that can be reused in different learning contexts to maximize the teaching-learning process<sup>(1)</sup>.

These learning objects are instruments to support the expansion of access to information by integrating multiple media, languages, and resources, which allow the development of an interactive educational process that articulates theory, practice, and research<sup>(2,3)</sup>.

With regard to the teaching of diagnostic reasoning, it is agreed that educational strategies based on case studies, case reports, and simulations using virtual patients contribute substantially to the development of students' clinical reasoning<sup>(4)</sup>. However, it has also been noted that the use of learning objects and other tools offered by information and communication technologies are potential tools for teaching, learning, and the improvement of clinical reasoning, especially diagnostic reasoning in nursing.

The cognitive process of the preparation of nursing diagnoses, which is com-

monly called diagnostic reasoning, requires a high level of competence in professionals; since it is not a simple activity, it requires monitoring and strict control of thought<sup>(5)</sup>.

Diagnostic reasoning is a complex process resulting from the integration of thought with the data collection, observation, and grouping of information in order to identify, classify, and name the phenomena that are found in different clinical situations<sup>(6)</sup>. This is a cognitive activity that involves not only the generation of hypotheses, but also the constant collection of information about and analysis of the clinical situation coupled with the use of scientific knowledge and professional experience to confirm or reject the hypotheses<sup>(7)</sup>.

Diagnostic reasoning contributes substantially to the development of accurate nursing diagnoses, which reflect the responses of individuals in relation to actual or potential skin problems, which are essential in clinical practice.

Thus, the present study describes the evaluation of a VLO developed to mediate the teaching of nursing diagnostic reasoning, applied to the integumentary system from the perspective of undergraduate nursing students.

## METHOD

This is a descriptive study of the methodological research type applied in production technology. The methodological research aims, through the use of a systematic mode of the existing knowledge, to develop a new intervention, significantly improve a previous one, or even develop and perfect a tool, a device, or a measurement method<sup>(8)</sup>.

For the development of the VLO, each step of the ADDIE model (analysis, design, development, implementation, and evaluation) was followed. This is recommended by the contextualized instructional design (CID), which is defined as the process of planning, development, and systematic use of methods and techniques for educational projects supported by a technology that facilitates the contextualization and functional layout of the subject matter<sup>(9)</sup>.

The site chosen for performing this research was the Department of Nursing at a public university in Piauí. The implementation of the VLO, called "Diagnostic Reasoning in Nursing Applied to the Integumentary System," took place in September and October 2014.

The population consisted of 92 students from the seventh, eighth, and ninth periods of the nursing program of the higher education institution (HEI), with a non-probabilistic sample for convenience. The population included those who were enrolled in the second semester of the nursing course in the year 2014. All students agreed to participate and signed the informed consent form (ICF). Students of these periods were enlisted because they are already familiar with nursing taxonomies and are encouraged to use diagnostic reasoning during the trainee program.

Of the 30 nursing students who agreed to participate and were registered in the Moodle environment of the Distance Education Center (DEC) of the HEI, 21 followed the activities of the four modules of the VLO and responded to the evaluation questionnaire (consisting of an open question and 14 closed questions, of which five were included in order to obtain details of the students, and nine questions were aimed at assessing

the VLO) through a Likert interval scale with the following response alternatives: strongly agree (SA); agree (A); disagree (D); and strongly disagree (SD). The elaborate questionnaire aimed to evaluate the perspectives of nursing students in terms of the importance of content, technology contribution, stimulating learning, the adequacy of the VLO in the virtual environment, and its ability to attract students' interest.

To evaluate the questionnaire, a pilot study with three students from the fifth semester of the nursing course at the HEI who were not part of the study sample was proposed in order to identify students' difficulties in understanding the questions and to assess relevance, sufficiency, and appropriateness issues.

The study was submitted to the Ethics Committee of the Federal University of Piauí and was approved by means of the opinion 745,398. The research was conducted in compliance with the ethical aspects guaranteed by Resolution 466/2012 of the National Health Council. All participants signed an ICF.

## RESULTS

Table 1 illustrates the characterization of the students. The average age of the participating students was 22.3 years; the majority of the students were female (62%). Most of the students (52.4%) used a computer more than five times a week, followed by students who used a computer four to five times per week (33.3%). Notably, 71.4% of the respondents used a computer at home. Furthermore it is important to highlight the low computer use at the university (28.6%); there was no mention of libraries as a place

of greater computer use by students. However, all students reported using the internet as a tool to improve academic performance.

**Table 1:** Characterization of the nursing students who evaluated the VLO. n=21. Teresina, 2014.

Variable	Average	"Distribution in categories"	N (%)
<b>Age (years)</b>			
	21		6(28,6%)
	22		7(33,3%)
	22,3	23	5(23,8%)
		24	1(4,8%)
		25	2(9,5%)
<b>Sex</b>			
	Female		13(62%)
	Male		8(38%)
<b>Computer usage frequency</b>			
	Once a week		1(4,8%)
	Two to three times per week		2(9,5%)
	From four to five times a week		7(33,3%)
	More than five times per week		11(52,4%)
<b>Place where the computer is mostly used</b>			
	Home		15(71,4%)
	University		6(28,6%)
<b>Accesses content from the Internet to improve academic performance</b>			
	Yes		21(100%)
	No		0(0%)

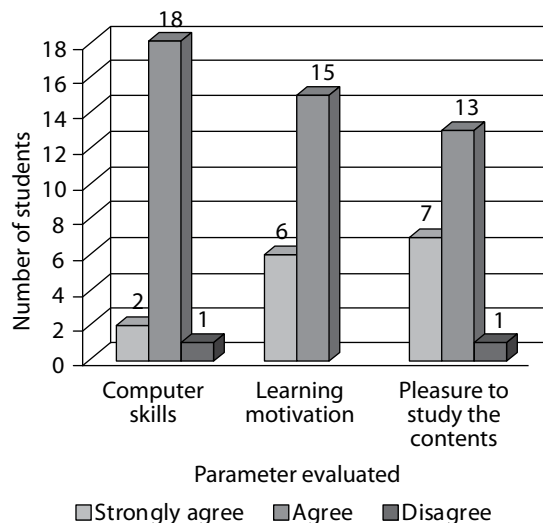
Source: Direct research

Graph 1 represents the evaluation of students in regard to the development parameters of computer usage skills, the motivation of the VLO in relation to learning, and pleasure in studying the VLO's contents. Almost all students (20) agreed that the VLO helped develop or improve computer use skills and only one student disagreed.

For the learning motivation parameter, all students agreed that the developed VLO helped in motivating learning in terms of nursing diagnostic reasoning applied to the integumentary system, with six students strongly agreeing and

15 agreeing. In the last parameter displayed in Graph 2, seven students strongly agreed and 13 agreed that it was pleasant to study the contents of the VLO. There was only one disagreement relating to the assessed item.

**Graph 1:** Distribution of evaluation of the computer usage skills parameters, motivation, and pleasure in studying the content of the VLO by nursing students. n=21. Teresina, 2014.

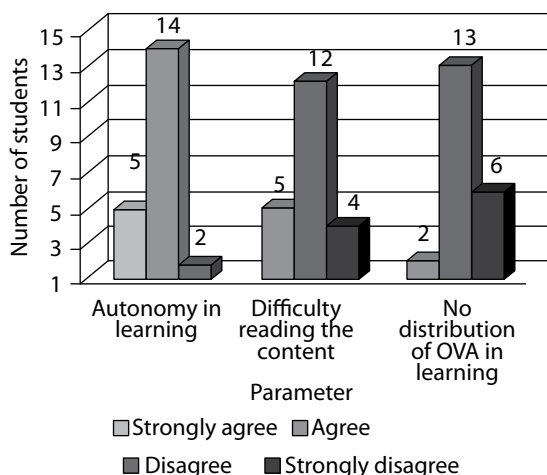


Source: Direct research

When referring to autonomy in learning, five students strongly agreed and 14 students agreed that the VLO gave them autonomy during the learning process of reasoning in "nursing diagnosis applied to the skin and skin appendages" and two students disagreed with the aforementioned parameter. With regard to difficulty reading the above content on the VLO, 16 students disagreed and five students agreed that they had difficulty reading the text of the VLO (Graph 2).

Moreover, Graph 2 illustrates the assessment with regard to the non-contribution of the VLO in learning, in which 19 students disagreed with the referred item and only two students considered that the VLO did not contribute to the learning of diagnostic reasoning in terms of the nursing applied to the integumentary system.

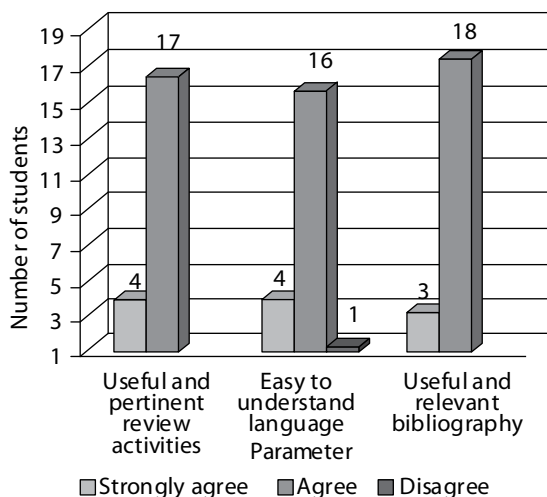
**Graph 2:** Distribution evaluation by nursing students of the following parameters: autonomy, difficulty reading, and non-contribution of the VLO. n=21. Teresina, 2014.



Source: Direct research

Graph 3 shows the evaluation of students in relation to the review activities, language, and bibliography of the VLO.

**Graph 3:** Distribution of evaluation by nursing students of the following parameters: review activities, language, and bibliography of the VLO. n=21. Teresina, 2014.



Source: Direct research

The usefulness and relevance of the review activities were evaluated positively by all students, including four who strongly

agreed and 17 who agreed with the item evaluated.

When considering the language used in the display of the VLO content, 16 students agreed and four strongly agreed that the question was easy to understand. Regarding the bibliography, 18 students agreed that it was useful and pertinent, while three students strongly agreed (Graph 3).

## DISCUSSION

Regarding the age variable, in this study, there was a predominance of young adults with a median age of 22.3 years, which is in line with existing studies in the literature, which notes the predominance (94.4%) of nursing aged between 19 and 25 years<sup>(10)</sup>. It is also in line with another specific study that shows that most of the nursing students (75%) are between 19 and 23 years<sup>(11)</sup>.

Regarding gender, there was a predominance of women (62%) in this study. This is a similar result to that found in the following studies. In particular, most students (94.4%) in the study aimed at evaluating the website of a nursing course were female<sup>(10)</sup>; 93.2% (41) of the participants who evaluated a virtual learning environment in terms of endocrine physiology were female nursing students<sup>(11)</sup>; and a study performed with nursing students at a university in Rio Grande do Sul noted that of those students, 84.5% were female<sup>(12)</sup>. Such findings reflect historical determinants of female predominance in nursing, although there is a growing tendency toward profile change.

With regard to weekly computer usage, there was a predominant frequency (52.4%) of greater than five times a week. Importantly, home use of the computer was reported by 71.4% of participants. Low

prevalence (28.6%) of the university as a place of computer use by students raises the need to increase computer use in educational institutions. These results differ from those found in the study with nursing students from a public university in São Paulo, in which 68.3% used computers to access the internet predominantly at university, and 29.5% reported using the internet predominantly in their homes<sup>(11)</sup>.

Of the students, 100% said they access the internet to improve academic performance. This is a consistent result, but higher than the one found in a study developed with nursing students from the University of Paraná<sup>(13)</sup>, in which 86.1% of nursing students reported using the internet as a technological resource to enhance their knowledge.

It is evident that the use of teaching materials mediated by educational technologies brings significant contributions: autonomy, improved knowledge, and learning. When used by students, healthcare professionals, and patients, such technologies add value and are a promising tool for education in health and in nursing<sup>(14-16)</sup>.

Diagnostic reasoning in nursing requires a questioning attitude in order to direct data collection and rate and group in order to try and infer the actual response of individuals to health problems, as well as assist in decision making. Therefore, the emphasis on the development and evaluation of digital educational materials that address diagnostic reasoning is emerging and such an approach needs to be expanded in the context of HEIs.

## CONCLUSION

According to the students' evaluations, it is clear that the VLO developed to mediate the teaching of diagnostic reasoning in nursing focused on the integumentary system and inserted into the Moodle environment was considered favorable in providing autonomy (19), motivation (21), and pleasure (20) during learning. In addition, 20 students agreed that the VLO presents an easy-to-understand language. All students thought that the educational material offers review activities and a useful and relevant bibliography.

The VLO proved to be potentially effective in supporting the teaching of diagnostic reasoning during the evaluation of the integumentary system. Therefore, it is expected that the VLO contributed to the formation of the students in terms of their nursing education; the VLO expands the horizon of teaching and learning opportunities for diagnostic reasoning applied to the integumentary system and trains future nurses to seek knowledge in critical and reflective ways to help them in the practice of the current context of health.

The content related to diagnostic reasoning in nursing, despite being developed from materials available from international and national literature of health, clinical evidence, and the experiences of the authors, was not previously assessed by nursing experts. This is a limitation of the study; however, we intend to make an extension of the evaluation involving a number of experts.

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