Virtual Learning Environment for Dermatology Education

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Abstract

The electronic resources available for educational use have rapidly developed in recent years, thus increasing the use of new assessment and evaluative pedagogical models. Pre- and post-course testing using a virtual learning environment (VLE) can be useful for analyzing student learning, as well as for evaluating the course itself. This study aimed to identify and evaluate the use by the students of a VLE assessment model as part of a dermatology course at the School of Medical Sciences (SMS) – UNICAMP and to evaluate the course itself.

The research sample included 145 students who were enrolled in the medical degree program in 2015 and 2016. The data was obtained using the Modular Object-Oriented Dynamic Learning Environment (MOODLE) platform, an identification tool containing 10 questions called "Knowing You" and a bank of 80 multiple-choice questions with a similar level of difficulty that had been previously analyzed by residents and dermatology professors. Evaluations were conducted before the beginning of the module (pre-test), shortly after the dermatological practicum (post-test) and at the end of the module (final test). Among the students invited to participate in the study, 81.38% responded to the "Knowing You" questionnaire, and the majority of students displayed good or reasonable knowledge of technology and preferred to study alone at night. Only 2.6% of the students used the VLE. During the assessment step, 50.34% of the participants completed all three tests. The post-practicum test scores were higher than those of the final-module test, which in turn were higher than the pre-module test scores. The analysis was adjusted for the groups in regard to the completion time of the partial post-practicum test. Varying time did not influence the test results among different classes ($p=0.7456$) or among other groups ($p=0.9073$).

The method enabled the creation of tests with a similar degree of difficulty as no significant difference was observed between the groups and students. We observed that few of the students in the medical course at SMS – UNICAMP used the VLE and that the system of assessment was useful for documenting the module learning.
The results also induced changes in the learning model used in the discipline of dermatology, with the goal of better knowledge retention by the end of the module. Therefore, it may be beneficial for students, professors, educational institutions, and development agencies to re-examine their use of VLEs in dermatology education. Questions submitted by dermatology professors from other well-recognized medical schools can be added to the question pool. Thus, this method can also allow for an external evaluation of the discipline or the school.

Keywords: Dermatology, Education, Medical, Educational Measurement

Introduction

Due to profound transformations in the field of information technology and communication (ITC), the development of teaching strategies that train students has become crucial for the formation of increasingly competent professionals.1

Educators committed to a better quality of education need to take into consideration the technologies available to improve the resources used in the classroom to obtain increasingly positive learning results.2

In this context, the development of a virtual learning environment (VLE) that adds ITC components to the teaching-learning process can contribute to the knowledge of working conditions and the limitations and main difficulties of students, thereby offering new didactic actions, correcting distortions, suggesting possibilities, modifying strategies, reviewing methods, and finally, promoting didactic support for students with difficulties.1

For dermatological education in undergraduate medicine courses, the time provided to learn is limited.3 In a survey conducted in Miami and New Haven in the United States of America (USA), interns (medical subspecialists and resident physicians) performed poorly in the diagnosis of skin diseases, indicating that the dermatological abilities of the students were restricted.4

According to Silva,5 Internet-based educational systems represent an alternative to correct this deficiency and offer greater contact between medical students and specializations.

Comparin et al.6 showed that the use of a virtual tool for dermatology education, developed via an interactive website, is as effective as traditional teaching-learning models.

Based on this information, the recognition of different dermatological lesions needs to be valued among the general principles of undergraduate medicine. However, a VLE can create this new reality as a tool that provides, in a critical and committed manner, the construction of knowledge or contributes to the improvement of traditional models.7

The present study aimed to evaluate student contact with a VLE and to use an assessment system for the discipline of dermatology for fourth-year students (out of six school years total) taking a medical course at the School of Medical Sciences (SMS) – UNICAMP.

Methods

The assessments represented the central element of this study, and they were applied online at distinct times, with
The study relied on the participation of fourth-year volunteer students enrolled in a medical course at the SMS at Campinas State University.

This study had two parts: the first was observational, cross-sectional and descriptive, and the second was longitudinal, prospective and analytical.

The aim of the first part was to characterize the target students of the research, and the second part involved observation of the students' knowledge based on the scores they obtained during the disciplinary module (Figure 1).

**Figure 1.** Study design: Student characterization (first step) and three virtual learning environment tests (second step).

For this first step, to characterize the target audience, an identification instrument containing 10 personal questions called "Knowing You" was created.

This instrument was implemented in the Modular Object-Oriented Dynamic Learning Environment (MOODLE) platform together with a pool of 80 multiple-choice questions with similar difficulty, and immediate feedback was
provided (that had been written by professors and previously analyzed by eight residents and another professor of dermatology) that included information pertaining to specific anatomical regions and elementary lesions.

Each student participating in the study completed three assessments containing 10 questions (chosen at random from the question pool and complied using the "Questionnaire" feature of the MOODLE platform).

The assessments were administered before the beginning of the module (pre-test), shortly after the dermatological practicum (post-test) and during the final module (final test). Each of the three assessments presented questions with equal degrees of difficulty, and all questions were randomly selected. After the assessments were performed, exploratory analysis of the data was conducted using summary measures (mean, standard deviation, minimum, median, and maximum). The scores were transformed into ranks and compared by ANOVA for repeated measures to correct for the completion time of the partial post-test. The level of significance considered in the analysis was $5.0\%$.

This study was approved by the Research Ethics Committee of the University of Campinas, reference number: 44632015.8.0000.5404, 13 July 2015.

**Results**

Of the 145 students invited to participate in the study, 118 (81.38%) responded to the "Knowing You" questionnaire consisting of 10 personal questions.

Initially, the students were questioned about their knowledge of technology, and 1.7% had very poor, 5.9% had poor, 45.8% had reasonable, 39.8% had good, and 6.8% had very good knowledge.

Afterwards, when the students were asked which communication tools they had used most frequently to study, 1.7% responded that they had chatted online with others, 2.5% had used the telephone, and 95.8% had used the Internet as a communication tool. The students replied unanimously that they had never used web conferencing or discussion forums as communication tools.

Regarding the use of the Internet, 0.9% of the students responded that they navigated the Internet infrequently or did not know how to navigate it well, and 0.9% said that they navigated the Internet moderately, while 56.4% said they were accustomed to and proficient in Internet use. In addition, 41.9% stated that they were highly proficient in Internet use. None of the participants responded that they had never used or did not know how to navigate the Internet.

When asked about the manner in which they prefer to study, 0.9% of the students showed a preference to study in groups, 11.0% preferred to study in pairs, and 88.1% preferred to study alone.

Regarding the preferred time to study, 7.7% favored early morning, 42.7% favored night, 24.8% favored afternoon, and 24.8% favored morning.

Regarding the forum tools and discussion lists, 85.6% stated that they did not use them, and only 14.4% reported their participation.

For the distance learning courses, 64.7% of the students reported that they had never participated in any of these courses, 9.5% had participated in self-taught classes (without an instructor), 6.9% had participated in simulation
laboratories, 4.3% had participated in hybrid classes (online and in-class), 3.5% had participated in some type of distance learning class with an instructor, 2.6% had participated in VLE classes, 2.6% had also participated in video-conference classes, 0.9% had participated in some other form of distance learning class, and 5.2% had participated in other types of classes.

Regarding the evaluation of the VLE and its help in collaborative work, 64.4% stated that they partially favored this type of work, 30.5% fully favored this type of work, and 5.1% did not have a preference.

When questioned about the advantages of taking online courses, 36.4% of the students stated that schedule flexibility was the greatest advantage, 30.5% stated that the possibility to learn at their own pace was the greatest advantage, 20.3% emphasized the benefit of self-learning, 9.3% stated diversification of study places was the greatest advantage, 2.5% viewed the tools that provide the exchange of information among participants to be the most advantageous aspect of online courses, and 0.9% stated other advantages. No participants mentioned saving money as a significant factor.

Finally, when asked in which contexts they preferred to take a distance course, regardless of any possible difficulties, 81.4% preferred the home, 16.1% preferred environments such as the library or study rooms, 0.9% indicated class recesses, and 1.7% preferred other environments.

Regarding the evaluation step, 50.34% of the participants performed all three tests. The analysis was adjusted for the completion time of the partial post-test for all the groups.

Varying time did not influence the results of the tests administered among the different classes (p=0.7456) or among the groups (p=0.9073).

Regardless of the group, the partial post-test scores were significantly higher than those of the pre-test and those of the final test. The final test scores were higher than the pre-test scores.

**Discussion**

From the results of the "Knowing You" questionnaire, we observed that the majority of students displayed good or reasonable knowledge of technology. This number may be related to the fact that they have grown up with technology as a part of their lives since childhood. Technological resources allow young people to be continuously connected to information by controlling its flow and managing discontinuous and simultaneous information.

We also observed that forum and/or discussion lists are tools that were hardly used by the students in the study; 85.6% said they would not use these tools.

Forums and discussion lists are currently frequently used in higher education. However, in the educational context, it is still necessary to cultivate proper regulations for their use. A study conducted in Portugal at the Technical Institute of Braganca and the University of Minho showed promising results regarding the use of these tools.

Although the use of VLE has increased in recent years, only 2.6% of the students that participated in this study reported having experience in this area.

Regarding the virtual evaluation, the MOODLE platform was very efficient in fulfilling its purpose. Three tests were performed, including the pre-test, partial post-test, and final test, at different times. All tests had immediate feedback.
with expectations of formative character.

MOODLE is an important didactic tool that provides teachers with diverse evaluative resources and provides students with a dynamic learning space aimed at social development, the promotion of mutual collaboration among participants, cooperation, and the exchange and sharing of diverse information that can be used with distant learning in the classroom or in hybrid classes\textsuperscript{17}. The tests created using the platform were based on the need to improve the student assessment process, as well as evaluation of the discipline of dermatology as part of the medical course at SMS – UNICAMP. All tests presented equally difficult questions and were randomly selected. In this manner, a question used for the students in a pre-test could have been used for the post-test or final test in another group.

Currently, curriculums are based on learning cycles and skill development. Educators work with the objective of being accountable for each other's work. In this context, a formative assessment benefits professors in terms of the organization of groups, selection of activities, or elaboration of methods. This assessment requires instruments for monitoring and attending to diversity, for example, that of a student's portfolio. In this case, technologies can also make this contribution\textsuperscript{18,19}.

Completed pre-tests in the discipline allowed for a clearer assessment of the student's previous knowledge in relation to the working themes across the outpatient specialization practicum. After applying the evaluation with ten multiple-choice questions describing elementary dermatological lesions on a scale from zero to ten, an average score of 6.4 was obtained. This result showed that the subjects addressed in disciplines taught in previous years, such as integrated pathophysiology and medical semiology, were consolidated and put into practice when appropriately required.

Immediately after the end of the practicum in the discipline, these same students were reassessed and demonstrated an even better performance. The post-practicum test had an average score of 8.0, evidencing a greater accumulation of knowledge. However, when the students were assessed again at the end of the module after all groups took the practicum, a decrease in the students' level of knowledge was observed, with an average score of 7.2. This decrease was predicted because it is natural that some information will be forgotten.

Concerning the difficulties, most students included finding a place in the course program to apply the tests. Another difficulty was related to the students' participation in the study, considering that a significant number of volunteers who proposed to participate in the study were absent for at least one of the tests.

Other major advances made possible by this study (after analyzing the obtained data) were the revision of the pedagogical model for the discipline of dermatology, readjustment of the hours between the theoretical and practical classes (recognizing that the theoretical classes were followed by practical lessons but without a relationship between them, thus negatively impacting the practice of theory) and the use of virtual assessment with the MOODLE platform in the internal institutional evaluation process. Multiple-choice questions submitted by dermatology professors from other well-recognized medical schools can be added to the question pool. This new methodology can allow for an external evaluation of the discipline or the school.

In the world of education, it is crucial that educational institutions are willing to learn and implement new tools in both the learning and evaluation processes.

**Conclusion**
The vast majority of student participants in this study displayed good or reasonable knowledge of technology and preferred to study alone and at night. Only 2.6% of the students had used a VLE.

One VLE was developed and proved to be efficient. Using this VLE, it was also possible to structure and apply the questionnaires to evaluate both the students and the discipline of dermatology itself.

The diagnostic assessment with immediate feedback fulfilled the students’ formative roles. The results induced a change in the pedagogical model for the discipline of dermatology, accomplishing the goal of improved retention of knowledge by the end of the practicum. Therefore, it could be useful for students, teachers, educational institutions, and development agencies to re-evaluate the methods that use the same methodology.

The interface and functionalities of the tool used fully met expectations, making it possible to understand the needs of the students involved and to review the pedagogical planning for the discipline.

Therefore, VLEs contribute to the teaching-learning process in dermatology and are also useful instruments with which to evaluate institutions.

**Take Home Messages**

The electronic resources available for educational use have rapidly developed in recent years, thus increasing the use of new assessment tools and evaluative pedagogical models. This study aimed to evaluate student contact with a virtual learning environment (VLE) and to use an assessment system to evaluate the dermatology medical course at the School of Medical Sciences (SMS) – UNICAMP. The study population was composed of 145 students who enrolled in the medical course in 2015 and 2016. The data were obtained using the Modular Object-Oriented Dynamic Learning Environment (MOODLE) platform, an identification tool called "Knowing You" and a bank of 80 multiple-choice questions with a similar level of difficulty. Among the students invited to participate in the study, 81.38% responded to the "Knowing You" questionnaire. Only 2.6% of the students used the VLE to study. During the assessment step, 50.34% of the participants completed all three tests (pre-, post-, and final tests). The post-practicum test scores were higher than the final-module test scores, which in turn were higher than the pre-module test scores. The method enabled the creation of tests with a similar degree of difficulty from a question pool. Professors from other well-recognized medical schools can provide questions to the pool, and this method can be used as an external institutional evaluation tool. The results promoted a change in the learning model used in the discipline of dermatology, with the goal of better retention of knowledge by the end of the module.

**Notes On Contributors**

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Appendices

Declarations

The author has declared that there are no conflicts of interest.

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