

TOWARDS THE DEVELOPMENT OF SKILLS IN MEDICAL EDUCATION: “THE VIRTUAL QUIZ IDENTIFICATION STATION”

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The imaging and sectional anatomy “Virtual Quiz Identification Station”, a Clinical Anatomy tool created in 2007/2008 academic year, in the ambit of the Clinical Anatomy Curricular Unit (2nd year/2nd semester) of the Medical Course in the Faculty of Medicine of the University of Porto (FMUP) gives specific training for real assessment of anatomical structures. Integrated in WebCT Vista, it consists of an animation, built in Adobe Flash 8, which includes, randomly, 40 images of a total of 2500. The importance of the “Virtual Quiz” was confirmed by the students’ results in the Clinical Anatomy practical examination. The ones who had used this tool succeeded in getting a much better performance than the ones who had not used it. In fact, the “Virtual Quiz” showed to be of major importance for the teaching/learning programs of Anatomy in our Medical Course.

Keywords - Virtual Quiz; Clinical anatomy; Identification station; e-learning

1 INTRODUCTION

Introduced in different medical curricula all over the world, Clinical Anatomy is considered highly relevant for future physicians, as it provides basic anatomical knowledge to health professionals [1]. Recognized as a strong foundation of clinical medicine, it has the purpose of providing solid anatomical background, reinforcing the significance of functional and living anatomy, normal variation, three-dimensional relationships and imaging applied to medical practice, in order to meet the emerging challenges of clinical practice. In addition, Clinical Anatomy promotes critical thinking [2], crucial for the acquisition of clinical reasoning. Ultimately, this area of knowledge contributes to linking basic and clinical areas in Medical Education [3, 4], providing some certainty that students start their clinical training with anatomical knowledge, essential to the physical examination of patients, diseases’ diagnosis and some clinical procedures.

Anatomy is the biomedical discipline that has benefited the most from the new technologies regarding the visualization and knowledge representation [7, 8, 9]. This discipline grants students the knowledge and comprehension of the three-dimensional (3-D) dynamic structure of the human living body, so that they may quickly apply the appropriate cognitive skills to clinical problems whenever it is necessary [1, 5, 6]. Particularly, in the interpretation of radiological and sectional anatomy material in current medical practice, these cognitive skills are essential.

Recent years have been marked by computer science evolution that has created new learning and teaching opportunities. In fact, despite the heavy tradition in classical pedagogical methods, the use of online materials in support of medical courses has become common.

Considering the importance of promoting self-directed active learning attitudes in medical students [10, 11, 12, 13], and the fact that computer technology in education is more and more adopted, the imaging and sectional Anatomy Identification Station - “Virtual Quiz” - allows the improvement of the acquisition of a correct “anatomical reasoning” by medical students.

In the context of the Bologna process, the Clinical Anatomy Curricular Unit of the Medical Course in the Faculty of Medicine of the University of Porto (FMUP), supported by the Office of Support for New Technologies in Education, developed this new teaching resource, integrated in the WebCT Vista.

Students attending Clinical Anatomy (2nd year/2nd semester) during 2007/2008 academic year benefited from this learning object.

The syllabus of Clinical Anatomy before Bologna Process was supported online by tools and materials that were not so interactive. The learning content management system was used as a repository and not in its full pedagogical potential [14, 15].

Virtual tools allow a specific imaging and sectional anatomy training that promotes the development of not only active learning, but also training for practical assessment of anatomical structures' identification, which is of crucial importance for medical students. It leads to excellence in the learning process of the area of Medical Education and to the achievement of anatomical competence, which is essential for the clinical reasoning [16].

Considering the above, we defined the following purposes for this study:

- (i) to actively follow the teaching/learning process;
- (ii) to stimulate the use of electronic resources;
- (iii) to promote interactivity between the teaching staff and students;
- (iv) to provide training of specific competencies;
- (v) to provide objectivity in the identification of anatomical structures with immediate feed-back;
- (vi) to improve academic success;
- (vii) to transfer knowledge to other educational scenarios (Medical Schools in African Portuguese Speaking Countries – EDULINK Project).

2 METHODS

In order to create the “Virtual Quiz”, photographs of used human dissected material and body sections, belonging to the Institute of Anatomy of the Faculty of Medicine of the University of Porto, were taken. Imaging material used for practical sessions (x-rays, cross-sectional CT scans and MRIs) and a few authorized photos of sectional anatomy were also used.

The e-learning platforms, as well as pedagogical and technological support, were assured by the Office of Support for New Technologies in Education of University of Porto.

The “Virtual Quiz” consists of an animation, built in Adobe Flash 8, which includes, randomly, 40 images of a total of 2500. To each one of these images (labelled structure) there is a correct answer. The student has a minute to answer each set of 2 images. Then, a sound, similar to the sound the students hear during their “real” practical examination, is heard and the page advances automatically to the following set of images. After viewing and identifying the 40 anatomical structures the result appears and the student can check his/her answers and compare them with the correct ones (immediate feed-back).

This tool, being exported to a SCORM package, allows the transposition of the final grade to the Learning Management System (LMS); the teachers have access to individualized information as well as to the integration of the grading board of the LMS that contains the global performance of the student in all the online activities through the course. As the “Virtual Quiz” is an instrument that can work dissociated from a LMS, it can be used online and offline.

The “Virtual Quiz” exists in two versions: the first one including only head and neck, and the final one including the total units of the program: head/neck, thorax, abdomen, pelvis/perineum, back and limbs.

A pelvis/perineum mini-“Virtual Quiz” is currently under development, and will be used in a course for Medical training in Africa as a result of a cooperation programme established with Angola and Mozambique Universities.

3 RESULTS

The online platform was consulted by 272 students (89,5%) from 304 registered, most of them having used it at home, through their personal computers. Students have, in general, medium level skills in informatics and deal with the computer for research subjects, participation in forum sessions, chats and e-mails. The qualitative analysis of questionnaires assessing satisfaction levels was very positive,

considering the online component support performance in Clinical Anatomy. Nevertheless, the level of interactivity student/teacher was far from the expected, although the level of interactivity between student/teacher has to be improved.

Taking as reference the students who have performed the final exam in Clinical Anatomy, 44.3% performed the first version of the “Virtual Quiz” Identification Station (head and neck) and 73.2% have performed at least once the final version of the “Virtual Quiz” Identification Station.

A positive significant correlation was obtained between the number of sessions and the classification obtained in the practical assessment (identification of structures) ($\rho=0,23$, $p<0,001$). (Fig. 1)

Comparing the results obtained by the students who completed the first version of the “Virtual Quiz” Identification Station with those who did not, it was demonstrated that the first obtained higher classifications in the practical examination. (average grade=15,0 vs 14,1; $p=0,014$).

No differences were found in the assessment of the theoretical exam (average grade = 12,0 vs 12,3; $p=0,314$). (Fig. 1)

When the comparison was made between students that performed the final version of the “Virtual Quiz” with those who did not performed, the same situation was demonstrated. (average grade=14,7 vs 13,9, $p=0,040$)

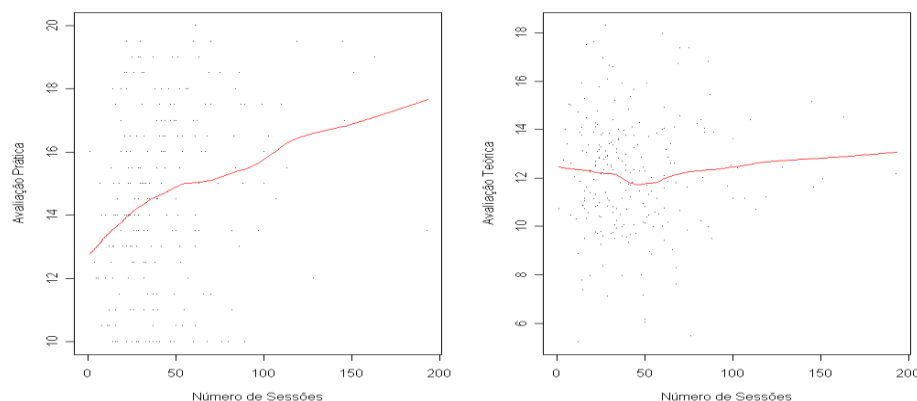


Fig. 1 – Number of sessions and grading of the practical (left) and theoretical exam (right).

4 DISCUSSION AND CONCLUSIONS

Our results demonstrate the adequacy and importance of developing new tools in programs of Anatomy in Medical Education – fitting real education situations and in the scope of a teaching/learning context – even in a field that offers a lot of materials. These findings are supported by equivalent research in other fields [9, 12, 13]. The students consider that the “Virtual Quiz” is an important tool, since it promotes active learning and feedback is quickly available. Another point is that it has the advantage of being extremely flexible to be used in other learning contexts and also to be offered to Master and PhD programs that include identification of anatomical structures. Linking these important issues to the correlation with improvement of academic performance, we show that this instrument is a valuable resource in the teaching/learning programs of the Medical Course.

The development of this tool is part of a holistic strategy in Clinical Anatomy pedagogical approach [14, 15, 17], which can foresee new changes in the curricular development of the Medical Course.

The effective use of this instrument can be exported to other educational contexts, where identification of anatomical structures is included in the learning process. As an example, there are currently cooperation projects ongoing with Medical Schools of Portuguese speaking countries, as the recently awarded EDULINK Project “A NAME for Health”.

The e-learning@UP project promotes a National and International network between the teaching staff interested in Information and Communication Technologies applied to the educational process. In this context, a background has been created to develop new tools like “Virtual Quiz” identification station,

which is used not only as a complement to the learning process but also as assessment training station and, in a near future, as an assessment device.

The materials were increasingly improved, specially in terms of e-learning potentialities, in order to deal with educational pressures imposed with a view to the development of the required “anatomical thinking”, which depends on:

- (i) pressure from clinical departments towards the need of solid anatomical competencies;
- (ii) the evidence that clinical competencies have to be achieved early in the medical course;
- (iii) the stimuli induced by introducing clinical scenarios in the first years of medical education towards the acquisition of medical expertise;
- (iv) the means of attracting clinical professional to teach this basic science [1, 18].

The academic year 2007/2008 was marked by the great challenge of developing of a tool to be used in a virtual environment to support students in the identification of anatomical structures, which is part of the evaluation process of Clinical Anatomy. The original anatomical dissections, as well as the imaging material used in the practical sessions, were provided by the Institute of Anatomy. Students evaluated the “Virtual Quiz” Identification Station, assumed as a “Virtual Training Station”, as “useful” in the view of expertise acquisition, and in order to develop clinical reasoning since the beginning of the Medical Course [10]. Moreover, we suggest that this frequent use of this recently developed tool will guarantee that medical students are able to more confidently identify anatomical structures when they start the clinical training, and deal with new technological challenges.

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