

Production of online educational resources for the teaching and learning of veterinary anatomy

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Abstract

Anatomy atlases adapted to the web environment are tools for permanent consultation and support for study which enable the problems of traditional teaching on the Veterinary Anatomy course to be overcome. Their production involved the creation of a digital image bank using high quality dissections. The images were archived in PDF format and labelled using the Adobe Acrobat program and linked to a website that enabled learning to take place according to a logical sequence. The Atlases have been published on the Virtual Veterinary Medicine platform of the UAB Faculty of Veterinary Medicine and can also be presented in CD-ROM format. They are easily accessible teaching resources, with permanent and cheap access, and are very highly rated by students. Their use may lead to a decline in presence learning and facilitate adaptation to the European Higher Education Area (EHEA).

General area of interest of this innovation

This innovation is suitable for teachers of subjects being adapted to the EHEA who are interested in information and communication technologies as a teaching support tool. The experience presented here may be particularly useful in subjects where a great deal of images are used, such as the Morphological Sciences.

1. Objectives

In recent years, we at the Anatomy Unit of the UAB Faculty of Veterinary Medicine have considered how to adapt the course to the EHEA, and also tried to solve some of the problems inherent in the teaching and learning of Veterinary Anatomy.

The objectives we propose are to place teaching resources that can be consulted on an ongoing basis at the student's disposal. These are an alternative to traditional attendance-based teaching, reduce the role of the teacher to acting as a mere transmitter of knowledge, and improve and innovate such attendance-based teaching with support initiatives using a distance-based medium.

2. Description of the project

2.1. Current context

The Veterinary Medicine course at the *Universitat Autònoma de Barcelona* has been included in the pilot plan for EHEA adaptation since the 2004-05 academic year. The main purpose of this plan is to adapt the structure of studies to the new regulatory and methodological framework included in the Bologna process. In specific terms, Veterinary Anatomy is a subject with content that is included in the courses of Anatomy I and Anatomy II, which are taught in the first and second six months respectively of the first year of the Veterinary Medicine degree course. The two courses account for a total of 22.5 credits, and involve 225 hours of theoretical and practical presence learning, and 19 ECTS, which involves approximately 475 hours of work by the student. It is therefore a subject that entails a significant workload for the student. The practical classes in the subject are a very important part of the total study and work load, as they account for more than 50% of the total classes and student's work.

2.2. Situation affected by the teaching innovation

Among the main problems involved in the traditional teaching of Veterinary Anatomy is the inevitable lack of teaching hours, at least in attendance-based teaching, due to the change in the educational philosophy of the new Study Plans. The recent introduction of the European credits system, which is based more on the student's personal work than on the hours spent by teachers and students in the classroom, means that there is an emphasis on the time that students spend on their own learning. The student assumes a more central role and is no longer merely a passive receiver of content during class time, and takes on a more participatory role and becomes an active part of his/her own learning. It is therefore obvious that according to the above, increased methodological diversity and greater flexibility in types of learning are necessary in this new situation. One of the measures of adaptation to the European system of credits is that libraries must increase their importance as a teaching support service, and information and communication technologies (ICTs) must play a predominant role and must be integrated into teaching. The creation of specific resources, such as designing websites with didactic content which help in the teaching and learning process, can facilitate autonomous and active distance learning, and increase the student's role in the educational process.

Traditionally, a great deal of the time allocated to practical activities in Veterinary Anatomy is spent on carrying out dissections of the bodies of dogs. These practical sessions are undoubtedly of educational value but also have clear disadvantages, as their full potential is not always exploited by students. The systematic dissection of the body takes up a great deal of time, and the work done by the students is also obviously not of high quality due to the lack of time, their obvious inexperience or because the groups in which they work are larger than would be desirable. Furthermore, the dissection of the body is of a conservative nature, as it attempts to preserve the structures as much as possible, and this means that the student often does not gain a clear idea of the arrangement of the structures and does not clearly understand their function. A further problem is that in order to avoid exposure to toxic products and deterioration of the preparations, students obviously cannot have permanent access in order to look at and study the dissections performed. This means that what is learnt in the Dissection Room is often quickly forgotten due to the impossibility of it being reviewed on a regular basis. The innovation presented here gives students access to a didactic resource that can be consulted at all times with easy access, and which can make at least a partial contribution to relieving the problems of traditional anatomy teaching.

3. Methodology

The first step in the preparation of the Anatomy Atlas was the production of high quality anatomical preparations (prosections). The prosections were photographed in order to create an extensive bank of digital images. The most representative images, which were selected and archived in PDF format, were appropriately labelled using the Adobe Acrobat® program, for which the UAB has a Campus licence. The list of anatomical items of interest was shown in each image, and all the details necessary for correct interpretation by the student of the prosection presented. The features of the program make some degree of interactivity possible, as it is possible to access the images either with or without the labels displayed. This enables the Atlas also to be used as a tool that makes self-directed learning and self-assessment possible.

The images were linked to a website produced using a website editing program, which allowed the documents to be organised in such a way that readers—the students in this case—had fast and user-friendly access to the general contents of the page and to the table of contents of the images. Hyperlinks were created which facilitated location of the various sections of text that act as a theme for the document, and enabled the various images placed at the student's disposal to be arrived at simply and in different ways. The organisation and presentation of the website was such that by using an explanatory text, students were able to access it quickly and see the image chosen and return to the text quickly. An alternative possibility

is independent access from the page to each of the images, regardless of the text; In this case, the images were ordered using a progressive logical sequence, from the most superficial to the deepest, and from the proximal to the distal regions. The structure of the website also enables the content to be updated quickly. Its structure is versatile enough so that it can be changed, with materials added or replaced, in a very simple way. The way it presents didactic material means that it is also appropriate for presentation on a CD-ROM.

The Atlases were published and made available to students on the Virtual Veterinary Medicine platform of the UAB Faculty of Veterinary Medicine. The series of websites gives access to several hundred images with notes covering various topics in the field of Anatomy and Embryology, which are illustrative of the practical sessions carried out in dissection rooms.

The students were also consulted with regard to the level of acceptance of the didactic materials made available to them, and the grades obtained in recent academic years were also monitored.

4. Results

4.1. Educational resources produced

The following works have been published in recent years in a digital medium on the UAB Virtual Veterinary Medicine platform:

Muscles of the limbs of the dog. Virtual atlas.

<http://minnie.uab.es/~veteri/21197/atlas/inicio.htm>

Muscles of the dog: Neck, trunk and tail. Virtual atlas.

<http://minnie.uab.es/~veteri/21202/inicio.htm>

Atlas of the preimplantational embryonic development of domestic mammals.

http://minnie.uab.es/~veteri/21197/embriologia_atlas/AtlasText.html

The limbs of the dog: Innervation and vascularization. Virtual atlas.

<http://minnie.uab.es/~veteri/21197/AIVM/inicio.html>

The general appearance of the websites is shown in Figures 1 to 4.

Figure 1. General appearance of the website. The general contents and image contents appear on the left of the document. The hyperlinks for the contents enable browsing in the main document, and located on the right of the screen, and in the images, included in independent files



Figure 2. General appearance of the website. The text acts as a theme for the document and allows the student to access the various images available simply and by different routes

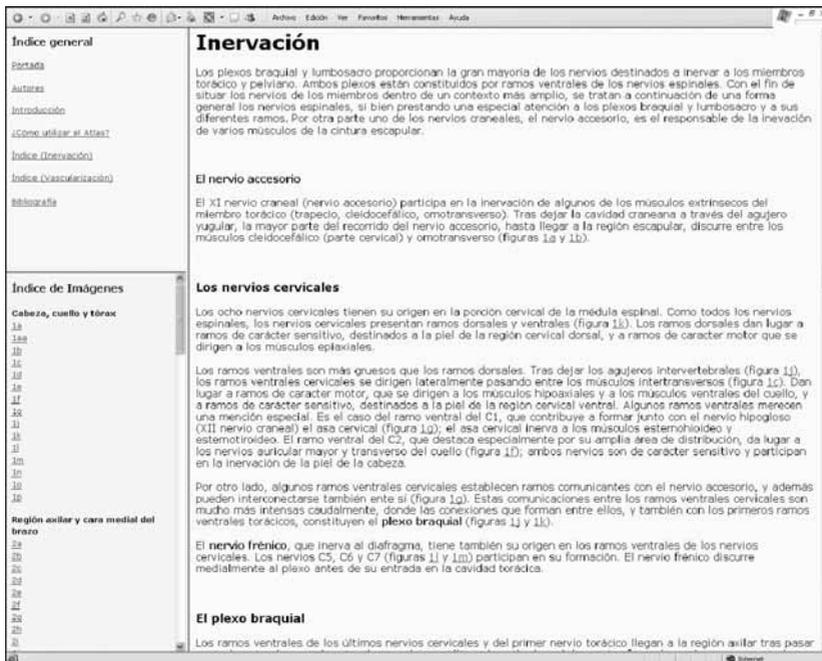


Figure 3. Image in PDF format showing a dissection of the lower limb of the dog, showing various anatomical structures marked with letters and numbers. The images were labelled and titles were added using the Adobe Acrobat® program, for which the UAB has a Campus licence. The labels are folded (cf. Figure 4)

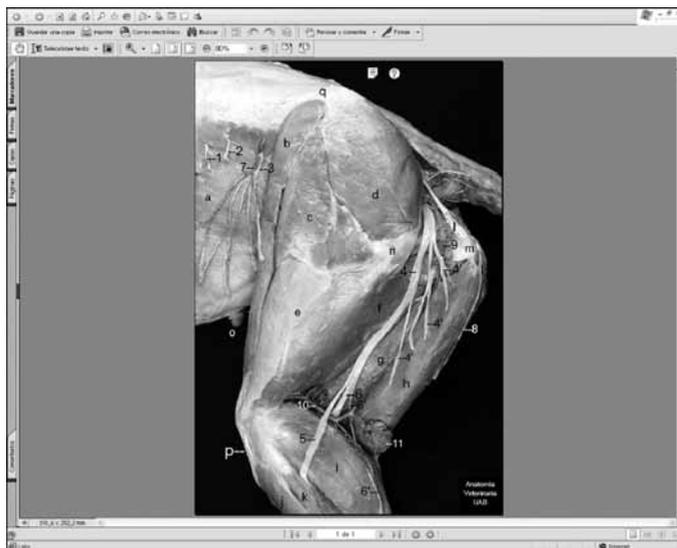
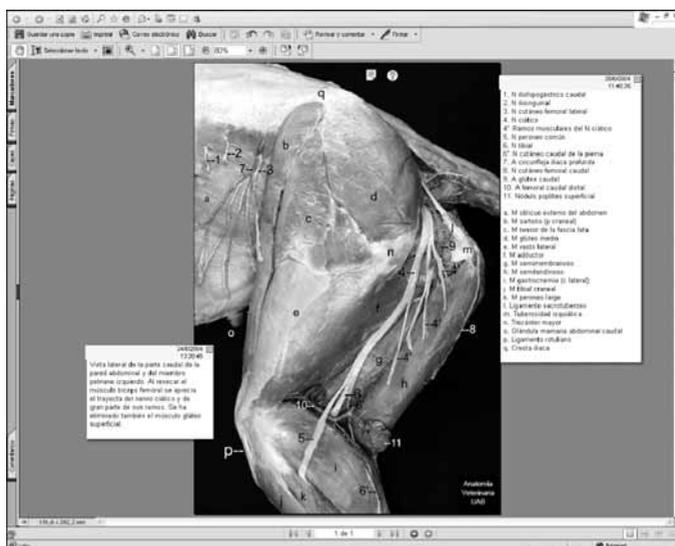


Figure 4. The image shows the same dissection as in figure 3, but in this case the labels have been unfolded in order to be able to identify the various structures and ascertain how the dissection was performed



4.2. Assessment by the students

In order to find out the opinion of the students of the educational materials produced, they were given a questionnaire that included various questions on the Anatomy teaching resources made available to them before the end of the teaching period of the 2004-05 and 2006-07 academic years. Analysis of the surveys showed that the students rated the online publication of the Anatomy Atlases very highly as a means of support for their studies. An almost unanimous majority of those surveyed rated their interest in these resources in their learning process as high or very high (Figure 5). The frequency of use is also high (Figure 6). Of particular note is the frequency of use of the online Atlases, which was significantly higher in the 2006-07 academic year than in the 2004-05 academic year. This is undoubtedly related to the continuous assessment methodologies introduced in the 06-07 academic year, which stimulate more frequent consultation of educational materials.

Figure 5. Students' assessment of the materials in the subject Anatomy I in the 2006-07 academic year. 1: very low rating, 5: very high rating. n=144

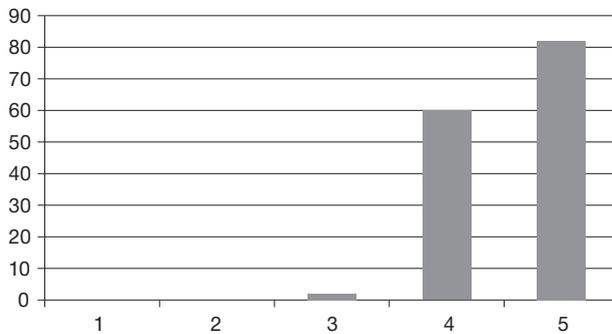
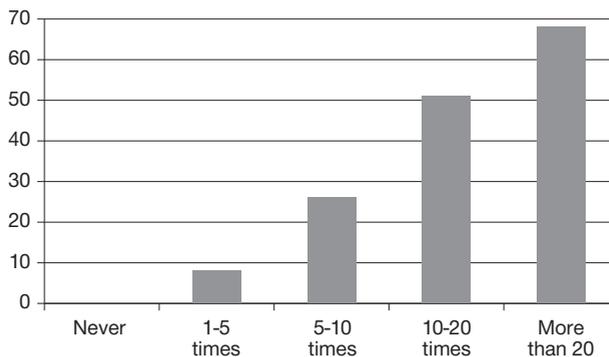


Figure 6. Frequency of use of the materials in the subject Anatomy I in the 2006-07 academic year. n=144



When those surveyed were asked how they rated the quality of the images presented, or whether the presentation format of the material was the most appropriate, 92.5 % of the responses said that the images were good or very good, and a slightly smaller proportion, 80 %, said that the presentation format for the material was appropriate or very appropriate. Most of the students registered - 73 % - used the books recommended in the teaching guide for the subject and the online Anatomy Atlases as a complement to the theory classes or practical sessions.

Ease of access to the online material was frequently determined by the computer equipment that the students had in their own home. In the 2006-07 academic year, 2.8 % of those surveyed still did not have a computer in their home, and 7 % had a computer but still did not have an Internet connection; 15 % said they had a normal connection and finally 75 % had an ADSL connection. The latter figure differs significantly from that recorded in 2004-05, when only 52 % of the total registered students had broad band connections. Finally, when the students were consulted as to whether they would prefer to have the material on another type of medium, only 35 % said that having the material on the Internet was sufficient; 43 % would have preferred to have had a CD-ROM, and 22 % said they would have preferred to have the document on paper, even if this had involved them making a financial payment. Obviously, having a good computer with an ADSL connection is important for getting the most out of online resources; furthermore, the data obtained infers that a large percentage of students prefer not to depend on the fluctuations of the Internet, and for many of them, studying directly on the computer screen is not a comfortable experience.

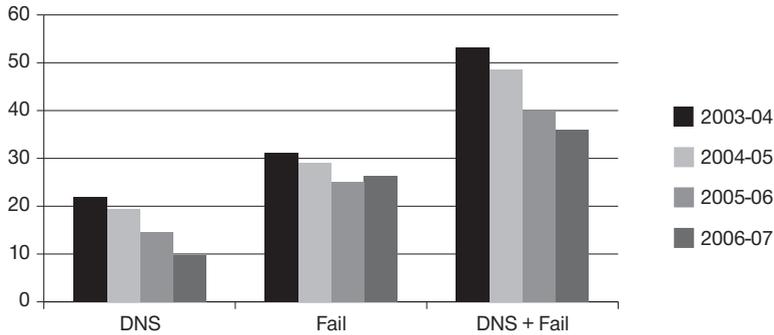
4.3. Academic results obtained

Analysis of the students' academic results shows how they improve slowly compared to those obtained in previous years (Figure 7). However, merely introducing the ICTs does not significantly change teaching if changes in pedagogical practices are not also taken into consideration (Cebrián, 2003). In accordance with this approach, we believe that the improvement in the results is Not due to merely and simply to the educational materials made available to the students, but also to the introduction of continuous assessment in recent academic years, after the beginning of adaptation of the subject to the EHEA. We feel that the Atlases presented here will enable different types of continuous educational assessment managed over the Internet to be introduced. This has been seen to be an effective strategy in encouraging students' learning (Cebrián, 2003).

5. Conclusions

The publication of the Anatomy Atlases on the UAB Virtual Veterinary Medicine platform makes them an easily accessible didactic resource, with a low financial cost and permanent access, which students can consult at any time, both at the faculty and at

Figure 7. Academic results obtained in the Anatomy I subject. The percentages of Did Not Sit (DNS) and Fails (Fail), and therefore the percentage of students who did not pass the subject has fallen in recent academic years with the introduction of continuous assessment methods, which has led to a clear improvement in results.



home, using any computer connected to the Internet. Their use leads to a reduction in the dependence on attendance-based teaching in Veterinary Anatomy, and also decreases dependence on learning in the Dissection Room and the limitations of space and time that this entails. When the teaching resource is well presented and well produced, it is very highly rated by the students, although its use is only optimised when the student has the appropriate computer equipment. The use of this didactic instrument can promote self-directed learning and facilitate the introduction of continuous educational assessment strategies. These materials may be a useful tool in the process of adaptation of the subject to the EHEA.

We are planning to publish more Atlases that cover the existing range of content in the future. Furthermore, now we are moving towards education that is more focused on the student, in which the role of the teacher is changing. Teachers will no longer play the central role and instead become facilitators of the learning process. It therefore seems appropriate to add a list of learning objectives that is well-structured and feasible in the time available to the online material. It would also be advisable to include self-assessment trials in the document in order that students can see whether they are reaching the educational objectives set for themselves.

References

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Interesting link

- Innovation website: <http://quiro.uab.es/>

Keywords

Veterinary anatomy, education, computer-aided learning, ICTs.

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Supplementary materials on the CD-ROM

Demonstration of the VIRTUAL VET website: tour of the virtual collection of images taken from dissections for the Anatomy I course.

Project leader

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Presentation of the project leader

The head of the project has been a Professor in the area of Anatomy and Compared Pathological Anatomy since 1984. He has been a Full Professor since 1993 and in various academic years, he has been the head of the subjects Anatomy I, Anatomy II and Clinical Anatomy of the UAB Veterinary Medicine Degree Course. He has been a Qualification Co-ordinator and Facilitator of the Pilot Plan for adaptation of Veterinary Medicine studies to the EHEA. He is currently vice-dean of Teaching in the UAB Faculty of Veterinary Medicine.

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