



# ADVENT OF TECHNOLOGY IN TEACHING ANATOMY

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Veterinary Anatomy is a basic subject in the study of Veterinary Medicine and related biomedical sciences. The anatomy laboratory, for example, is an ideal environment for growing and assessing early skills and introduces students to the need for communicating effectively with each other and the staff. The use of peer-assisted learning, team-based learning, and near-peer teaching have been shown as methods that can promote development of communication skills as well as the required anatomical knowledge and understanding

Anatomy education has been persistently controversial with concern over its significance and its teaching standards in medical schools. After a decline for many years, concern that anatomy teaching has fallen below a safe level has been loudly echoed by Warner and Rizzolo (2006) and Turney (2007).

Cultural changes, scientific progress, and new directions in veterinary education have modified the role of dissection in teaching anatomy in Veterinary colleges. In order to understand the present situation, it is necessary to mention some important facts that have changed the way in which anatomy is taught and also to analyze the role of the dissection in this process.

"Dissections are essential as they give students a hands-on experience of learning animal anatomy. There is no way one would fully deserve a degree in zoology without ever touching an animal," says Vartika Mathur, a zoologist at Sri Venkateswara College,

University of Delhi. India is following a global trend to phase out animal dissection, or to make it voluntary, despite opposition from scientists who say that the experience is impossible to replicate with models (Priya, 2011)

India's ban comes after pressure from animal-rights groups such as the Indian arm of PETA (People for the Ethical Treatment of Animals), based in Mumbai. The new rules promote the use of plastic replicas or computer models and allow animal dissection only as a last resort.

## Computerized teaching

Teaching anatomy with computerized learning packages will help the students to know exactly what to expect beforehand and how to best spend limited time in the dissection room (Collins, 2008). The future of anatomy teaching must rely more on visual aids outside the dissection room as students who accessed web-based computer-aided instruction resources scored significantly higher on examinations than those who never accessed the online



**Fig.1.** Model showing internal organs in dog.  
(Courtsey: opensource.wdka.nl)

1. Professor



Fig. 2. "The Haptic cow". (Courtesy: www.wired.com)

content (Mc Nulty *et al.*, 2009). Well-designed educational software can encourage a high conceptual level of understanding as well as increase understanding of the specific topics being addressed. In a virtual dissection of anatomy program, students can perform tasks at their own pace, repeating as necessary (Martinson and Jukes, 2005).

One anatomy program that uses modern technology very successfully to enhance learning is ProDissector Frog (Schneider and Morse, 2005). This innovative program offers the capability of controlling the opacity of organ systems within a composite layered image so that their spatial relationship can be effectively visualized.

A multimedia CD-rom on "Regional Dissection of Ox" has been developed in Tamilnadu Veterinary and Animal Sciences University with high quality videographs and with an audio on live dissection procedure captured region-wise. Radiographic, arthrology images and a self-assessment quiz are the added features of the CD (Geetha *et al.*, 2006)

### Models and Mannequins

These alternatives comprise synthetic training objects—designed to replicate or simulate organs, limbs, or whole animals and apparatus for simulating physiological functions and for the teaching of clinical skills (Fig.1). Plastic models showing animals' internal structure are commonly used for teaching morphology (Martinson and Jukes, 2005)

Mannequins (or phantoms) are life-like representations of animals. For difficult procedures such as the urinary catheterization of female dogs, anatomically correct mannequins can allow the student to follow the visual and tactile clues for the technique.

However, a simple comparison between the animal practical and the alternative is not always sufficient to fully investigate the potential and impact of alternatives. All curricular design involves combining tools from many different sources, and alternatives will almost always be used in combination to meet teaching objectives and to achieve a comprehensive learning experience.

A range of reports has suggested that the techniques described in this paper provide for good education and, as reported by Balcombe (2003) over 30 studies have shown that the alternatives are found to be equal or superior in terms of teaching efficacy when compared to conventional animal practicals.

### Medical Imaging

Imaging has become more important diagnostically and in teaching anatomy, which has created a need for new expertise to interpret radiography [helped with clay models (Oh *et al.*, 2009)], ultrasound, metabolic imaging, and multiplanar (virtual 3D) constructions (Dalley, 1999 and Miles, 2005) such as high resolution CT cadaveric scans (Durosaro *et al.*, 2008).

### Virtual Simulation

Since learning is correlated to level of involvement (Bergman *et al.*, 2008), interactive and problem-orientated learning adds interest and aids in long-term retention of knowledge to identify clinically relevant anatomical structures (Boon *et al.*, 2002a; Miles, 2005 and Turney, 2007).

First-year students at the Royal Veterinary College, University of London, were taught to appreciate bovine abdominal anatomy



Fig. 3. Body painting to show skeleton of horse. (Courtesy: www.pinterest.com)

using a rectal palpation simulator, "The Haptic Cow," which provided 3D visualization and life-like feel of internal anatomy (Fig. 2). One hundred eighty-four students provided positive feedback via a questionnaire and approved the Haptic Cow simulator's engaging learning technique without the need to use cadavers (Kinnison *et al.*, 2009).

### Body Painting

Some Universities offer students time to pursue passions outside the core curriculum like arts, humanities, and life-drawing classes that can compel the mind to better establish anatomical relationships and reinforce humane issues (Phillips and Berge, 2000 and McLachlan, 2004). However, body painting has been an additional visual aid in surface anatomy classes (Fig. 2) for reviewing underlying systems in which questionnaire studies indicate that this technique has been accepted to enhance learning by staff and students (Op Den Akker *et al.*, 2002; Mc Menamin, 2008 and Finn and McLachlan, 2009).

It is clear that as anatomists, we should adjust our courses to incorporate the modern technologies and communication skills in teaching anatomy.

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