Learning in the third dimension

Sharon Boyd, Eoghan Clarkson and Brian Mather explain how the Royal (Dick) School of Veterinary Studies is using the latest 3D modelling techniques to help students develop their clinical skills.

THE development of clinical skills requires a blend of practical and theoretical knowledge. Clinical skills labs play an essential role in providing students with a safe, controlled environment to develop these key skills; for example, suturing, venepuncture and anaesthesia. A thorough understanding of anatomical structures and articulations in 3D is essential to achieving competence in these skills. It has been argued that students’ spatial ability can help this anatomical understanding, and that this ability could be developed by using 3D models. Animal welfare considerations also drive our search for alternative models.

Advances in the field of technology-enhanced learning have gone some way to alleviate the limitations of traditional models; for example, video recordings of staff demonstrating the use of a particular resource can provide guidance after the practical class to aid revision. Mobile devices such as phones or tablets allow students to access additional resources easily, especially when these have been clearly linked to the clinical lab item using QR codes that students can scan.

3D simulation tools such as the glass horse (www.3dglasshorse.com) allow users to manipulate a 3D animated model of, for example, the equine gastrointestinal tract to gain a clearer understanding of the underlying complications of colic. Students can use such tools to improve their skills with access as and when required – thereby providing on-demand resources to meet individual learning needs.

3D printing

The advent of 3D printing has allowed institutions the option of printing relatively cheap models developed using various digital scanning techniques – from using desktop scanners to extracting the data captured during clinical imaging. The costs can vary depending on the type of printer and the complexity of the finished print, and material choice plays a part too. The capacity to print in various colours, opacities and even flexibilities offers a wide range of applications.

These resources have proved effective for students and clinical staff, particularly in instances where the correct approach to a difficult orthopaedic case requires advance planning. The resources produced as part of 3D model creation and printing can be repurposed in a variety of ways. For example, 3D computer models can be used to supplement clinical skills lab resources, accessible as interactive 3D models (such as the dog’s skull pictured, http://qrs.ly/lr4m3qe), or as a video showing the object being manipulated. Making these public allows us to share the resources with vets in practice (as a CPD resource) and with potential students as part of the veterinary school’s policy to share its research.

Taking 3D models one step further, augmented reality provides the opportunity for staff and students to access and interact with the model in a virtual space through the use of a headset. These can be expensive.

The authors are members of the Veterinary Medical Education team at the Royal (Dick) School of Veterinary Studies. Sharon Boyd is an associate lecturer in distance education; Eoghan Clarkson is manager of the Digital Education Unit; and Brian Mather is an elearning developer. The authors thank Rob Ward, Susan Rhind, Dylan Clements and Julie Dickson for contributing to this article.
(eg, Oculus Rift, www.oculus.com), or relatively inexpensive (eg, Google cardboard, google.com/get/cardboard, which makes use of the student’s own mobile phone). While these devices provide an alternative way of viewing and interacting with a 3D model, they are still limited in comparison with a physical model. One way of overcoming this lies in integration with a haptic device, providing physical sensory stimulus in addition to the visual input.

**Joint creation of resources**

At the Dick Vet, we believe student input into any project focused on generating teaching resources is essential, as they provide insight into the areas where they encounter specific difficulty. These are often not necessarily those areas we expect. Furthermore, student-generated content is now also possible. Many students have access to mobile devices with the option to download a range of apps allowing them to generate 3D models or record instructional videos of their own.

Work in this area also facilitates multidisciplinary projects, such as the collaborations carried out between students in the Dick Vet and the Edinburgh College of Art (ECA). One such partnership involved exploring the artistic possibilities of 3D models produced for veterinary education. In February, Dick Vet and ECA students attended a workshop with the artist Harriet Mead (harrietmead.co.uk). This workshop gave staff and students the opportunity to explore the world of horse anatomy through art, using live horses to create sculptural wire drawings.

We have found that the process of creating 3D models provides a wonderful range of opportunities for staff and students to work together to create multipurpose resources that assist in veterinary education. These resources are helping to reduce our reliance on older methods of creating models, thereby promoting animal welfare and increasing the lifespan of the resources.

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