One of the primary roles of scientists and in particular veterinary scientists is to communicate effectively to share knowledge and educate others. For veterinarians this might apply to communicating with the owner of an individual animal or with production animals it may apply to communicating with staff managing an entire flock or herd up to a broader regional or national/international level. Many scientific concepts however can be challenging to relay in words or simple photographs in limited time. At times this can result in miscommunication and misunderstanding of scientific ideas and concepts. The advent of equipment that makes it relatively simple to capture information and then share this via virtual or augmented reality has great potential for improving education and communication within veterinary and agricultural science and other areas. This presentation will cover some of the potential benefits of augmented and virtual reality and some applications within veterinary and agricultural science.

The definitions of virtual reality and augmented reality used in this context are 'virtual reality (VR) is an artificial environment which is experienced through sensory stimuli (as sights and sounds) provided by a computer and in which one’s actions partially determine what happens in the environment’ (Wikipedia, December 2015). This can include relatively simple 360 degree photographs or video up to artificially generated worlds allowing full interaction. Augmented reality (AR) is ‘an enhanced version of reality created by the use of technology to overlay digital information on an image of something being viewed through a device (e.g. smartphone camera)’ (Wikipedia, December 2015).

Current VR viewing devices include the Oculus Rift and Samsung Gear with a raft of new platforms nearing commercial release including the HTC Vive and Playstation VR. Some of these require significant associated computer processing power, including relatively expensive central (CPU) and graphics processing unit (GPU) requirements. For those who don’t have access to a high end computer but want to visualise 360 images or video then inserting a smart phone into a VR viewer, popularised by ‘Google Cardboard’ allows the viewer to see these images on the screen of a smart phone with sound from the phone speaker. This requires downloading an app and the uploaded 360 video to have specific code added to allow its viewing online, currently available on websites such as ‘You tube’ and ‘Facebook’. For those who don’t have a smart phone there are a number of computer platforms that allow the viewer to see 360 images on a standard computer screen and use the mouse to scroll around the full degree of vision. This is less immersive but still allows the viewer to see the overall vision.

One example of a VR environment that is already in use is the 4D virtual farm, this was developed with funding from the Office of Learning and Teaching and collaboration between the University of Melbourne, University of Sydney, University of Queensland, Murdoch University and Massey University. This produced ten farms across Australasia where tertiary students can see multiple views of a property in 360 degrees through time. One of these properties has subsequently been transformed into an Oculus Rift or Google Cardboard enabled version. This enables the viewer to move around a property over 20–30 different locations, view each image through 360 degrees and also through Autumn, Winter, Spring and Summer. It also allows interaction with a wide range of reference material. VR systems such as this have significant
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potential as aids to educate clients about yearly changes and disease, biosecurity, environmental health and safety, grazing impact and management of animal health amongst other possibilities. These sorts of concepts are likely to become more common with larger farms and changes in rural workforce to enable high quality training.

A key element of VR environments based on real images is that the real images must first be collected or created. Until recently these images were generally taken using a high quality camera with a fish eye lens and up to 8 or more images were ‘stitched’ together to create a single panoramic 360 degree photograph. Over the past five years some of this has been replaced initially by using several cameras, such as Go-Pros, in an array to take a 360 degree image or video at exactly the same time. This still requires post processing to turn the six or more images into a single 360 degree image. A range of new cameras released in the past year such as the Samsung Gear 360, Theta S and others now allow collection of 360 images at the push of a button and then very simple processing into a final image. The current quality of these images is lower than multiple photos taken by high quality digital camera however the work required to collect these is much lower. It is likely that cameras over the next few years will produce 4K video footage that may be processed into a 360 degree image at the push of a button, making collection and processing of these sorts of images very achievable. To illustrate 360 degree images to clients or others, these can now be uploaded to various social media sites relatively simply, although the process is currently slightly longer than uploading a standard video. This dramatic increase in the simplicity to both collect and display good quality 360 video means it is likely that more people will start to use and understand what this technology can achieve.

While VR has occupied much media attention in the past year, AR is also becoming more widely used and will likely impact education and extension in the next five years. One of the best known AR devices is the Microsoft Hololens which has been released as a ‘developers kit’, so will probably be commercially available in the next few years along with other new AR devices. These devices allow you to have information as text or images in your eyesight but still be able to see the real world, a mixed reality (MR). Other apps such as Aurasma allow you to point your mobile phone at a picture and then see a video or image that someone has associated with that. There are significant potential advantages associated with this. This might include simple things such as providing better training when people purchase a drum of anthelmintic for their sheep with all instructions provided via augmented reality and a code to unlock the drum at completion of the instructions. Alternatively in the future AR might be available for a range of training videos for surgery of animals such that you could see each step of a procedure as you were practising on a three dimensional model or on a real animal, rather than referring to a text.

Practical uses of AR are now appearing in some shops, for example if you want to buy some clothing you can open an app on a smartphone, point it at the tag on the clothes and see how they look on a model or match it with other clothing in the store or in your cupboard at home. In clinical veterinary practice there are a wide range of potential applications for AR – a simple example of this could be in merchandising vaccines where AR would show you a video of the benefits of using vaccines in certain situations and when these should be given for optimal benefit. Equally the app may show you how to correctly apply a product on-farm or how frequently needles should be changed or similar concepts. This could be as simple as pointing your phone at the injection apparatus and information or videos about this would then appear to explain how to use and maintain it.
Augmented and virtual realities do not magically improve the standard of education as they still require the production of high quality content to achieve this. They do however have the advantage of being highly immersive and the ability to enhance the chance of better communicating messages. This can improve the way that veterinarians communicate a range of ideas and improve client and community understanding of animal health, production and welfare.