

# THE USE OF AUGMENTED REALITY APPS TO MAKE LABORATORIES MORE ACCESSIBLE TO PEOPLE WITH COLOUR VISION DEFICIENCIES

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Colour is an important part of how we understand the world around us, from choosing fresh fruit and vegetables to reading traffic lights. Learning and research in science also has a large focus on colour, using colour and colour-based observations to inform experiments and interpret results. For people with a colour blindness, better described as colour vision deficiency (CVD), the colour focus of science can be an implicit barrier to learning or science-based careers. This study first explores the ways in which chemistry experiments can be inaccessible to people with CVD and next assesses tools that could be used to improve the accessibility of laboratories in STEM.

Recognising components of experiments that may prove challenging to CVD participants is a proactive approach to improving CVD accessibility, but they can be difficult to identify. There are several augmented reality (AR) apps available for mobile devices which can simulate CVD vision but no scientific evidence has been shown on their accuracy. During this study, four of these AR CVD simulating apps were evaluated using the Farnsworth D15 hue-based colour vision test results from eleven participants. The best performing CVD simulating app, based on scientific evidence, was then used to evaluate current undergraduate chemistry experiments at The University of Sydney. Of the 24 experiments identified as being potentially challenging for students with CVD, we applied CVD simulation to five chemistry experiments experienced by First Year students.

In the final part of this study, we evaluated the potential of AR apps *assisting* CVD participants in a laboratory environment. Farnsworth D15 colour test were used again to evaluate colour naming, colour filtering and colour shifting functions of AR CVD assistive apps. These CVD assistive apps were then applied during a live chemistry experiment to evaluate their real-life laboratory applicability. The results of this study will be presented along with recommendations of which apps and practices are best applied to improve the accessibility of STEM laboratories to CVD students.

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