Questacon SMART SKILLS

WORKSHOP
TEACHER RESOURCE

Short Activity: Create a Virtual Reality Headset

In this practical activity, a simple paper cut-out transforms into a virtual reality (VR) headset with the help of a phone and a pair of lenses.

Activity Objective

Create your own printable virtual reality viewing headset. This activity will show you how to build the viewer, and give you some ideas on how you might incorporate it in your classroom.

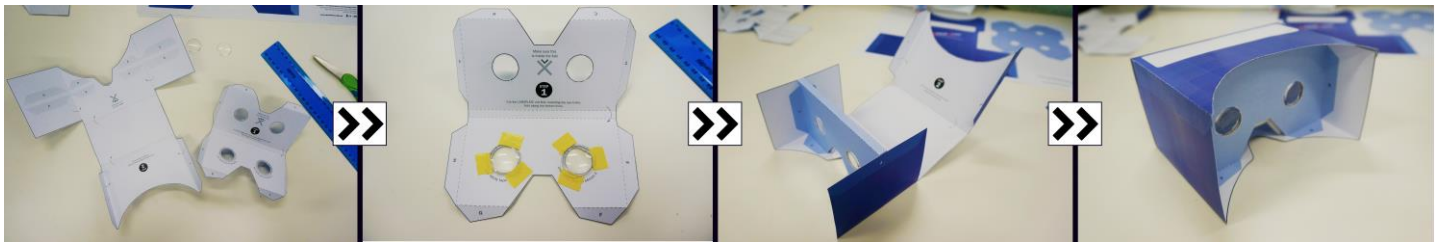
Materials and Tools

- Scissors
- Glue or Sticky Tape
- Printout of VR headset template on thick A3 paper (160GSM+). The template can be found at www.questacon.edu.au/teacher-resources
- VR headset lenses (2 per headset)
    - When purchasing, order 25mm lenses with focal length of 45mm with 'tabs' or 'legs' for easy application. Our headsets are designed specifically to accommodate these lenses and will not work with other dimensions
- Smart phone with internet access (Android 4.1+; iPhone iOS 8.0+)

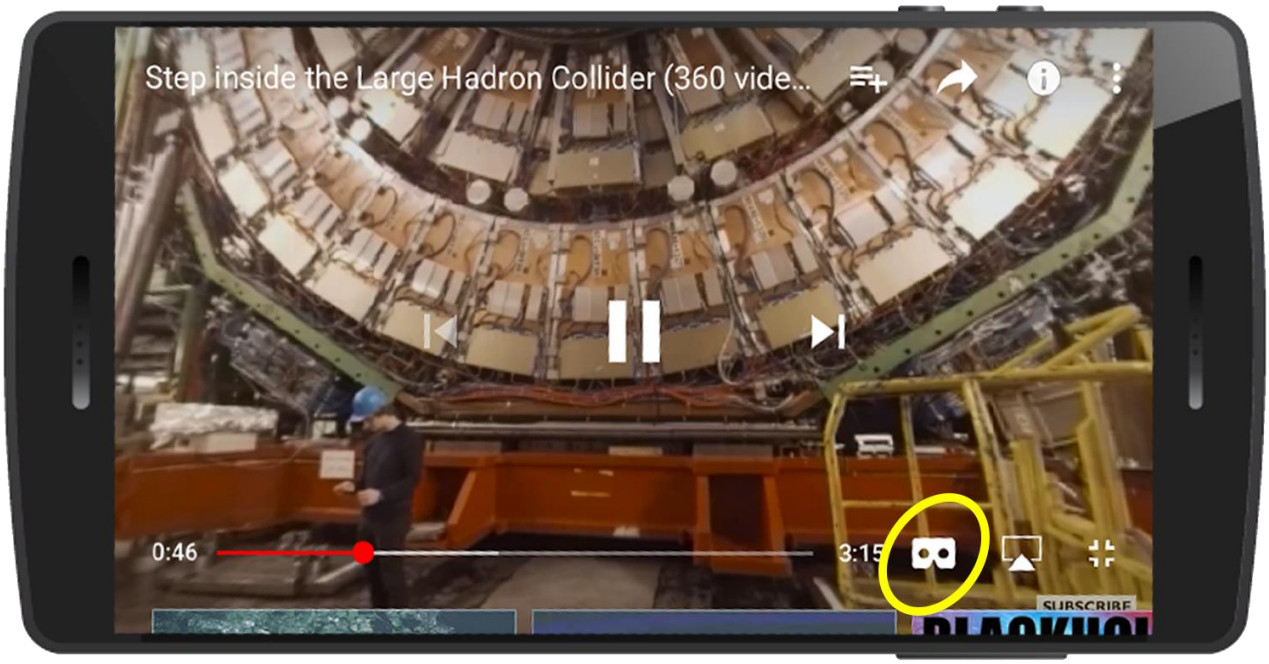
Activity Outline

Please ensure you follow your school WH&S procedures while conducting this lesson. If you become disorientated, do not tap the VR headset symbol in the YouTube videos. Drag the screen around with your finger, or use Google Chrome and the cursor on a computer.

1. Print the template double sided, flipping along the **short** edge at 'actual size' dimensions.
2. Assemble the viewer headset as per instructions on the print out.



3. With your smart phone, visit YouTube and search for *"Step inside the Large Hadron Collider (360 video)"*.
    a. Once the video starts, tap the VR headset icon (circled yellow in the image below).



    b. You will need to calibrate your phone to your headset the first time you use it. After pressing the VR icon, press the settings button (the cog) on the top right of the video, select "Headset," and then "Scan QR Code," and scan the image on the right using your phone's camera, this code will provide the exact dimensions of your headset, to correctly position each image on your phone screen.

4. Place the phone into the front of your headset viewer and bring it to your eyes. Remember to tap the cardboard headset icon before you put it into your own headset.
5. With the headset over your eyes, move your head and the headset about to look around while the video plays.
6. If the image is unclear or doubled when viewing through the headset, you may need to tweak your calibration. Refer to Appendix A (below) for troubleshooting details.

Further Investigation

The VR Headsets can be used to explore a range of VR applications and videos with an educational focus and support your lessons. The list below is a great place to start.

Apps to download:

a) Google Expeditions – Designed for classrooms, you become the guide while your students look through their headsets at 360° photos from all over the world. With each location there are several topics which can be discussed, each with a description that can be read out and the ability to highlight to the students where they should be looking.
b) Cardboard Camera – Take photos of interesting places in 360° format and share! Ask students to share a location special to them by getting them to take a 360° photo.

YouTube has some fantastic options; search for "*virtual reality video,*" "*VR video,*" or "*360 Video.*" There are heaps of videos available, which cover topics including Earth Sciences, Biology, Design, and Technology!

Here are some we recommend:

a) Cellscape VR –Tour the inside of a human cell
b) Virtual Plant Cell Cell Explore – Choose your own adventure of the plant cell
c) Explore the Solar System by Crash Course – Guided tour of the solar system
d) Step inside the Large Hadron Collider (360 video) - BBC News
e) Mythbusters 360 - various videos of their experiments and behind the scenes

Innovate!

Some apps require a button to interact. Challenge your students to modify headsets using simple materials to incorporate a functional button (Here's some inspiration from YouTube www.bit.ly/qssiVRbutton for inspiration). You could even make your own headsets and lenses from a plastic drink bottle (www.bit.ly/qssiVRbottle).

Curriculum Links

Our resources provide a framework for classroom activities and lesson plans that link to the Australian Curriculum in both the Science, and Design and Technology streams. Some of these curriculum links are highlighted below.

Science Inquiry Skills	Science as a Human Endeavour	Science Understanding
Science Inquiry Skills can be incorporated across all year levels depending on the types of videos chosen. The variety of Mythbusters videos are useful for further inquiry.	The diversity of free VR videos can link to Science as a Human Endeavour Strand. Topics to do with the development of the science fields can be supported by information in Expeditions. Year 7: Expeditions: ACSHE223, ACSHE120 Mythbusters: ACSHE121 Year 8: Expeditions: ACSHE134, ACSHE226 Hadron Collider: ACSHE136 Year 9: Mythbusters: ACSHE157, ACSHE160, ACSHE228 Hadron Collider: ACSHE158 Year 10: Mythbusters: ACSHE192, ACSH194	The diversity of topics that Mythbusters cover mean that an array of subjects could be explored and discussed in further depth after watching the video in VR. Year 7: Mythbusters: ACSSU113, ACSSU115, ACSSU117 Year 8: Mythbusters: ACSSU149 Hadron Collider: ACSSU155 Cells: ACSSU150 Year 9: Mythbusters: ACSSU175, ACSSU177, ACSSU178 Year 10: Mythbusters: ACSSU185, ACSSU187, ACSSU229 Space: ACSSU188

Design and Technologies Processes and Production Skills	Design and Technologies Knowledge and Understanding
Building and modifying headsets provides hands-on engagement and skills and aligns with project management, design, and production with emphasis on evaluation while calibrating the device. Years 7 & 8: ACTDEP036, ACTDEP039 *Years 9 & 10:* ACTDEP049, ACTDEP050	Facilitating further discussion after watching VR videos (such as the Mythbusters series) could focus on the impact cultural, financial, ethical and social factors could have on the environment, food and material resources depending on the experiment. Years 7 & 8: ACTDEK029, ACTDEK031, ACTDEK032, ACTDEK033 Years 9 & 10: ACTDEK040, ACTDEK041, ACTDEK043, ACTDEK044, ACTDEK045, ACTDEK046, ACTDEK047

Any questions? Just email teachers@questacon.edu.au.

Appendix A

Calibration

If you are experiencing doubled or out-of-focus images, try the following steps:

1. Check that the phone is centred in the viewer. Try holding the phone itself, not the headset.
2. The headset is sensitive to slight misalignments. Be precise with the fold lines when constructing the headset and double check the tabs of the headsets are secured accurately.
3. If the cardboard is bending slightly, the lenses may be pushed out of alignment. Try reducing the pressure on the headset, or lightly squeezing edges to realign.
4. When printing, select the printing option print "*actual size*" instead of "*fit to page.*" This should result in a headset that matches the QR code we've provided!

If you've tried these steps and still experience blurry images, you might need to customise the calibration code to the dimensions of your printout. The QR code we provided contains measurements accurate to the millimetre for the headset, but they can vary from printer to printer, or from one printing material to the next.

Measuring and generating a new calibration code is easy. Using a computer, visit https://vr.google.com/cardboard/viewerprofilegenerator.The help button provides comprehensive information on which parts of your headset printout you'll need to measure.

We recommend measuring a fresh printout rather than an already constructed headset. Measure and adjust the values at the webpage above, and see the effects live in your constructed headset.

For reference, our measurements are as follows:

- Screen to lens distance: 47mm
- Inter-lens distance: 60mm
- Screen vertical alignment: Bottom
- Tray to lens-centre distance: 35mm
- K1 distortion coefficient: 0.150
- K2 distortion coefficient: 0.030