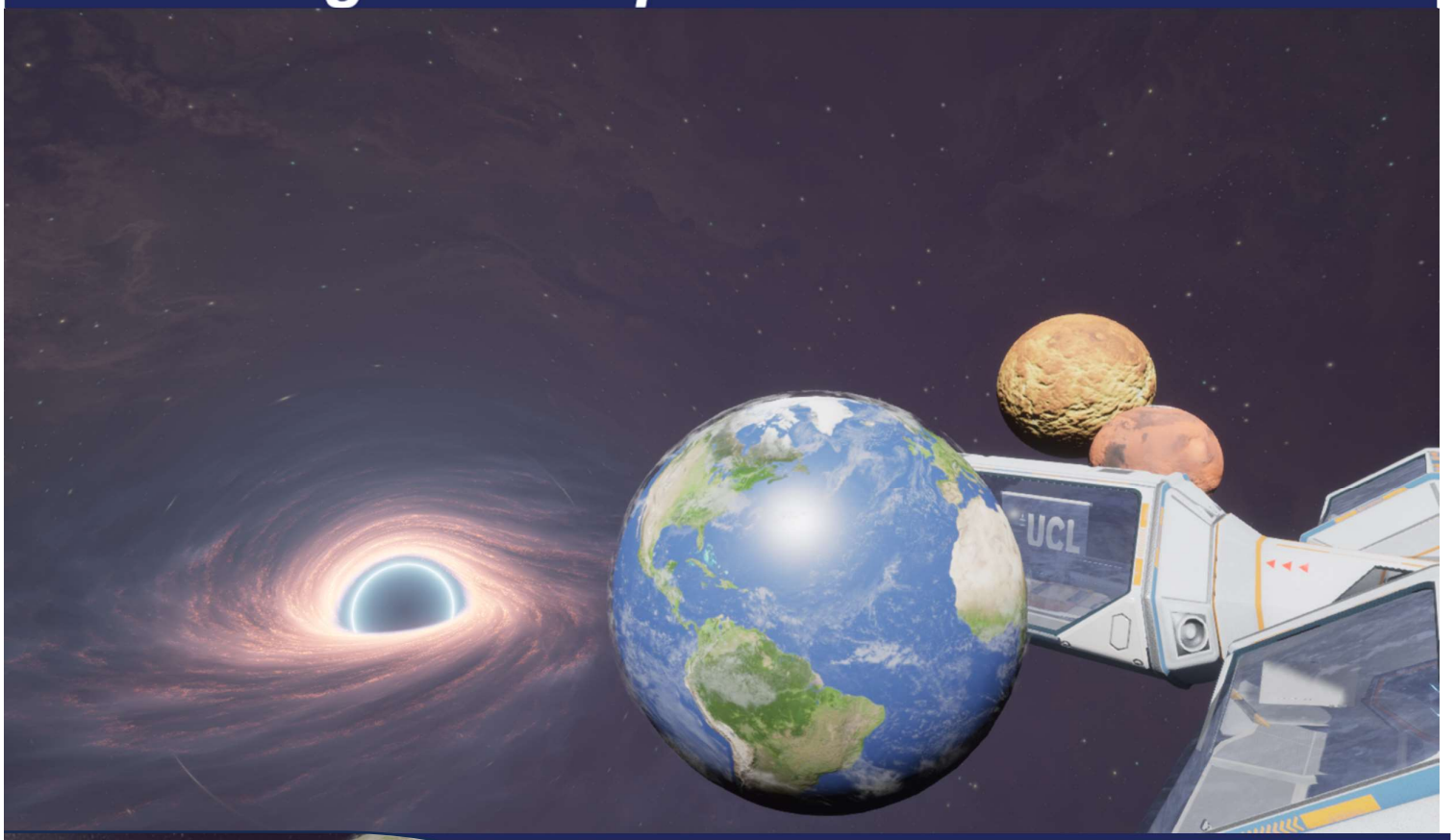
UCL Digital Outreach

UCL Digital Outreach:

A New Approach to Outreach and Widening Participation



Outreach in the Digital Age: Transforming Outreach and Widening Participation via Virtual Reality and Intelligent AI Digital Twins

Accessible via PC or Meta Quest2/3

UCL Digital Outreach

Contents

UCL School of Pharmacy and Dept. of Physics Digital Outreach

UCL VR Digital Outreach is a unique online digital space designed to make Outreach and Widening Participation for future scientists simpler and easier in an increasingly digital world.

Digital Outreach enables students from anywhere in the world to visit a virtual spaceship stationed near a black hole and interact with instructors and fellow students using digitised environments and VR headsets as if they were there in person despite being hundreds or thousands of miles apart. By simply putting on a set of virtual reality goggles, they can meet physicists and their digital avatars, learn about advanced physics concepts, watch educational videos, and explore 360-degree immersive experiences. This allows them to see real-time demonstrations and receive training on sophisticated equipment, even though they don't have physical access.

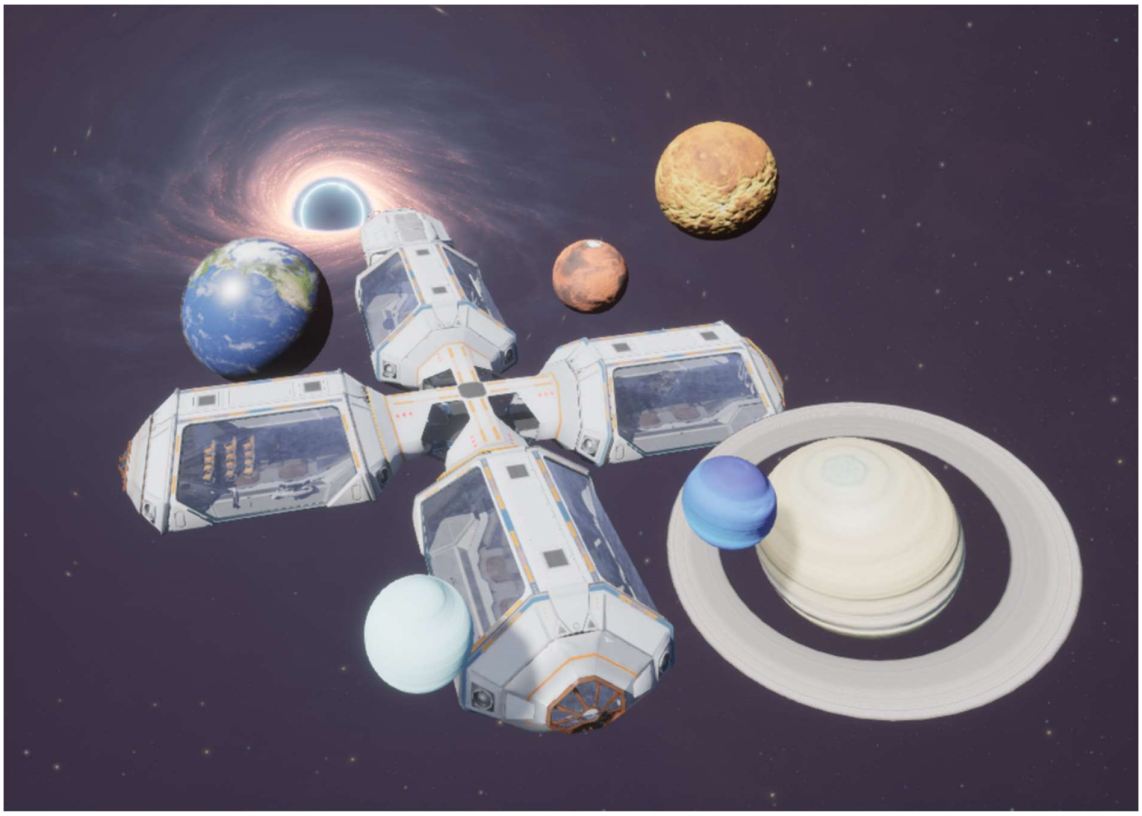


Figure 1

UCL Digital Outreach: Virtual Environments

UCL Physics VR Digital Outreach is arranged across five different sections/rooms to illustrate the different areas of physics and cosmology.

1) Entry Room:

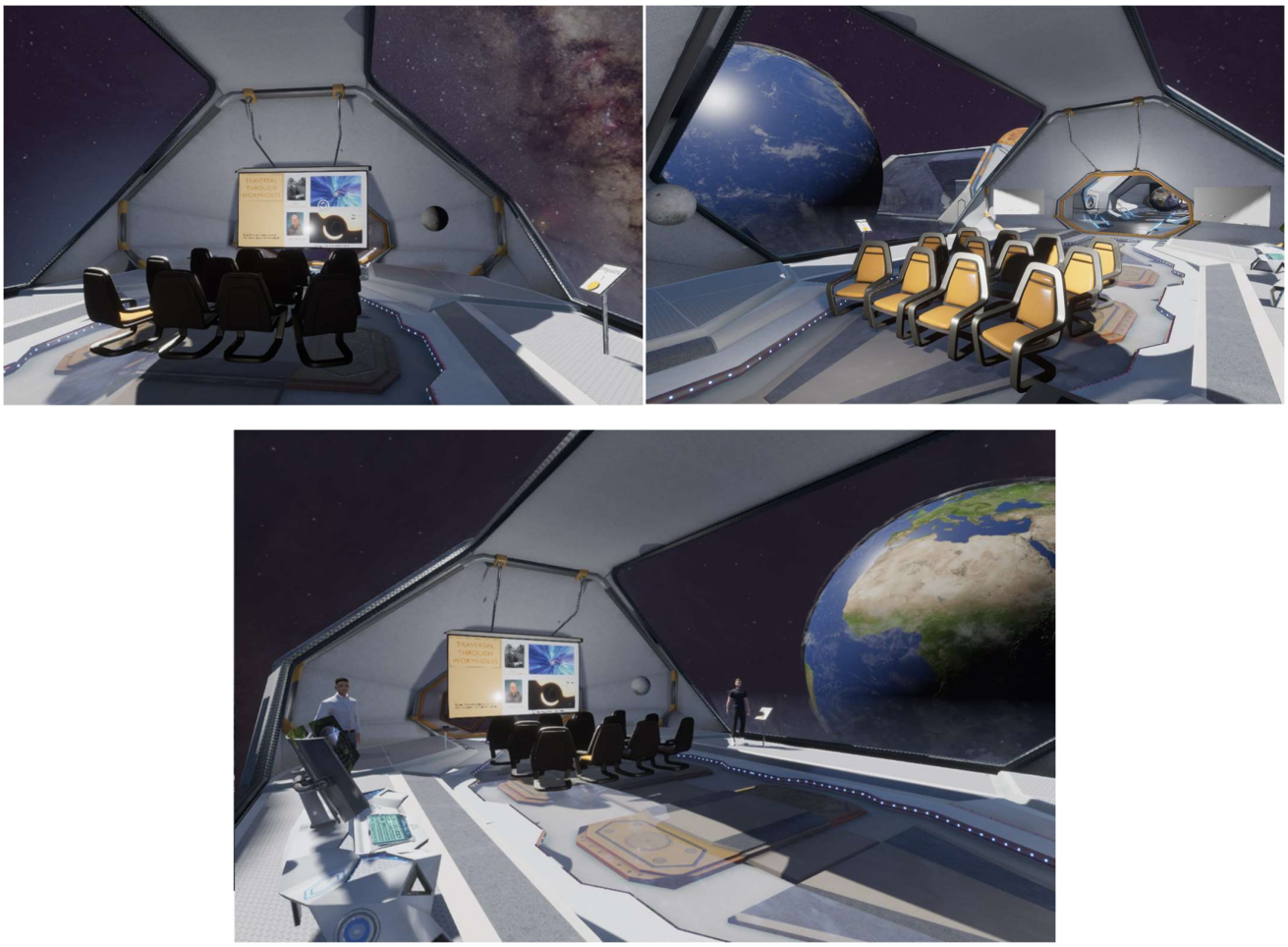


Figure 2

In the entrance room, users can meet two AI avatar students and find out about UCL Dept. of Physics, how students are taught at UCL Physics and ask them any personal or physics questions.

2) The Solar System:

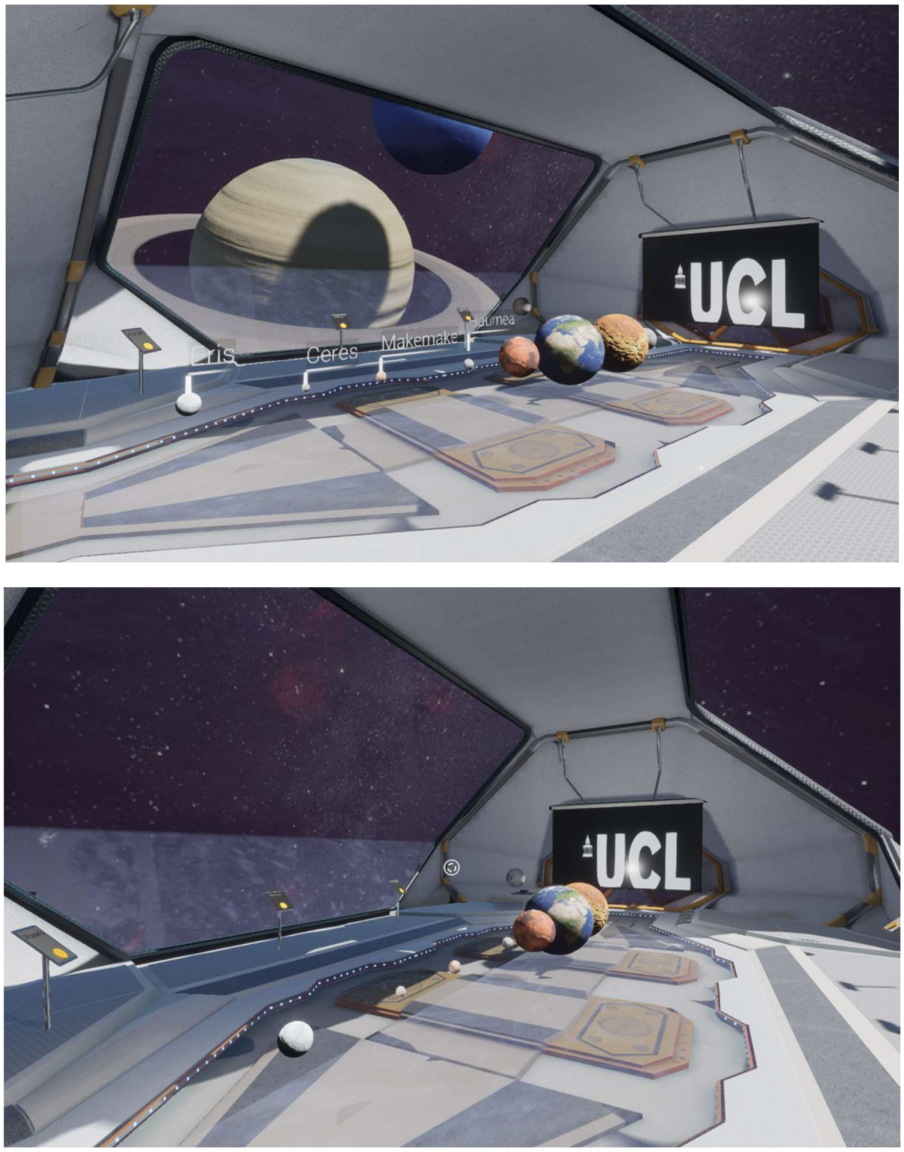


Figure 3

Within the solar system room, students can learn more about our solar system including seeing some of the moons and dwarf planets within it, as well as the relative rotations and day cycles of the planets.

3) Earth

Figure 4

Within the Earth room you can see a spinning Earth, which in future hopes to have accompanying slides or video information as well as AI avatars to speak about Earth and give information about it.

4) Ellis Wormhole

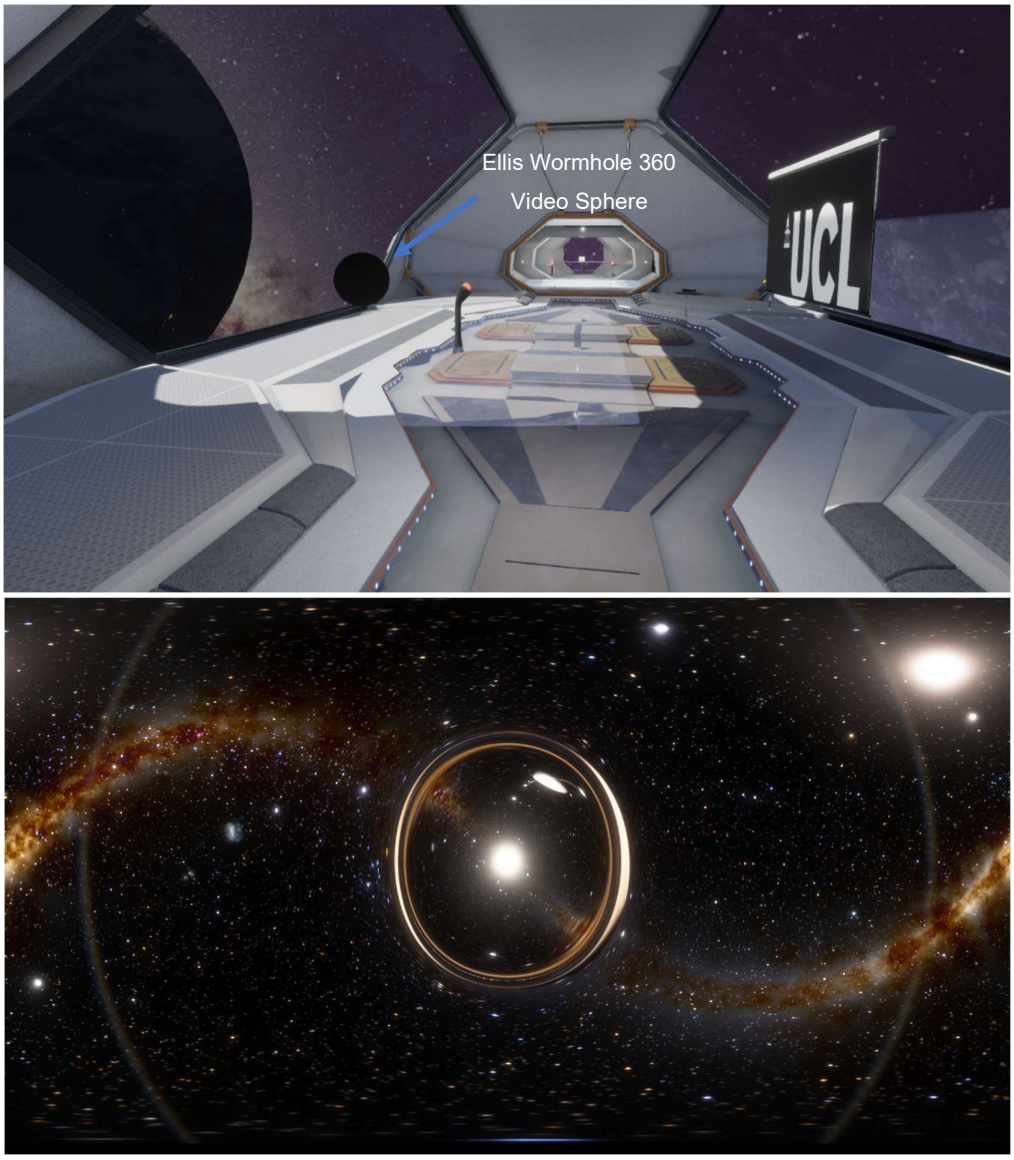


Figure 5

Within the fourth section, users can traverse an Ellis wormhole through a 360-degree video simply by walking up to the black video sphere or pushing the button next to it. A fully immersive video, created using the realistic physics engine Space Engine, then plays, providing a breathtaking journey through the wormhole.

5) Schwarzschild Wormhole

Figure 6

Within the fifth section, users can watch a video depicting the traversal of a Schwarzschild wormhole, accompanied by an alien voiceover that explains the various steps and stages. The narration covers the physics behind the phenomena observed during the transition from a black hole to a wormhole, and finally to a white hole.

6) Black Hole

Figure 7

Within the sixth section, users can spawn a black hole by pressing the button located on the edge of the ledge. Due to the high processing demands required to load the black hole, this feature should only be used on machines with a capable GPU. Currently, it does not run on the standalone version of the headsets and requires link mode to function properly.

Software Access

Both the UCL Digital Outreach MetaQuest 2/3 Virtual Reality and PC software versions are hosted on ***Sidequest*** allowing for updates to the software and easy user access. Clicking on the red button enables users to download either the PC version of the software or sideload the Android/ Quest2/3 version (as long as the headset is set for developer mode). Users will need to install Sidequest on their PCs prior to downloading the software.

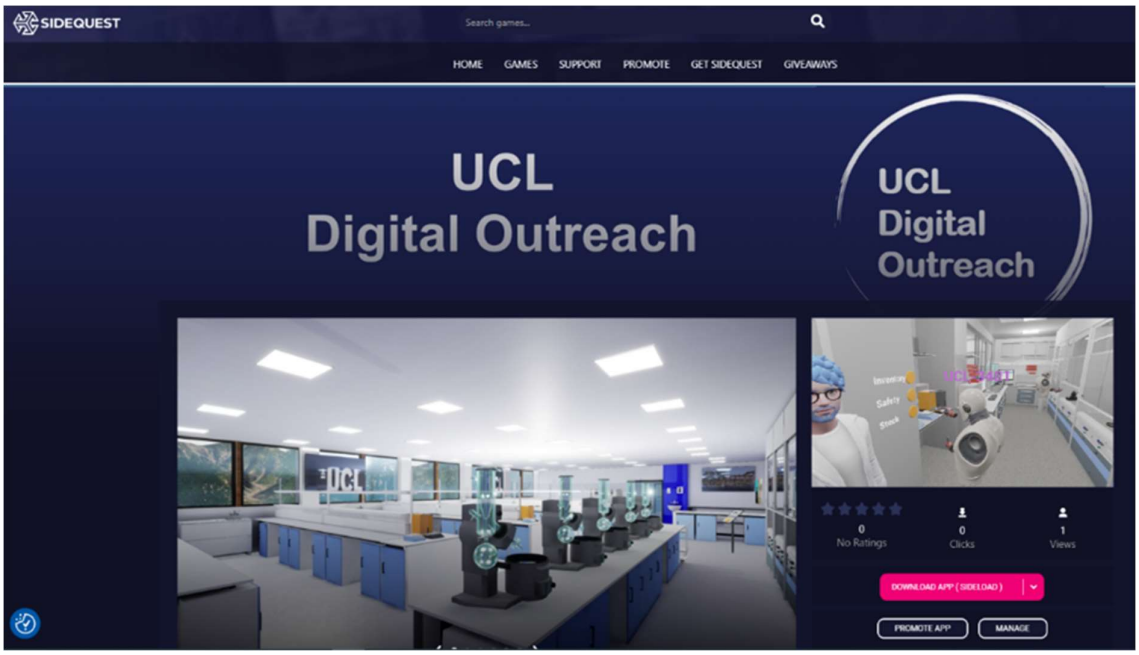


Figure 8

Software Access: PC

Users need to navigate to the PCVR version that is available on the Sidequest Software and select **DOWNLOAD APP(PCVR)**.

Figure 9

This will prompt the download of the PC version of the software (approx. 4 GB). At the screen, users should click on the **DOWNLOAD** button.

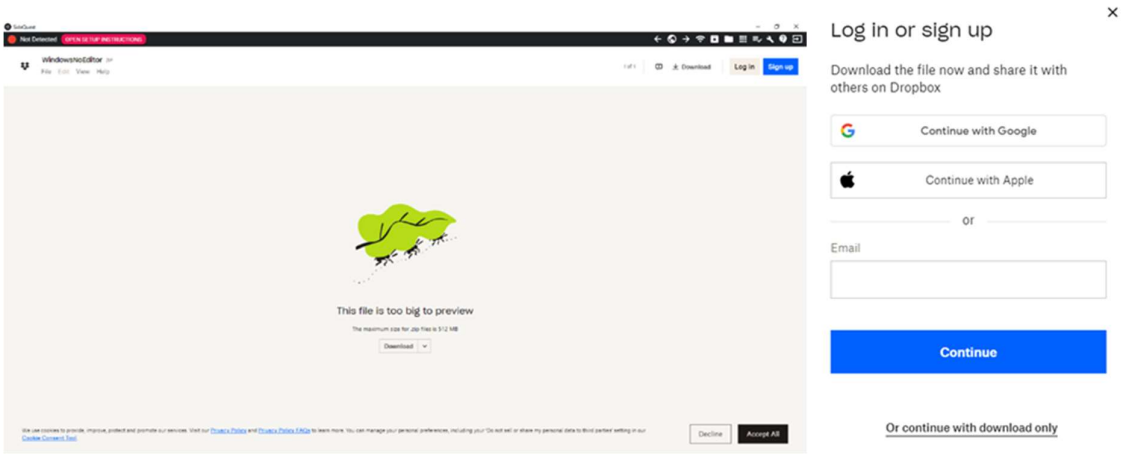


Figure 10

Users that have Dropbox can sign in or simply follow to the **Or continue with download only** link as shown above.

Once downloaded, the PC version needs to be unzipped and then the application can be accessed by double clicking on the LAB427_Outreach_V1 icon.

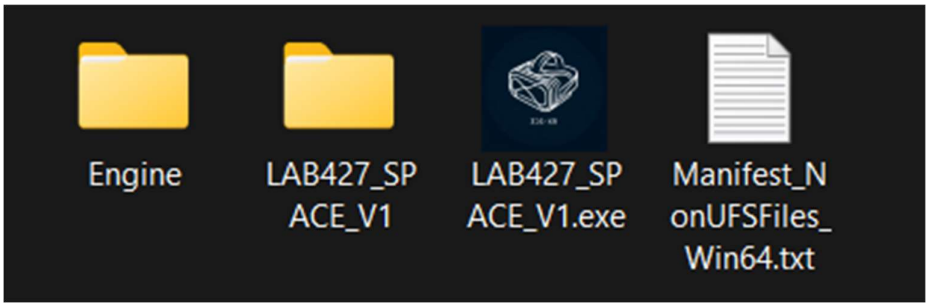


Figure 11

On running the software the first time, it may prompt you to install some pre-requisites – DirectX Runtime – these are needed for the VR software and so you need to follow the on-screen prompts (Figure 10).

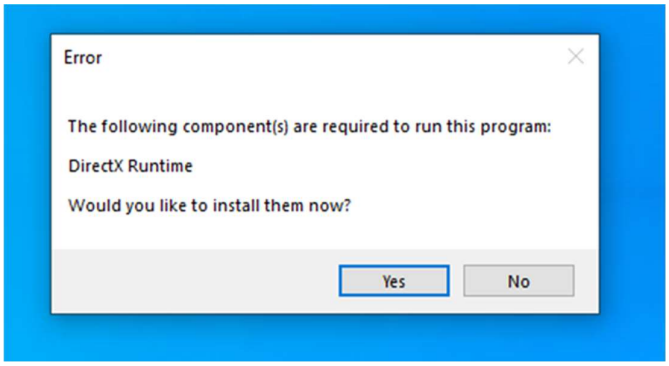


Figure 12

Software: Logging in via PC

Once the software has loaded, the user is directed to the loading screen. Registered users need to enter their e-mail and password either via the keyboard on their machines or use the mouse with the keyboard on the screen. If this is the first time a user has accessed the software, they will need to register first.

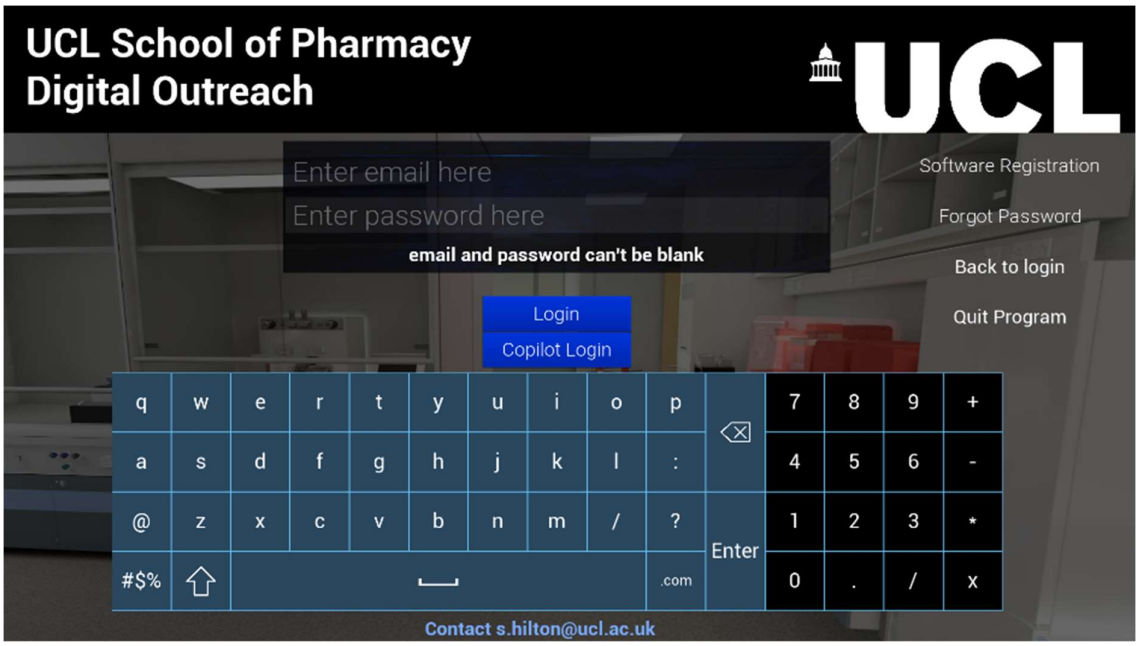


Figure 13

Software: Email Registration

To register an email address on the server to access the software, the user needs to click on the **Software Registration** text on the login Screen. Once on the Software registration screen, enter an email, password, and username (no spaces) by clicking on the keys on the keyboard on the screen with the mouse or from the users keyboard. Click on each box for entry with the mouse and then click on the keyboard letters or PC keyboard to add the data. Once each line in finished, simply click on the next line to enter the data for that line.

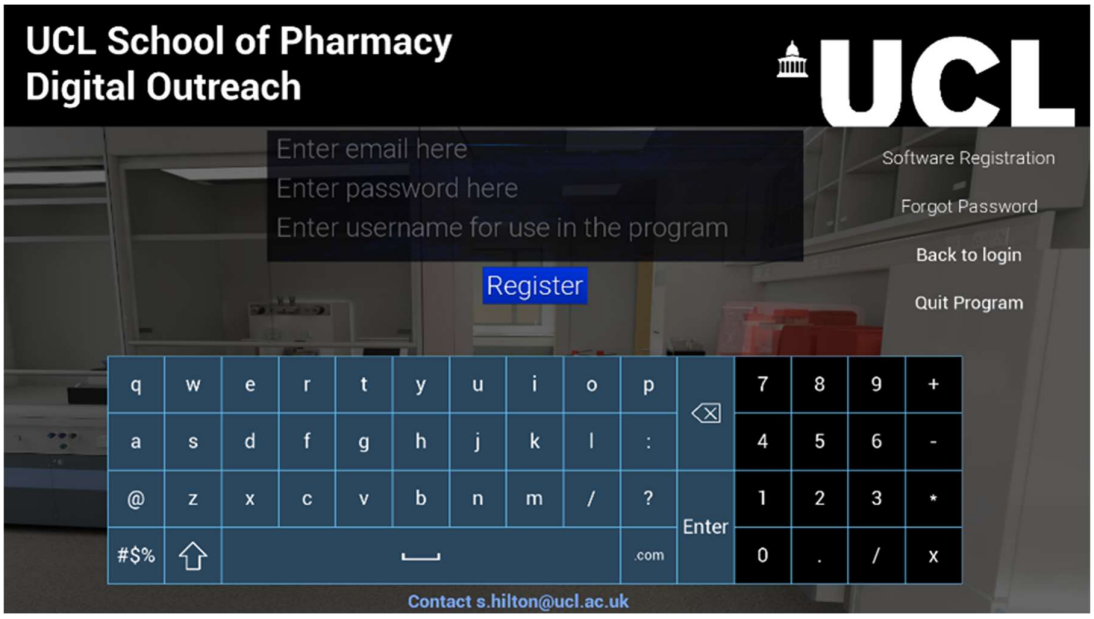
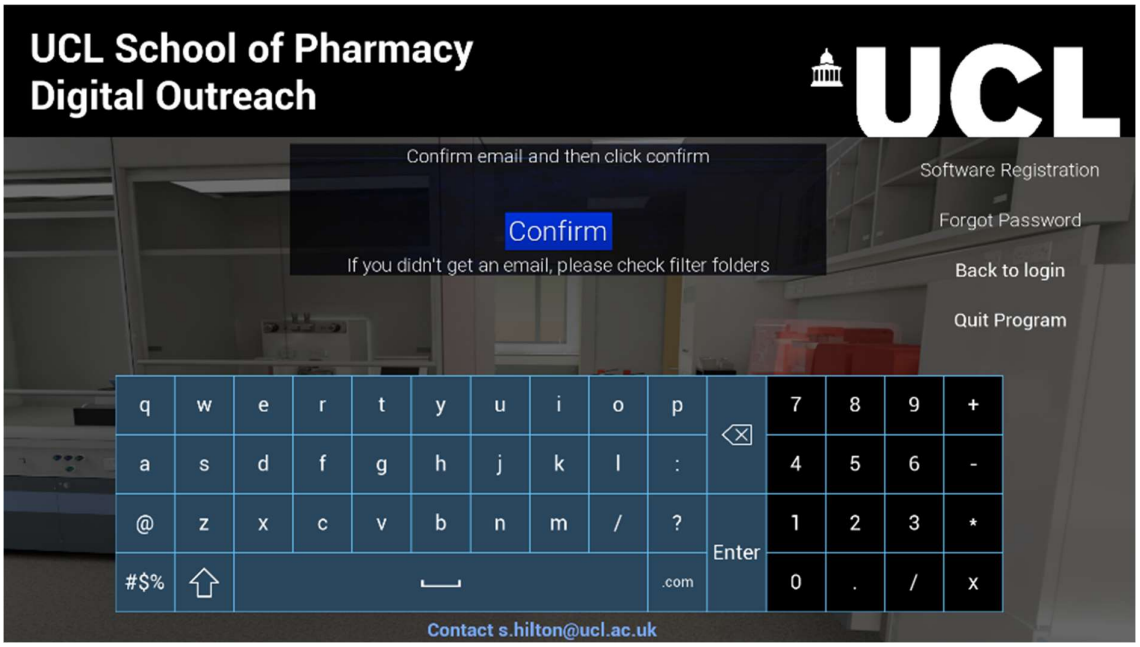


Figure 14

Once you have entered your user data, click on the **REGISTER** button and the screen will then change to the confirmation window and a confirmation email will be sent to the address you sent (may go to junk mail, so please check). Please click on the registration link to confirm your email address and then click on the confirm button to ensure your email is verified in the software.

NOTE: You cannot leave this window or close the software until you have confirmed your email. Once you have confirmed your email in your email software, you can then click on the CONFIRM button and go back to the LOGIN SCREEN.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UCL
Confirm email and then click confirm
Confirm
If you didn't get an email, please check filter folders
Software Registration
Forgot Password
Back to login
Quit Program
q w e r t y u i o p
a s d f g h j k l :
@ z x c v b n m / ?
#$%
.com
Enter
7 8 9 +
4 5 6 -
1 2 3 *
0 . / x
Contact s.hilton@ucl.ac.uk

Figure 15

User Controls: Accessing the Server for Multi-user access

Once the user has passed the loading screen, they enter in front of the multi-user connection. Simply clicking on start followed by host (if hosting) or the server (top left of the screen) will enable easy access to meetings with other users.

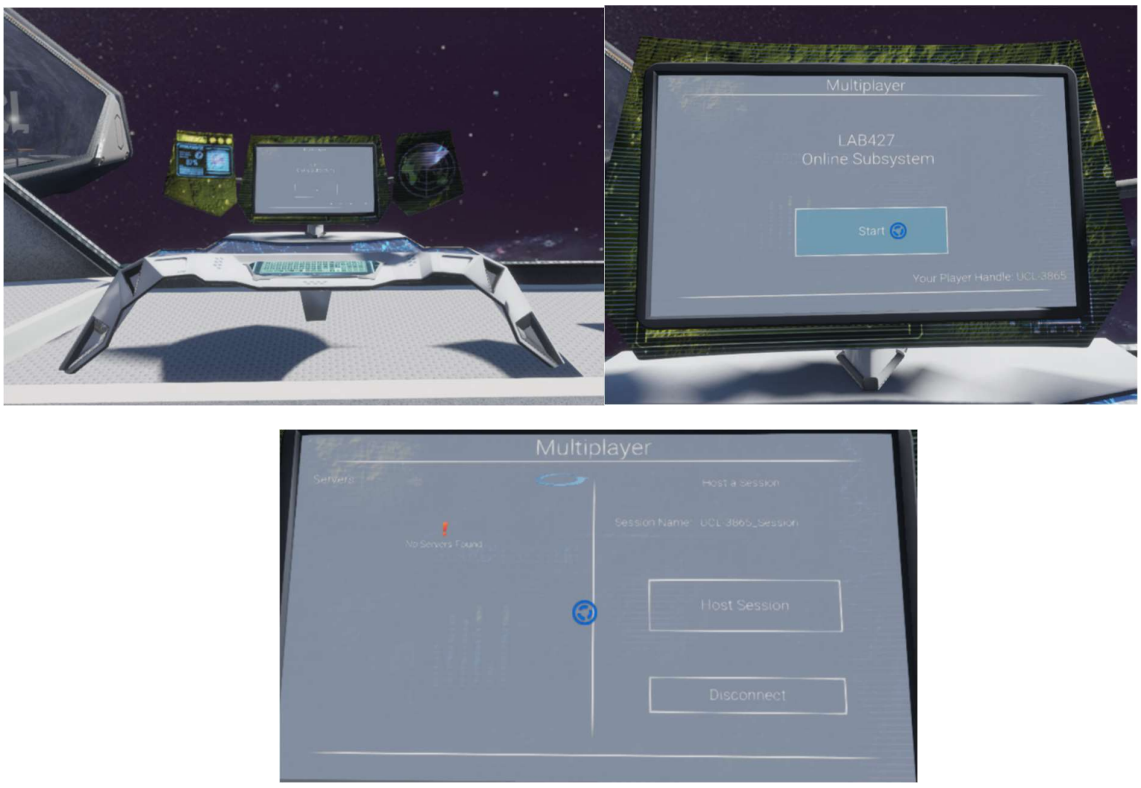


Figure 16

In order to access the software in Multiplayer mode, where students can speak to UCL students and staff and interact as a group, users need to ensure that they have stable access to local Wi-Fi. The software usefully indicates the strength of the Wi-Fi and individual users to ensure good connectivity. On the joining screen (Figure 25) users with stable Wi-Fi are shown in green, users with lower Wi-Fi are shown in yellow and unstable Wi-Fi are shown in red. Please check this when joining the software and adding users.


Multiplayer
Session Active
Players
Session Name:
steve_Session
Player Name:
steve
Leave Session

Figure 17

User Controls: Navigation

Once loaded, the user can navigate around the environments by using the **WSAD** keys on the keyboard and moving the mouse for the viewpoint. To open and close doors, simply click on the handle when it glows, allowing easy movement into the next rooms.

Figure 18

User Controls: Object Interaction

To Interact with objects on the PC, simply click and hold with the mouse for pickup and release to let go. In the LAB427 centre, some objects have gravity enabled, so will behave in the same way as in real life and drop to the floor.

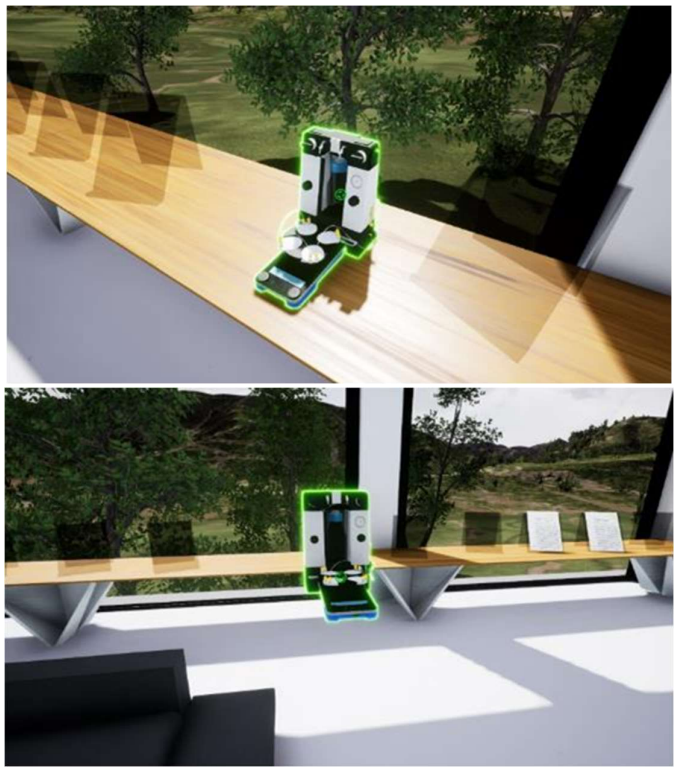
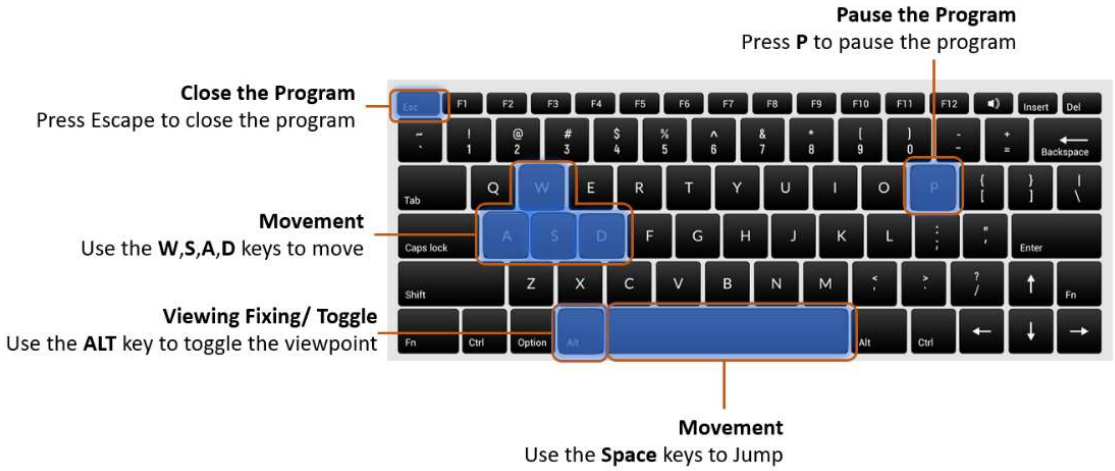


Figure 19

User Controls: PC Software

The PC version of the software is controlled by the keyboard and mouse as shown below. Users can navigate around the virtual building via the W,S,A,D keys on the keyboard and the mouse controls the users viewpoint and allows for interaction with objects.



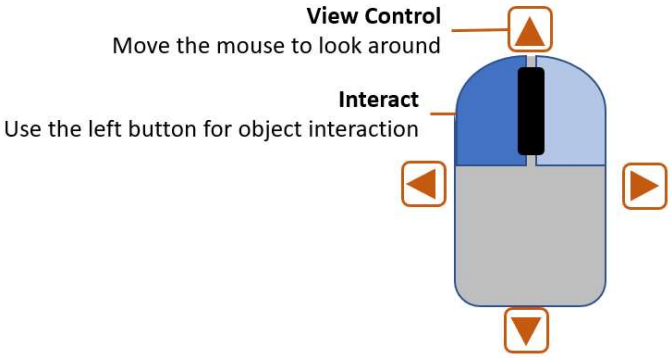


Figure 20

Launching the LAB427_SPACE_V1 Training app on the Quest

Once you have powered ON the Oculus Quest headset and put on the device, you should see the Quest Home room (Fig. 21, A). To open the LAB427_Outreach_V1 application:

1. Raise your right hand holding the controller and Click on Oculus circle button shown (B)
2. This will bring up the main menu bar (C).
3. Using your first finger (Fig 21, D) select the button with 9 dots (Fig. 21, C) on the main menu.
4. Once the Apps screen is opened, click on the menu in the upper right corner (Fig. 21, E).
5. Scroll to the end of the list and select Unknown Sources (Fig. 21, F).
6. Click on LAB427_Outreach_V1 to open the app (Fig 21, G).

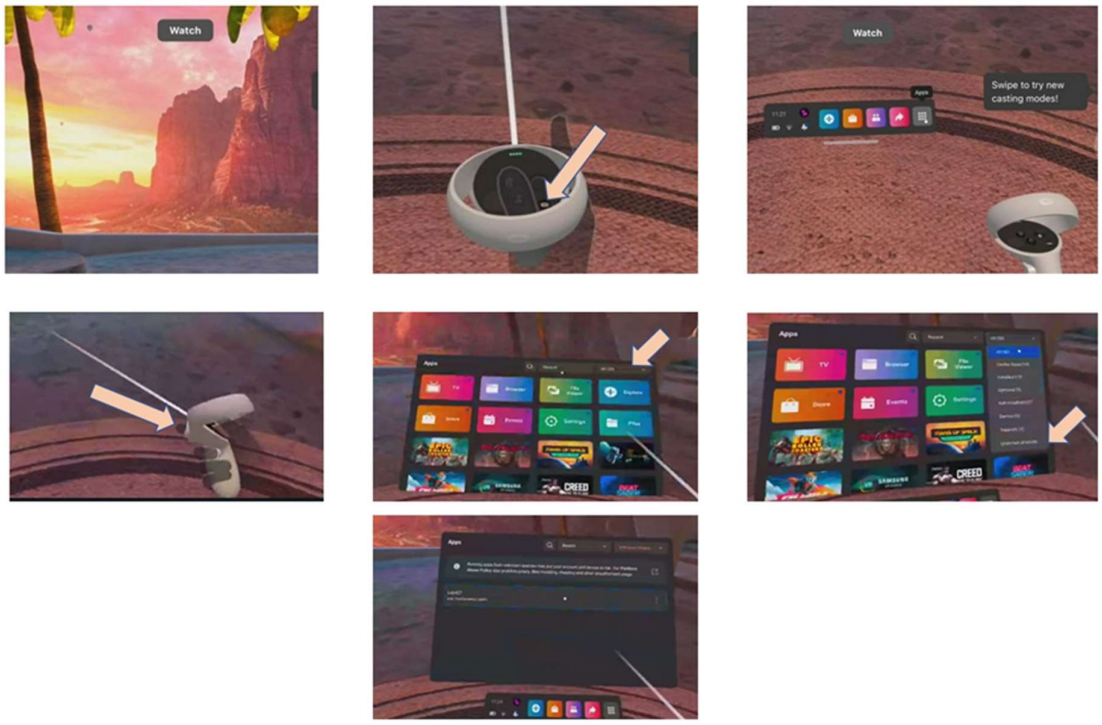


Figure 21

Navigation within the App

You can use the Digital Outreach VR app in either a standing or seated position. To navigate around the room, you can physically walk and turn around, but it is preferable and much easier to use the teleportation feature, especially if you prefer to sit down. To teleport around the rooms, simply press the left-hand thumb-stick down, whereupon a blue circle will appear on the floor. Point where you want to go, “Click” and hold the Left-hand thumb-stick button forward then release it.

You can keep holding the thumb-stick button and point in different directions until you find a desirable spot you want to go to. Please note that:

- Teal-coloured teleportation indicates a valid teleportation location.
- Red-coloured teleportation indicates an invalid teleportation location.

Alternatively, you have free movement by pressing the joystick on the Right-hand controller.

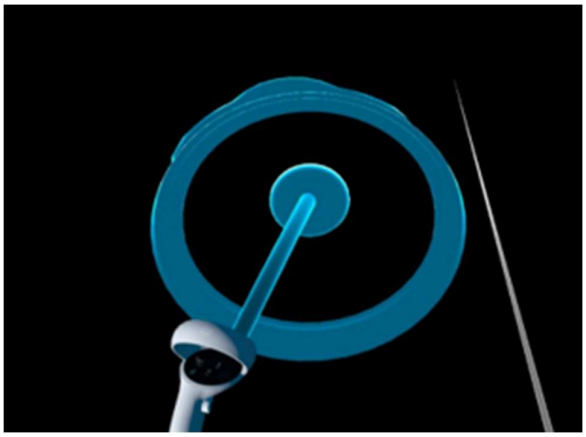


Figure 22

Object interaction within the App

To interact with objects within the software:

Simply point towards the object with your right hand, which will then glow blue if its interactable and click the select button to active the object/ initiate movement of the object – doors etc (Fig. 23).

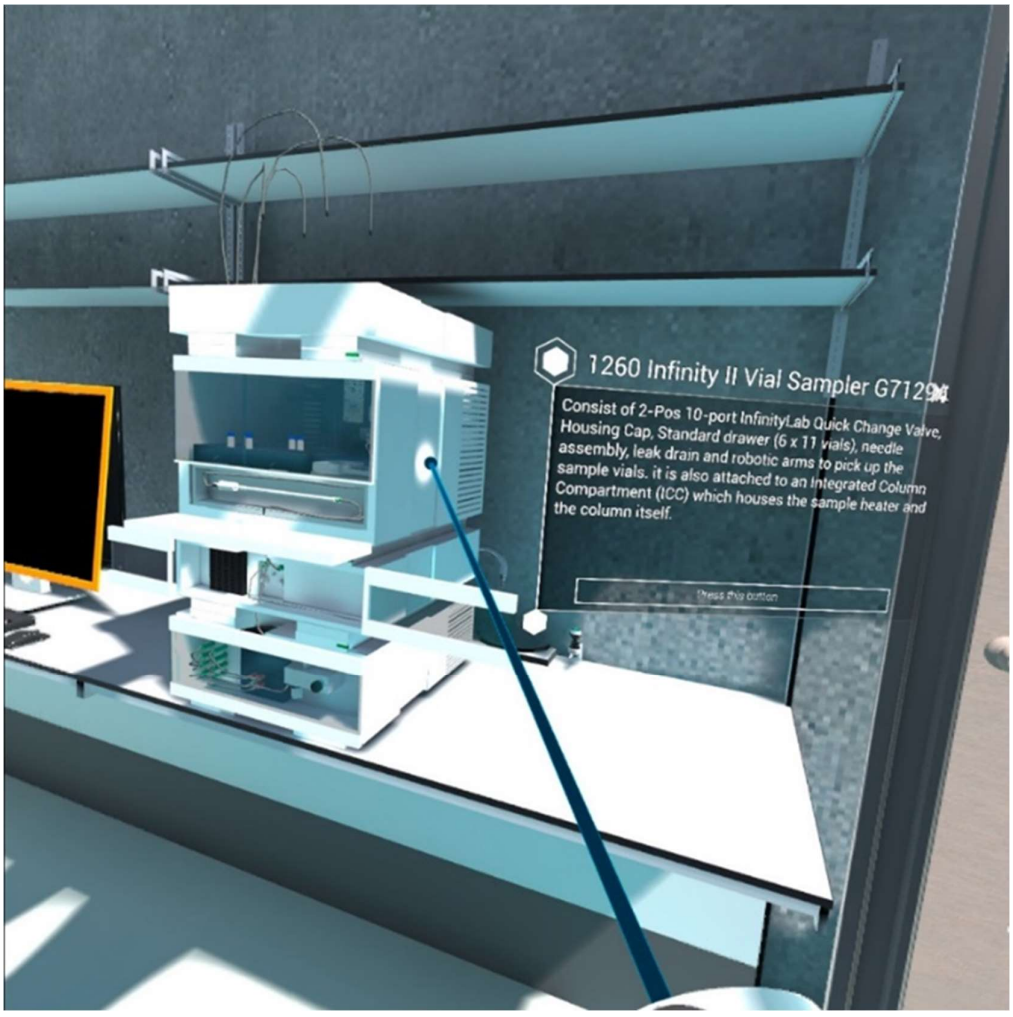


Figure 23

Object interaction within the App -Gripping/ Selecting

To pick up objects, simply squeeze and hold the Grip button and rotate your hand to turn it around and move it further or closer to you using the Right-hand joystick (Fig. 24).

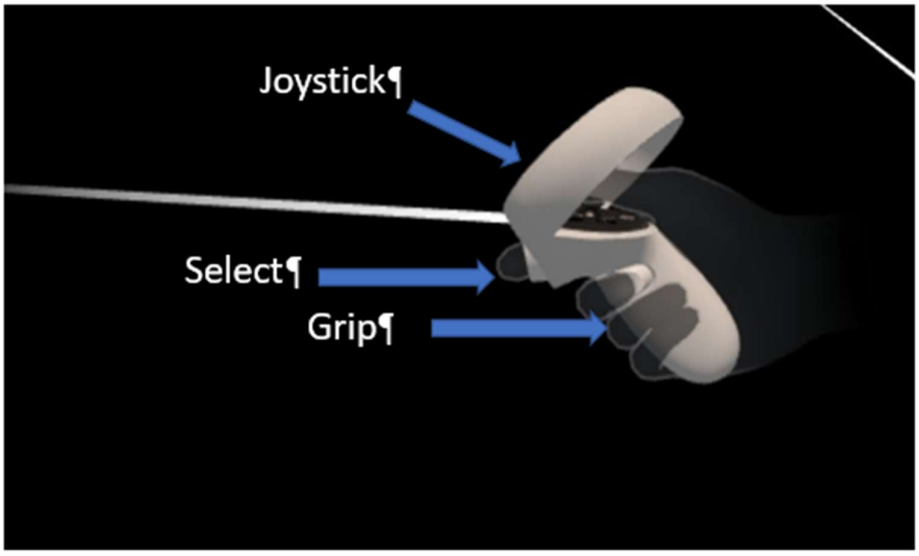


Figure 24

Moving Between Digital Environments

To move between digital environments. Users need to click on the panels on the walls – this opens up a wider panel allowing them to move to the different environments. Simply click on the START LEVEL to move to that room – this also transports others with you at the same time, so that all users are in the same room, assuming they are on multi-user mode.

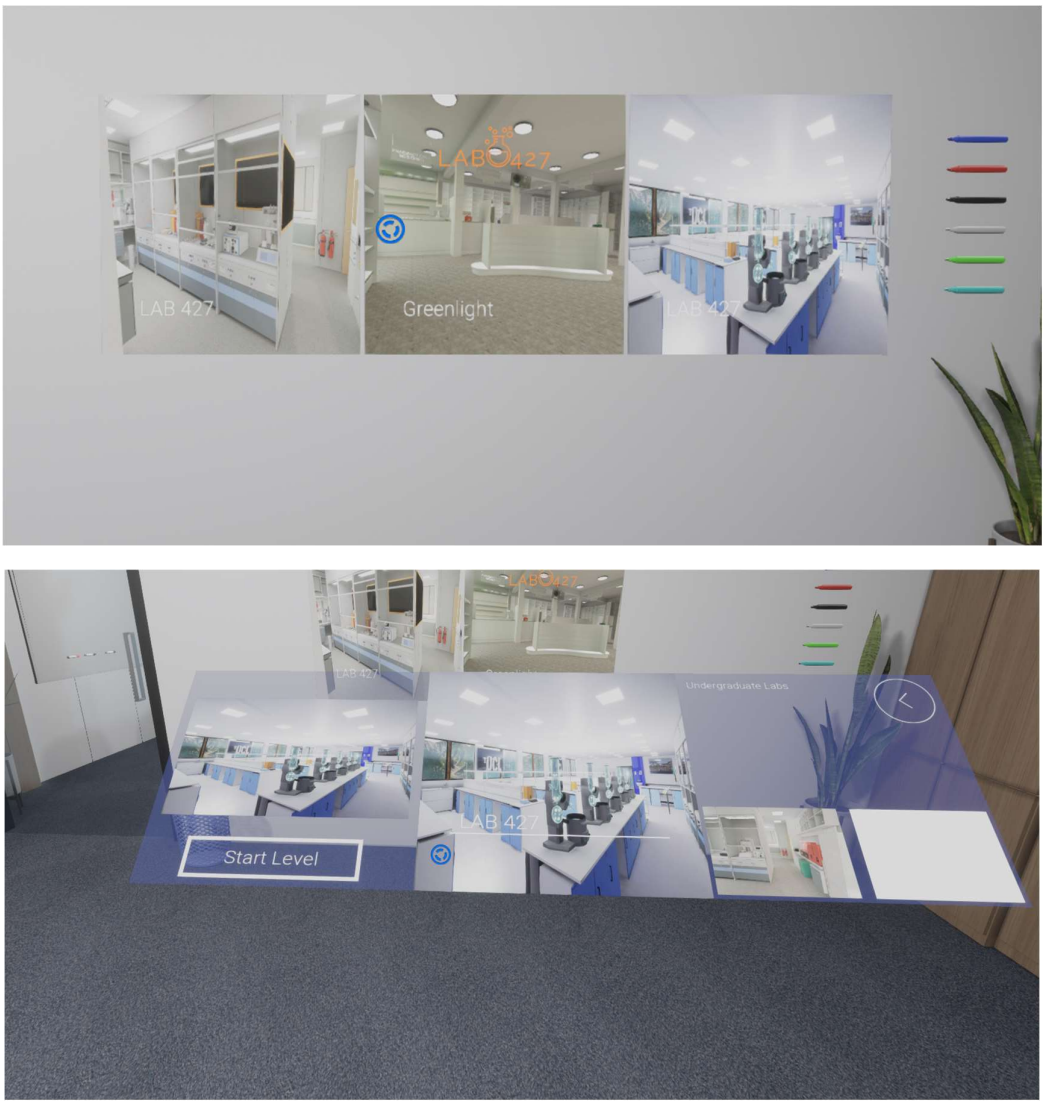


Figure 25

Speaking to AI-Based Intelligent Avatars in the App

To select and switch on an AI avatar, simply click on the orange buttons shown.

Figure 26

Once the AI avatar has loaded, look at the Avatar and press and hold **B** on the PC keyboard or **X** on the Quest 2/3 controller to talk to them. Once you have finished talking, simply let go and the Avatar will respond to your question.

Figure 27

Use of Digital Whiteboards

The digital whiteboards are a great way of working together in Virtual Reality, the exact same way as real life. In order to use these, users need to pick up the pens and remove the pen caps by clicking on them. Users can then draw on the board as shown. To change the pen width, simply use the joystick to thicken, or reduce the size of the pen nib. To change the colour of the pens, dip the tip in the ink pots shown on the bottom right.

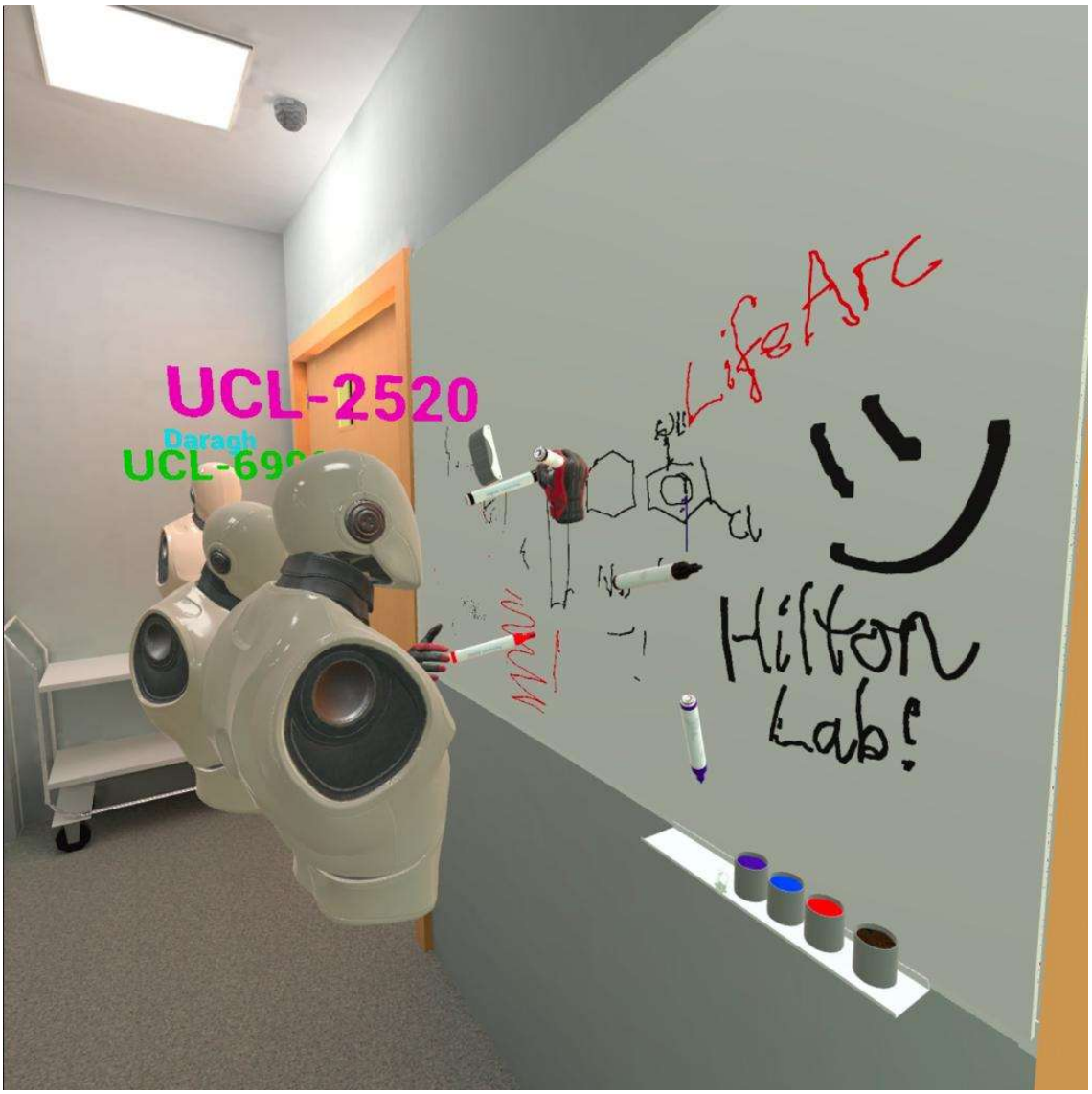


Figure 28

Use of 3D Drawing Pens

The 3D drawing pens, as shown are a great way of interacting in VR with others to explain 3D concepts that are simply not possible in real life.

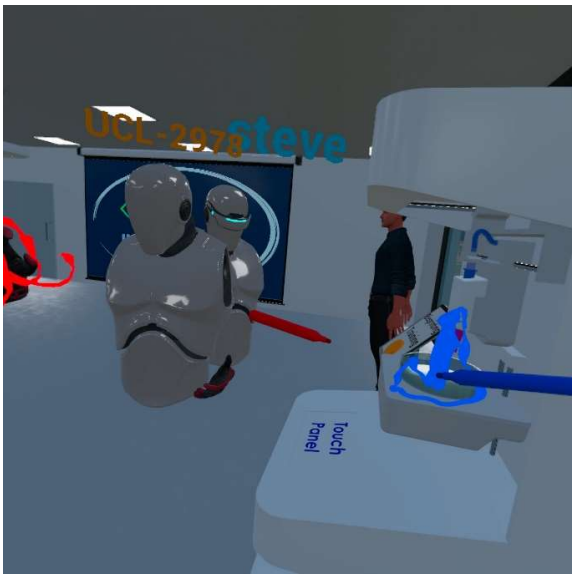


Figure 29

In order to use the pens, simply grab the pens using the grip button on the controllers and then, once held, use the select button to draw in 3D. Once drawn, objects can be picked up by any user in the software. To delete drawings, simply overlap with the blue (single delete) or grey (global delete) waste paper bins to delete drawings.

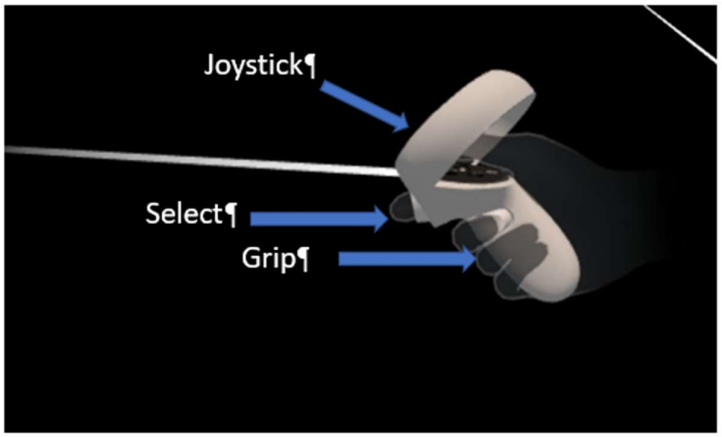


Figure 30

Use of Spawning Windows for Adding Equipment

The Virtual Reality space is designed to be flexible for use by an array of different groups. As such, the environments contain spawning windows where users can add in different

items as needed. In order to use these, simply select by a mouse click, or trigger click in VR to select the items required. Then grab the object in the spawner window on the bottom right panel.

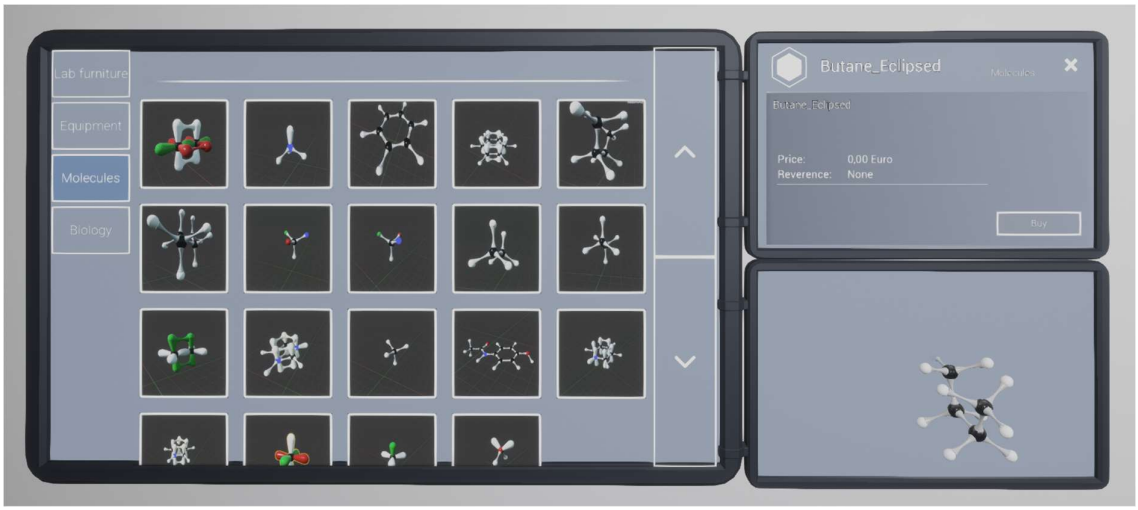


Figure 31

To delete an object, simply click on it once in the environment, which will bring up the selection menu and click on the delete button to remove it.

Figure 32

Use of PPT Slide Screens

Most of the digital spaces in the UCL Digital Outreach Software incorporate links to PowerPoint presentations. In order to move between slides, use the Slide Changer as shown, the exact same way as you would in real life. Each slide changer is unique and linked to the one that it is situated near to.

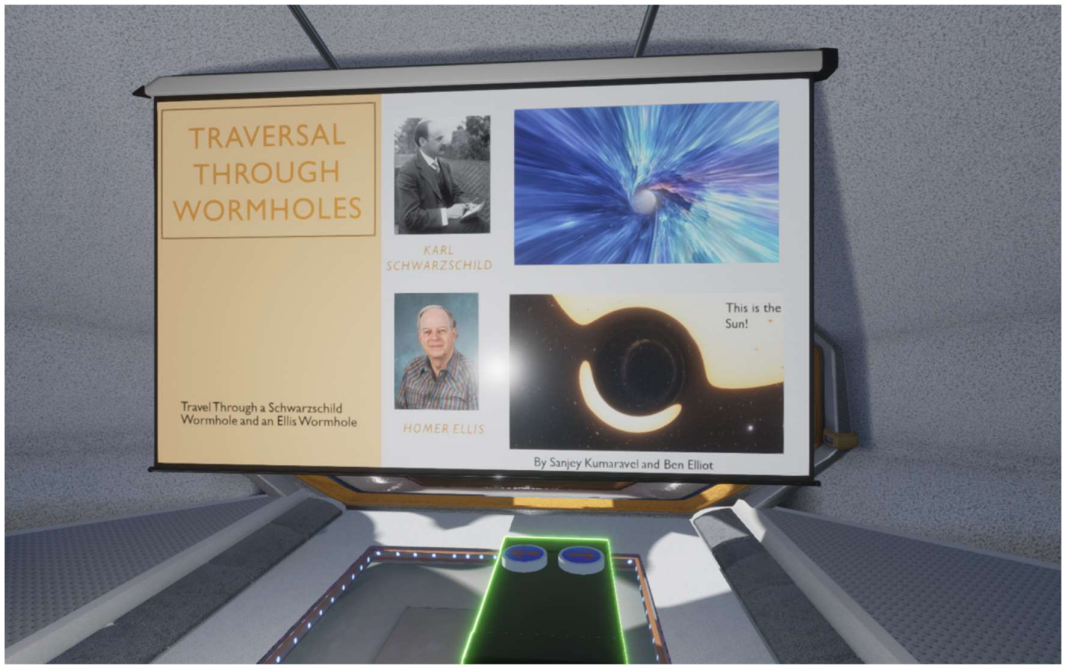

TRAVERSAL THROUGH WORMHOLES
KARL SCHWARZSCHILD
HOMER ELLIS
This is the Sun!
Travel Through a Schwarzschild Wormhole and an Ellis Wormhole
By Sanjey Kumaravel and Ben Elliot

Figure 33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