



Accessible Immersive Learning in Art and Design

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Case Study

The use of Frame VR as a Reusable Learning Object Space:
A subject specific exploration of Frame VR as a teaching space for
Three-Dimensional Design, Model Making, and Digital Art subjects.

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1. Case study aims: Why Frame VR?

Having explored many of the available VR portals such as AltVR, Spatial, etc Frame VR was chosen for its innate ease of use and that it is free to use. The single most significant quality it shares with all these other platforms is that it can be interacted with by users through multiple modalities. So while the emphasis is based upon the use of the platform as a VR space it is more accessible as it can be utilised through mobile and browser as well.

The editing functions of the space and the responsiveness through any standard browser gave assurance that the end-user experience would be maximal. Another key feature is that the editing function has depth with many advanced user functions but is initially relatively simple and straightforward, as a result the importation of teaching and learning materials is straightforward and responsive. So the importation of teaching and learning materials is straightforward and responsive. Very few technical problems were encountered during six months of interaction and use and it has been so useful that it is intended to set up a branded IADT portal for use going forward.

2. Methodology

2.1 Use-case 1: The use of Frame VR as a Reusable Learning space

One of the better template spaces available to the user of FrameVR is the simplified gallery space where within a digital rectangular space there are six panels which can be used to put up imagery, video, etc. The whole area is designed to look like a small art gallery with subtle even overhead lighting. The main advantage is that it can be used to lay out a series of sequential learning: for example, a simple set of guides that indicate basic principles of an activity.

Initially the use of this FrameVR space was considered to convey the simple principles of colour theory, such as complementary and contrasting colours; however it was deemed more beneficial to make this available for use with three-dimensional sculpting. To this end a space was set up that showed simple principles of proportion that relate to the sculpting of a human head. Rules-of-thumb such as the ratio of eye-width to head-width were visually indicated as well as the concept of primary, secondary and tertiary forms that precede the final gestural sculpt. This necessitated the fabrication, rendering and importation as images of visual exemplars of these principles. The ease of use that FrameVR provides for this is considerable where it is easy to import a range of image formats and place them on the gallery panels so that they can then be locked in position of display. The more impactful

aspect though was the ability to import 3D digital assets as .glb files, which have been designed for use with web 3D. Using this file format it was relatively easy to import actual sculpted heads which demonstrated the sculpting process through the forms. This is particularly useful in that they can be seen in virtual three dimensions. Another valuable function was that each 3D object can be rotated in space, a very useful feature which enabled the head to spin in place.

The advantage of this spatial layout lies in its ubiquity and ease of access. It was made available to students who were doing an in-studio module of clay sculpting as a teaching aid. No survey was made with these students to track their experience but using a feature within FrameVR where visits to the space can be tracked via an automated email notification that alerts when a user enters the space, it was seen that there was use by students of this resource.



Case study Frame VR space: anatomical head proportions showing skull



Case-study Frame VR space: anatomical head proportions showing primary and secondary forms



Case-study Frame VR space: anatomical head proportions showing final sculpted head in digital three dimensions.

2.2 Use-case 2: The use of Frame VR as a teaching aid

The second use-case involved the use of a pre-existing gallery template, to record another process for demonstration to other students: 3D scanning where an actual real world object can be scanned, such that a digitised copy can be made of its shape. This process was used in the projects of two final-year students of the Three Dimensional Design Model Making and Digital Art programme in IADT.

This use-case demonstrated two examples of how this technology could be used. One was the scanning of a large-scale clay sculpt and the other involved the scanning of a person's

head and shoulders. Both digital scans could not be used directly within FrameVR as the digital information is too dense to facilitate use through the web for use in VR. However using other digital modelling programs these assets were reduced in poly count without any major loss of fidelity and were then saved as .Glb files for use within the space. As before a simple record of the real-world process of scanning was indicated as images on the wall with the two digital assets both sculpt and digital cast being available in the space to be moved around and seen from all directions. There are no available images of this space as one of the significant limitations of FrameVR is that the free version has a limit of only three spaces available at any one time so this space was deleted to make available another for future use.



Head cast for scanning by Ryan Fretwell



Clay sculpture for scanning by Hannah Cuffe

2.3 Use-case 3: The use of FrameVR to indicate a complex process and the use of animated mesh components.

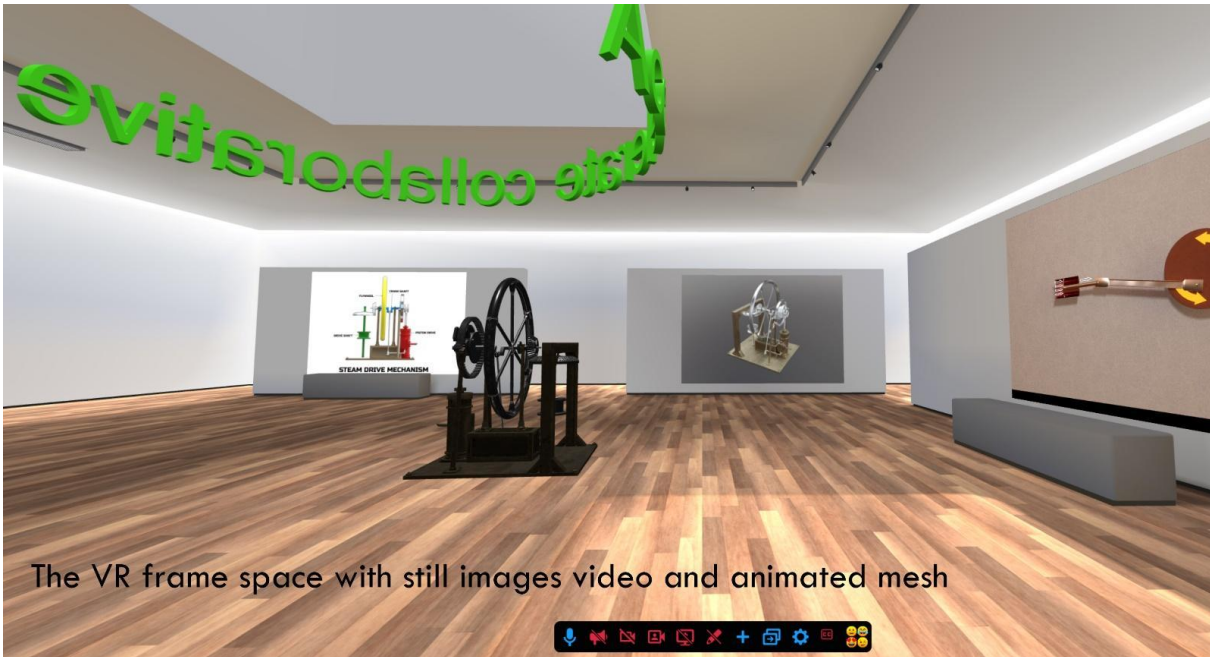
As previously stated the FrameVR system allows the importation and use of digital 3D assets in the .glb file format. This is an immensely useful format as it makes available digital objects through almost any screen based experience and one of the most powerful parts of this is the ability to record animated movement. This file format can have animated movement baked into the 3D mesh such that it will move continuously. The file size limitations mean that it cannot be used for extensive animated track movement but it can show a simple looped animation movement. It was with this capability in mind that the third use-case was initiated. In this use-case the idea of explaining the interactions between mechanical parts

within a stationary steam engine was chosen as an exemplar of a relatively complex interrelated mechanism that would benefit from display as a moving 3D asset that viewers could see how the engine was driven and the translation of the vertical motion of the drive piston to rotary motion was achieved.

This necessitated the construction of the stationary steam power plant in the program 3DMax using traditional polygon modelling techniques. This asset was then textured in Quixel mixer to provide surface differentiation between different parts. The most technically demanding element was the production of a short looped sequence showing the motor turning over and the subsequent rotation of the rotary drive. Ageing 3DMax was utilised to facilitate the animated movement. Extensive technical testing went into ensuring the smooth animated movement was captured accurately. The upload of the various test files to see which one worked was made using the Babylon extension for 3DMax which facilitates the saving of digital meshes as .glb files and which includes the ability to “bake in” animated movement.

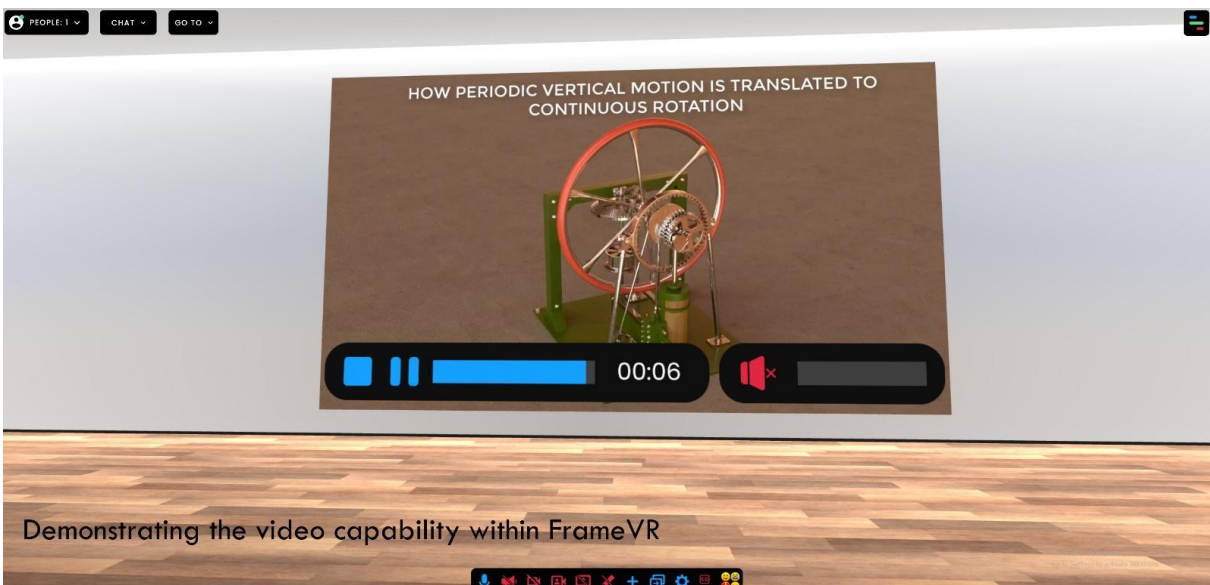
At first these animated meshes did not function correctly but after some communication with technical support from at FrameVR this problem was solved. The mesh when imported to the virtual space would go through its looped motion continuously as if the steam motor was in motion.

The full utility of this animation capability has not yet been fully tested within the programme but it is possible to have a number of animations embedded within one .glb file such that different animations can be selected when in FrameVR. This would be very useful for digital character animation where various skinned and rigged animation movements could be provided for the one digital character to perform.



The VR frame space with still images video and animated mesh

Frame VR space with still images, video and animated mesh



Demonstrating the video capability within FrameVR

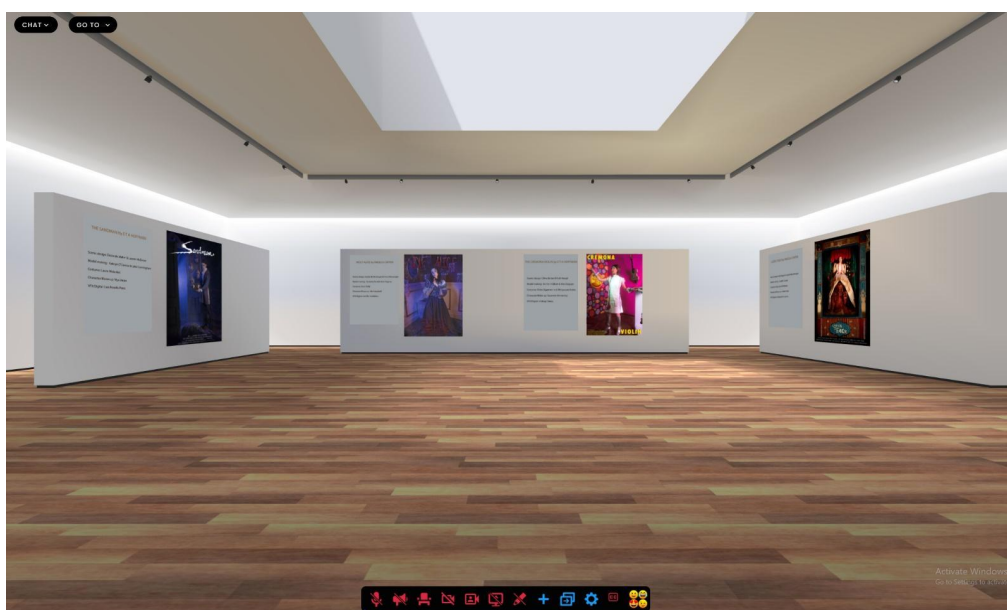
Frame VR space demonstrating the video capability within Frame VR



Frame VR space showing the animated digital steam engine to show mechanical action

2.4 Use case 4: The use of FrameVR to showcase student work.

As a final test of functionality FrameVR was used to showcase the final results of a module in Storytelling carried out by the second year cohort of the programme Design for Film. The module aim was to generate a still image somewhat like a film poster that summarised a short fable or tale inspired by the writings of Angela Carter and HTA Hoffman. The student groups were split into six which produced a life photo shoot of a character against a backdrop. These six images were uploaded to the IADT FrameVR space as an online exhibition experience.



FrameVR online exhibition of student work

3. Evaluation

The following describes the responses to a short survey sent to the graduate year four student group of Three-dimensional Design, Model making and Digital Art. The responses were part of a larger survey regarding the end of year student exhibition which was distributed to students through MS Teams as an assignment. As part of this students were asked their opinion about the suitability of using a FrameVR space as an addendum to the end of year online exhibition.

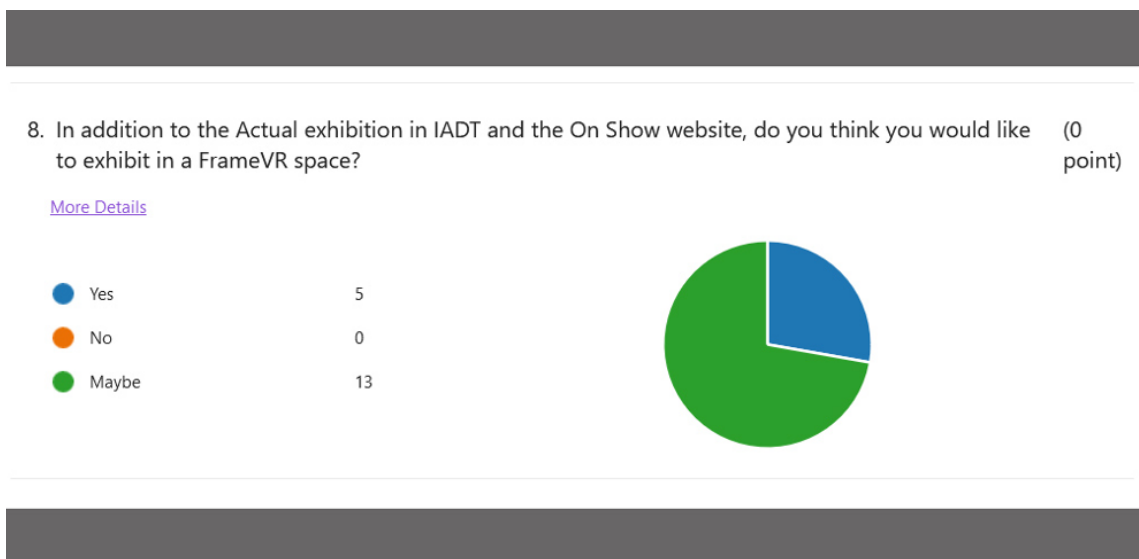
The results were largely positive with respondents agreeing that the FrameVR platform provides an advantage in displaying student content online.

Excerpt from IADT Student VR survey:

Question 8: In addition to the Actual exhibition in IADT and the On Show website, do you think you would like to exhibit in a FrameVR space?

6 out of 18 responded “Yes”

12 out of 18 responded “maybe”



Pie chart showing survey results for students opinions on exhibiting in Frame VR

Question 9: Do you think the FrameVR space is a good way to see student work

10 out of 18 agreed that it was a good way to see student work.

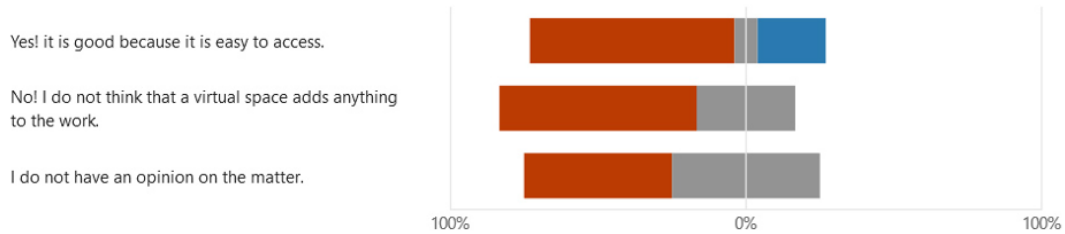
3 out of 18 did not think it was a good way to see student work.

5 out of 18 responded with “I do not have an opinion on the matter”

9. Do you think the FrameVR space is a good way to see student work (0 point)

[More Details](#)

■ Option 1 ■ Option 2 ■ Option 3 ■ Option 4 ■ Option 5



Bar graph showing survey results for students' opinions on the using Frame VR to see student work

Question 10: Do you think the FrameVR space is particularly beneficial in showing three-dimensional work as it can be seen in the round.

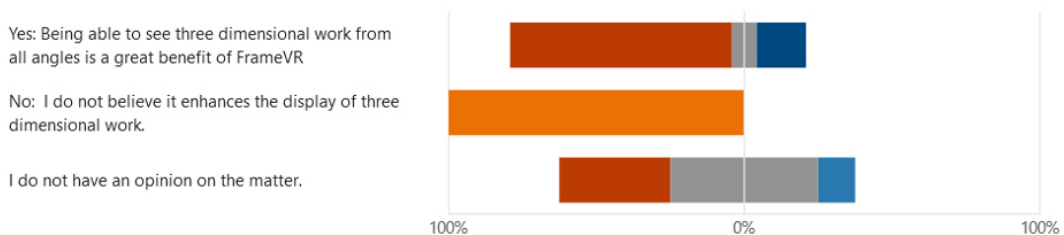
12 out of 18 agreed with the statement that the FrameVR space is particularly beneficial in showing three dimensional work.

6 out of 18 respondents did not have an opinion on the matter.

10. Do you think the FrameVR space is particularly beneficial in showing three dimensional work as it can be seen in the round. (0 point)

[More Details](#)

■ Option 1 ■ Option 2 ■ Option 3 ■ Option 4 ■ Option 5



Bar graph showing survey results for students' opinions on the benefits of using VR for showing three-dimensional work

Stats: Between 3rd - 31st March the online space had over 68 online visits.

4. Findings

The most valuable part of the Accelerate project for IADT was the introduction to and interaction with other academic users from Institutes across Europe and the UK. This was facilitated by Bath Spa University who brought the participants together and generated groupings of like-minded interest. The IADT involvement in the Accelerate project was as a case study team with colleagues from University of the Arts London. The meetings, training sessions, discussions, and collaborations were of immense benefit in shaping the progress of the project for IADT. In particular the early realisation of the power of the FrameVR platform and the possibilities of its use were made through interactive use sessions with colleagues using FrameVR and other software systems such as Gravity sketch. While unfortunately syllabus alignment was not possible within the scope of the project, very beneficial reflections were enabled by the close cooperation between parties and by being able to see the innovative project ideas and activities of academic colleagues from abroad.

These use-cases have been provided as passive teaching materials that have had some use by students within various modules. However it is intended to further develop the use of Frame VR as a teaching aid and to investigate more thoroughly its use as a digital classroom.

As indicated in Use-case 3, FrameVR really becomes valuable as a resource for viewing digital three-dimensional objects. The ability to walk around an object, even in a normal browser window or mobile phone, is very valuable in an educational and creative context. This is more effective when used in actual VR where the effect is very engaging. The added aspect of being able to demonstrate motion brings many new possibilities to demonstrate and share such digital assets as each of the objects can be downloaded from FrameVR by visitors if they have permissions.

The broad functionality within FrameVR is a valuable feature with the process of uploading and displaying a variety of still images, video and meshes, the capability of this digital platform for display, and teaching is immense.

There are many VR platforms available and the majority of them are provided free to use but the benefits of FrameVR as a system is the ease of use. The layout and editing from a UX perspective is simple but effective. Within this platform the emphasis has been placed on pop up panels that are clear and with the right amount of functionality. While the platform also allows for more advanced use case scenarios it is the effective and easy to use editing and layout that is most appealing for an educator.

4.1 Key findings

Pros:

- It is free to use.
- FrameVR is easy to use but allows for advanced users to be able to implement complex digital components such as animated meshes.
- There is a good range of provided templates and they are sufficiently flexible for most end use cases.
- As an online exhibition platform, it has robust functionality and is very useful.
- As a platform to provide guided workflow explanations of a technical process, activity or principles, it has proven flexible and easy to use.

Cons:

- Limit of three spaces at any one time. This even applies to the subscription model.
- Implementing advanced functionality requires specialist understanding as items such as animated 3D meshes require conversion to non-standard file formats.
- Whilst FrameVR provides the ability to implement a user generated digital space/environment, the process is technically challenging.
- As an online meeting space it shares the same challenges that one encounters in other platforms such as Teams or Zoom and that is that students prefer to remain present but silent, and it can be hard to engage group dynamics such as a team discussion/debate.

5. References

Link to IADT Frame VR: framevr.io/accelerate-advanced

Link to online exhibition of student work: framevr.io/dux-nua-zer