accelerate ▶

Accessible Immersive Learning in Art and Design

an Erasmus Strategic Partnership
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Case Study

'Think Again…' Exploring how immersive technology can be used as a learning tool for students of Art and Design in Higher Education.

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2021–2023

BATH SPA UNIVERSITY

SWPS University

Institute of Art, Design + Technology Dún Laoghaire

Sumy State University SSU

ual: university of the arts london

ЧЕРНІВЕЦЬКИЙ НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ ІМЕНІ ЮРІЯ ФЕДЬКОВИЧА · 1875 · VIVAT ACADEMIA

Contents

1. Case study aims

Bath Spa University and SWPS University implemented a project called "THINK - AGAIN…" The aim was to develop design concepts of the time using new tools - SculptGL software and Gravity Sketch software. The outcomes were presented in a shared Frame VR space; a common virtual classroom for experiencing, observing, comparing and discussing the final results.

The target audiences of the study were two groups of students with different levels of technological advancement. The target group at Bath Spa University were a small selection of [Y0] Integrated Foundation students who will specialise in pathways across the School of Art, Film & Media and the School of Design. Their previous experience with this technology was varied, and in most cases at beginner level. The target group at the School of Form were 3rd year Industrial Design students, and their technology expertise was advanced.

A cohort of 1st year students developed their design concepts using SculptGL software. It was their first contact with the computer 3D modelling environment. SculptGL was selected as it was open-source software which would support accessibility for this beginner group. Due to the advanced level of 3D modelling skills of the 3rd year students, the concept development stage was conducted in the VR space using Gravity Sketch software. This differentiation made it possible to evaluate and compare the two paths of project development.

The aim of the case study was to explore various methods and levels of adaptation of immersive technology for learning to teach art and design in higher education. The different level of technological advancement of the student cohorts created an opportunity for a multidimensional comparison of the two development paths.

To determine the potential of implementing new tools for teaching, an important aspect of the study was to define which approaches of concept development are easier, more intuitive or more satisfying for students. Another important part of the study was to test different methods of adapting students to the VR space so that their first experience was positive. It was assumed that a proper introduction to the new environment is crucial for further exploration of the immersive technology.

A particularly important aspect of the case study was evaluating the value of sharing a design space (collaborative room in the Gravity Sketch) and a virtual classroom/gallery where students presented their projects (Frame VR). The "Diagnostic Report; The Experience of Online Education" conducted at the beginning of the Accelerate project showed that across all partners, the lack of direct contact of students with other students and lecturers

was identified as the most important disadvantage of online education. Comparing the standard of their projects with others and learning by observing others were the missing functionalities of digital tools. In this context, the implementation of immersive technology has the potential to eliminate some of the difficulties associated with online learning.

2. Methodology

Sessions by case study partners were conducted separately but followed the same structure with students following a similar path. The only difference was the use of different tools to create 3D models.

The case study at SWPS was divided into three sessions each taking 45 minutes. In the case of third-year students, all sessions were held using immersive technologies. The first session focused on the introduction to the VR space. The method of incremental adaptation of students to the new environment was used to minimise negative experiences and avoid feelings of being overwhelming and disoriented. The first step for participants was to define the boundaries of their mobility area in the headset. Then they explored the default space of Meta Quest "Neverland Loft". The next step was to watch a short animation available in the TV application. This was to familiarise students with the changing metaverse around them. The last phase of the first session was completing an interactive tutorial prepared by the authors of the Gravity Sketch software. The available tutorial was found to be adequate in terms of advancement, intuitiveness, and functionality. The accounts were created on the Landing Pad (a cloud platform connected with the Gravity Sketch) for all students.

Further sessions focused on exploring Gravity Sketch in the collaborative room. Students were given freedom in choosing the functions, tools for 3d modelling, and the properties of objects such as scale and texture. The task of the lecturer was to explain how the tools worked, to support finding specific tools in the menu, to suggest the tool based on the description of the desired effect, and to observe behaviours of case study participants through a sharing screen. At the end of the last session, students uploaded their results for a shared virtual class (Frame VR) with Bath Spa University students. At this stage, users were free to create this space as well.

In the case of the [Y0] BSU Foundation students, sessions were held across multiple formats: in person, immersive technologies, and online spaces such as Google Meets. The methodology attempted to mimic that of the 3rd Year Industrial Design students, but taking into account the context and skill set of the Integrated Foundation students, some adaptations needed to be considered.

The first session focused on the introduction of a new modelling software, SculptGL, via a Google Meet session allowing students to test, play and experiment with the modelling software to generate new outcomes. This open-source software allowed students to access it instantaneously, whilst also using relatable 'actionable' language in its tool vocabulary, e.g. pinch, stretch etc. The students shared outcomes and collaborated to solve creative issues in realising a series of outcomes. The final part of this session involved exporting their models via 'SketchFab' which 'bridged' SculptGL & Frame VR.

The second session focused on inductions to VR and importing models into VR space, to then experience, curate and refine outcomes. This was structured in a rotational set up with students placed in small groups. At Bath Spa University, Technical Demonstrator Jon Warmington set up and inducted groups into the headset & VR space, whilst others were importing, curating and embellishing their models in a playful and experimental manner. These students then rotated to refine their models, re-curate or add too, whilst others had inductions.

3. Student Experience

Information about the user experience was collected through an online survey. The results of the research are presented below.

Participants used a wide range of tools to create their concepts. They used traditional methods such as sketching and manual prototyping, as well as more advanced technological tools - 3D modelling in Rhinoceros, SculptGL and Gravity Sketch softwares. Half of responders found the manual prototyping with Rhinoceros easier, which was well-known and practised more.

Which tool was easier for you?
10 odpowiedzi

- manual prototyping / RhinoCeros
- Sculpt GH / Gravity Sketch
- not sure
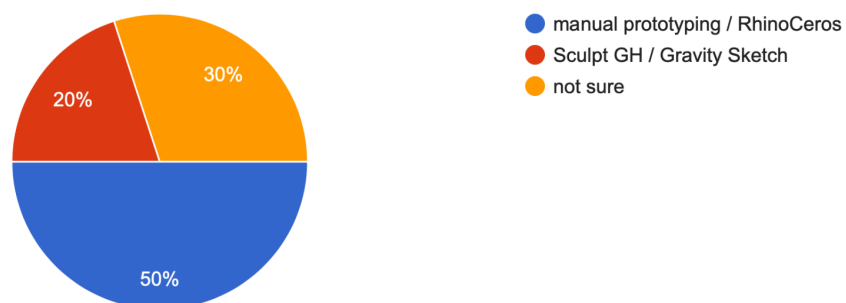
Briefly describe why the chosen tool was easier for you

9 odpowiedzi

Those tools were easier for me because I know well how to use them. On the other hand gravity sketch is such intuitive program that if I didn't have experience in rhino I'm sure gravity sketch would be the easier one

Probably because in the case of bending metal rods, manual prototyping is just as easy as software prototyping, as it's a simple material.

More precise

I think it depends, if you want to make a model that supposed to be ready for print or more technical way.. easier to do it with rhino.. but, gravity sketch also easier to do some explanation with quick sketch or make everything clear while delivering the concepts

For me it is always good to see and feel when you creating something. Because it is easy to recognise and easy to understand how it will work looks etc.

Easy to use

However 70% defined 3D modelling in VR space / SculptGL as more intuitive and satisfying.

Which method of developing a design idea was more satisfying for you?

10 odpowiedzi

- manual prototyping / RhinoCeros
- Sculpt GH / Gravity Sketch
- not sure

70%   10%   20%
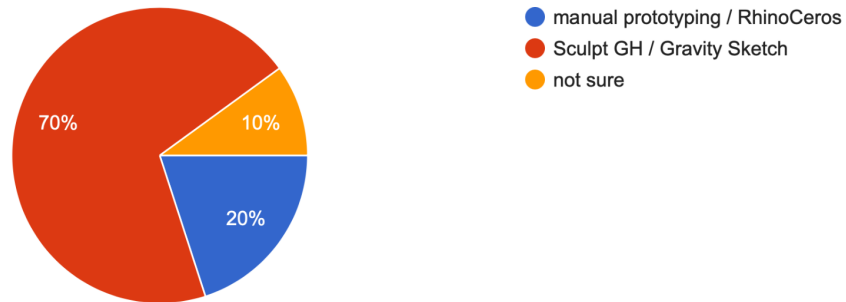
The most important positive characteristics of FrameVR were the experience of real scale and three-dimensionality of objects. The lack of precision was indicated as the most important disadvantage.

What feature of the tool did you like the most? (ex. experience of the real scale of the object)

9 odpowiedzi

Experiencing real proportions, sometimes when we design large works, we finish the whole work with doubts because the conditions are not perfect, VR allows us to experience the real proportions of large works in a realistic way, it is easier for us to find out where the work needs to be improved.

Also the online function is great, partners can draw in the same room with each other and communicate at the same time. It's really great for group work.

real collaboration! rhino don't have this feature unfortunately :(

Drawing in VR

Flatten/paint

The real scale tool is really great to get a feeling of how big an object actually would be. If you just do it in rhino you don't get that feeling of how big it actually is.

On blender I found more help online and tutorials on how to do more advanced creations. However, the simplicity of sculpt made it feel less stressful.

For sure experience of design in real scale

I think it's great to be able to see objects in VR, as sometimes we get complex shapes/patterns which are difficult to work with when projected on a 2d screen (eg in rhino)

Experience of the real scale of the object

All respondents felt the experience of collaborating in the Metaverse was highly satisfactory, supportive and inspiring. Learning by watching others was indicated as the most helpful function of the collaboration.
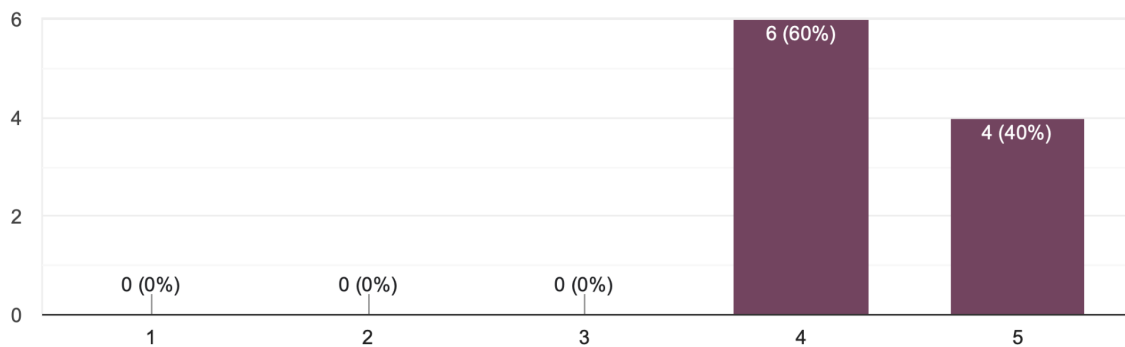
Was collaborating in the VR a satisfying experience for you?

10 odpowiedzi
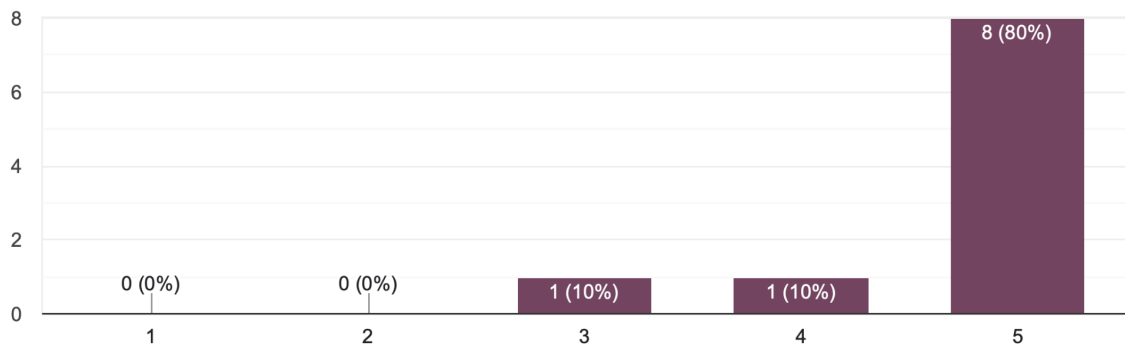
Was it helpful for you to see other people's designs in the VR?

10 odpowiedzi

Why see other people's designs in the VR was helpful for you?

8 odpowiedzi

I could see what options I didn't discover yet are they using and ask them how to do it

It is a nice inspiration, and you can also help each other with how to do certain things - that you would for example see in their design

Seeing them using tools that I did not discover yet

because I can see other people's design in many perspective and easy to have same page with the designer

Gave me lots of ideas and inspired me do use VR more.

Inspiration/i enjoy seeing what other people have made

It was fun to actually create something together with other people. Someone could start something and then give it to the other person to finish.

Seeing everyone's work in a VR space felt like I was in an real world gallery, only with no limits on what could be created.

The level of difficulty of adapting to the immersive technology was highly diverse, but no one defined it as very challenging. The most helpful and powerful method was their own exploration.
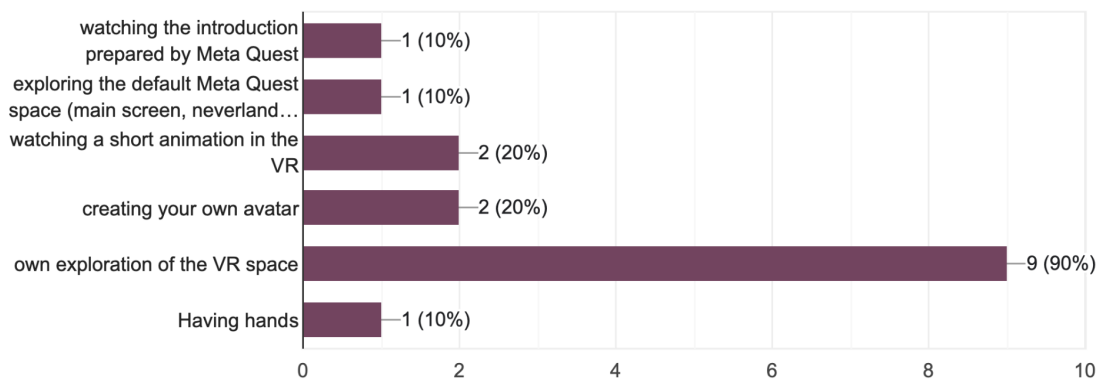
Evaluate the level of difficulty of adapting to the VR space during the sessions.

10 odpowiedzi
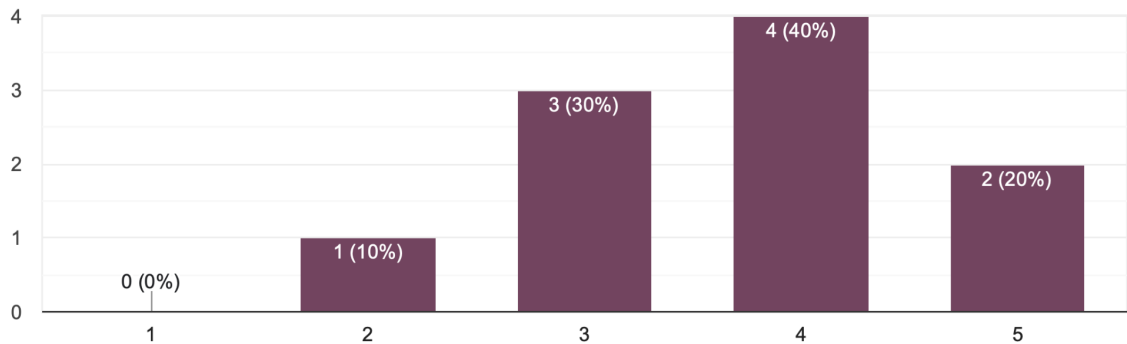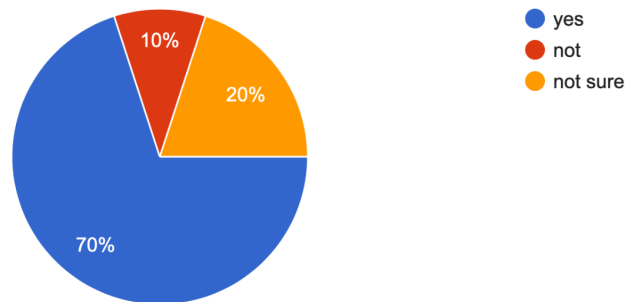

What helped you adapt to the VR?

10 odpowiedzi

Most students questioned said they would like immersive technology to be introduced into art and design teaching. Half of the respondents believed the hybrid model is the most efficient for further project development.

Would you like art / design lectures to be conducted using VR in the future?
10 odpowiedzi

Legend:
- yes (blue) 70%
- not (red) 10%
- not sure (orange) 20%

What model of conducting art / design lectures seems to be the best for you?
10 odpowiedzi

Legend:
- in person (blue) 30%
- in the VR (red) 10%
- hybrid (orange) 50%
- not sure (green) 10%
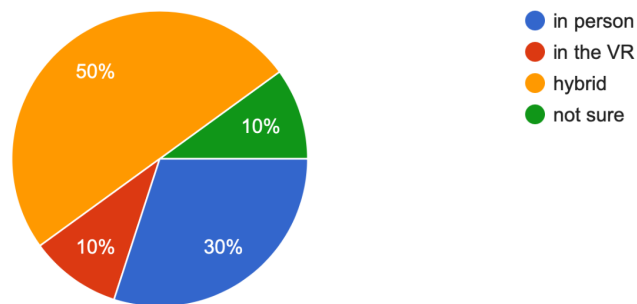
Several of the respondents felt 'off colour' after spending longer time (more than 1 hour) in the VR space. The common reason was blurry vision.

Have you felt a lower physical well-being after spending some time in the VR space?
10 odpowiedzi

Legend:
- yes (blue) 30%
- no (red) 40%
- not sure (orange) 30%
- don't remember (green)

If yes, what was the reason for this?
5 odpowiedzi
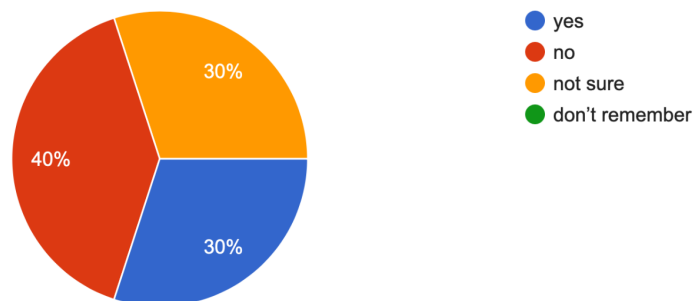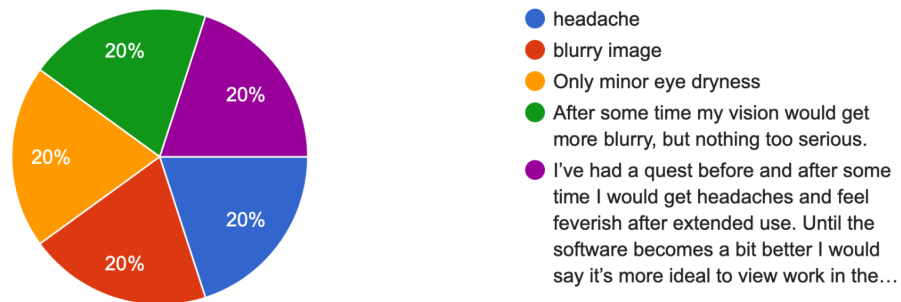

- headache
- blurry image
- Only minor eye dryness
- After some time my vision would get more blurry, but nothing too serious.
- I've had a quest before and after some time I would get headaches and feel feverish after extended use. Until the software becomes a bit better I would say it's more ideal to view work in the…

4. Findings

Sessions focused on 3d modelling in Gravity Sketch involved a constant interaction between the participants. They showed and explained to each other how to achieve a given effect. If someone needed more support, they created objects and passed them to those in need. Students tended to work on the same scale of objects. When someone in the group created a much larger object than the rest, other participants were asked to make it smaller as oversized objects were overwhelming for the rest. This has been interpreted as a need for a sense of security and equality in the metaverse. Misunderstandings between collaborative room users resulted in distancing individuals from the group.

In the collaborative 3d modelling room, users are visualised using the Meta avatars. If the user does not have an avatar, they are displayed as a white robot. All students demonstrated a strong need to create their own avatars as they didn't want to be impersonal white robotic visuals. Without personal avatars, they did not want to start a 3d modelling session. The Gravity Sketch settings does not allow users to login to an individual user account without creating a new Meta Quest user account in the headsets. Creating another account to access the application was the most frustrating for students and took half of one session.

During the set up for the VR Headsets at Bath Spa University, Technical demonstrator Jon Warmington identified an issue with the connectivity of the headset to 'eduroam' wifi. This resulted in the Headsets needing to 'hotspot' from a designated remote device for the duration of the session. This was only realised late on in the set up and wifi connectivity - especially when immersed in particular VR effects such as 'autumn leaves' - buffered a number of times across the session. This had an impact on engagement and the student experience.

An additional hurdle in the process was bridging Gravity Sketch and Frame VR with a third platform, Sketchfab. This added additional complexity and removed the immediacy of modelling and experiencing for the students. They were each required to generate accounts to export and upload models, providing unwanted additional administration. Thinking about the case study in the context of a large [100+] Integrated Foundation programme, the VR element of the case study is currently an unrealistic opportunity to offer all students an immersive experience without this being a significantly long project.

5. Evaluation

The research conducted in the ''Diagnostic Report; The Experience of Online Education'' at the beginning of the Accelerate project, showed that for most students online learning was less effective and motivating than in person. As no direct contact with other students and lecturers was indicated as the most important disadvantage of distancing learning, participants of the case study considered how the experience of immersive technology gave them a substitute of direct contact. The experience of three-dimensionality, watching the movement of others and creating a personal avatar had a significant impact on the illusion of reality. As opposed to online learning, students were highly satisfied with teamwork in the VR space. They had opportunities to help each other, compare work with others and learn through watching, which were the essence of collaboration and missing part of distance learning. The collaborative process of creating objects and space was inspiring and motivating.

One of the greatest difficulties experienced by the participants were technical issues. Using the above-mentioned advantages of immersive technology is impossible without access to the Internet, which negatively affects its accessibility. An additional number of required accounts at every step made it demotivating as online learning.

Due to the timeframes involved in the case study, there are a number of unresolved elements of the planned pilot project. The most significant being the final session which would see a collaborative meeting between the two cohorts.

6. Recommendations

1. Working in a VR environment requires access to multiple accounts. We suggest starting learning in immersive technology from the organisational issues. Setting up accounts during the first session will avoid disorganisation in subsequent classes. Preparing a tutorial or instructions on how to set up accounts can be very helpful as well.

2. If more than three students use headsets at the same time, sufficiently large working area preparation is necessary. For comfortable work, you need at least 1.5 m^2 per user.
3. Care should be taken to have good internet quality. Especially when the VR space is shared by several users, e.g. collaborative room in the Gravity Sketch.
4. If you want to use 3d models from the Gravity Sketch in the Frame VR, it's best to export each model separately (use layers). You can do it with another 3d modelling software as well, e.g. Rhinoceros.
5. First experience of new technology, in this case immersive one, is very important. Based on this case study we recommend self-exploration of the VR space by users. Participants are engaged and eager to discover new technology on their own.
6. Sessions no longer than 1.5 hours to avoid feeling off colour.
7. After each session, remember to charge the headsets.

7. Next steps

1. Increasing the number of headsets to make classes more productive and engaging all participants.
2. Developing cooperation between students from different universities and Inter-university project teams. Students collaborate at every stage of the design process.
3. Frame VR not only as a project gallery, but as a workplace as well.

8. Appendices:

Documentation

Session 1 | School of Form

Session 1 | School of Form

Session 1 | School of Form
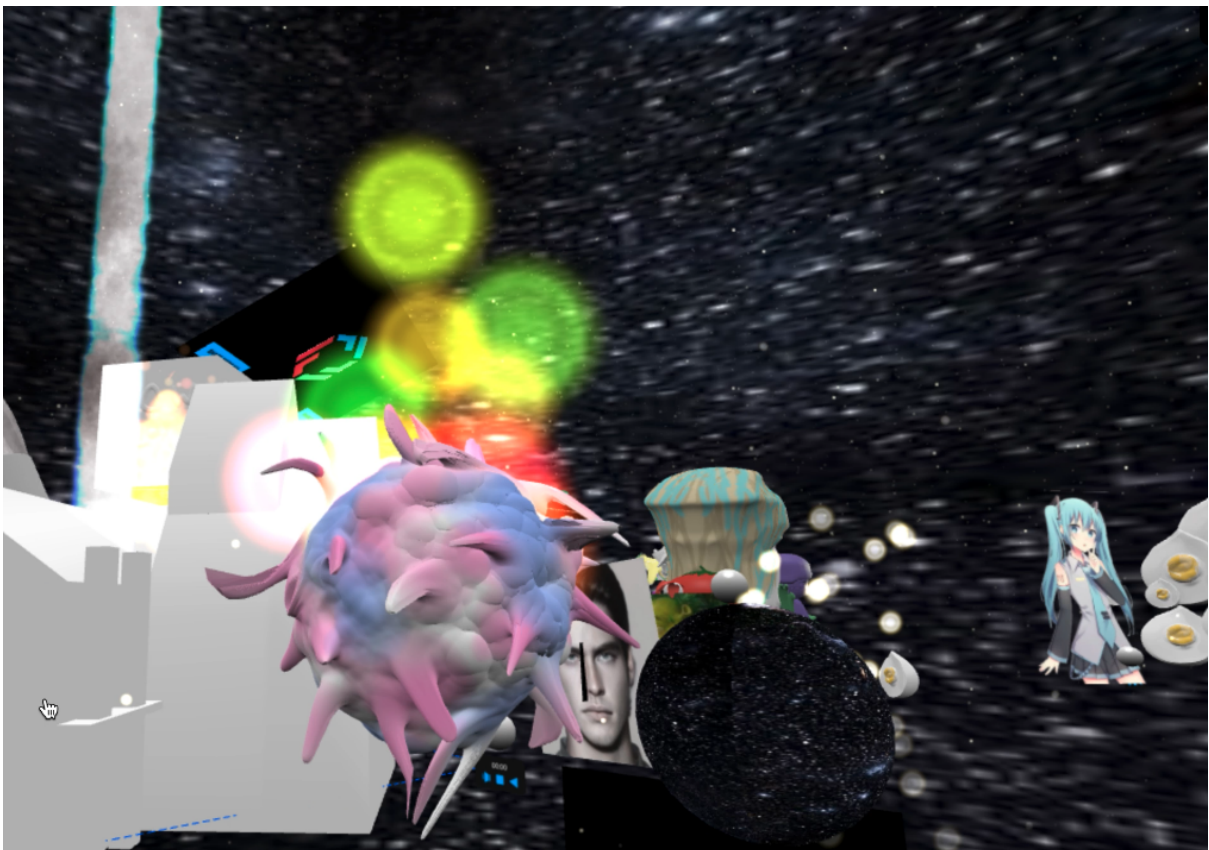
Session 3 | School of Form

Session 3 | School of Form

BSU IFAD student in VR headset

BSU IFAD student

BSU IFAD Case Study Pilot student outcome

BSU IFAD Case Study Pilot outcome

Case Study Pilot session plan by Jonathan Kelham, Bath Spa University.

I N T E G R A T E D - F O U N D A T I O N - I N - ART - & - D E S I G N- | Y - 0

C A S E - S T U D Y - P I L O T - S E S S I O N - P L A N

C A S E - S T U D Y - P I L O T - S E S S I O N - P L A N

Session Title : *T H I N K - A G A I N . . .*

Cohort :	Integrated Foundation in Art & Design [approx. 80 Students] - Y0. Half of cohort per session [approx. 40 students]
Date / Time :	Thursday 3rd March Session 1. 10:00 AM to 12:30 PM Repeated with the second group. Session 2. 1:30 PM to 4:00 PM
Location :	Locksbrook & Online
Software / Equipment Needed :	Students will need access to a laptop [to access software] and headphones. [either in the studio or in the Mac suites] Account for A-Frame - pre. Session prep for students. Use of browser based SculptGL software. Session will be recorded on google meets.

Context :	Students will be in the middle of a specialism specific module - responding to a brief from one of 10 different specialisms across the school of design or the school of art, film and media. Fine Art, Fashion Design, Textile Design, Photography, Fashion Photography, Interior Design, Creative Arts Practice, Graphic Communication, Digital Animation, Furniture & Product Design. Students will be asked to consider the development of their current ideas as 3D models - using speculation as a thinking process for them to *Think Again …* about their projects development - as a painting, photograph, garment etc. Using previous knowledge of SculptGL to generate a series of outcomes, which are then placed within the A-Frame Space to consider scale, impact, form, relationship to the work of others. This will then form part of the space for the response / collaboration with the case study partner.
Rational :	The session will build upon previous theory & practice: Speculative Design, Richard Serra's Verbs, Measured Drawing & Scale, Risk Taking, 3D modelling with SculptGL and Digital Curation… We have intentionally kept the delivery of the session as close to a typical digital session which incorporates introduction, application and reflective elements. This is to allow for a realistic and 'true' understanding of the potential barriers to utilising some of the A-Frame software presented at the Accelerate training. This online space will become the 'sandbox' / collaborative space between the two case study partners.
Module:	FAD 3002-20 Develop
Module Intended Learning Outcomes:	1. The application of ideas and practical knowledge to develop personal art and design questions. 2. The ability to prepare and present a personal portfolio of art and design work. 3. Reflection to enable a developing awareness of problem solving and personal progress

S E S S I O N	
20 Minute	Introduction to Aims and Objectives - *Think Again* & challenging expectations of a project - Garments as 3D models - DressX etc. & Sculpt GL refresher.
10 Minute	Speculating on how they might approach the session - *How can I use 3D modelling in my project - what idea might work - why could it be helpful : scale exploration etc.*
40 Minute	Sculpt GL - developing a series of 3-6 3D models
Break	
20 Minute	Introduction to A-Frame space and adding self + 3D models.
30-40 Minute	Curating, playing, 'breaking', experiencing 40+ 3D models in chosen A frame space. Ongoing reviewing
15 Minutes	Final reviewing, documenting of new works created in the digital space - *how does this alter from projects trajectory - what is the experience of this work in this specific space…*