Gallery Augmented Reality Interactive Experience (GARIE)

Assignment 2: High Fidelity Prototype

SENG2260: Human-Computer Interaction

The Planeteers

Contents

1) Problem Domain

The modern art gallery struggles to appeal to all generations. They do little in the way of attracting a younger audience and are more focused on attracting the older generations who have grown up in a world where going to the art gallery would have been a common form of entertainment. In today's fast paced world younger generations have entertainment at their fingertips, they no longer must go anywhere (such as an art gallery) to see creativity, they can simply open an app or play the latest video game to get their fix of creativity.

> *"It was found that of the thousands of young people who walk past the Auckland Art Gallery every day, few go in, and some could not even say where it was - even when they were standing outside it."* (Mason & McCarthy, 2006).

To solve this generational problem and bring the modern art gallery a modern viewing and interacting platform, The GARIE HoloLens System has been proposed.

The GARIE system aims to solve a problem of lack of interest in art galleries in modern society, by creating a more modern way of viewing and interacting with art and the gallery. It will improve the viewing experience by:

- Allowing users to walk up to a piece of art and instantly get information on the artwork such as artist name, price and description
- Allowing instant changes to languages and visual settings such as colour filtering
- Adding an augmented immersive experience to a piece of art, providing an engaging perspective to the artwork that could not be achieved by viewing the art normally

The system will also improve interaction with the art gallery by:

- Providing users with a virtual assistant that will be there for them any time they need to provide information and tutorials on activities that can be done throughout gallery.
- Allocating a creative space where users can create virtual art on a 2-dimensional canvas

These features are aimed to be very attractive to a younger patron, adding a whole new level of interaction to the gallery and to provide fast feedback that is required to satisfy modern day attention spans. Whilst being focused on attracting young people to the gallery GARIE also aims to accommodate older generations by using a streamlined interface in order to limit how much new information will need to be learnt.

Being able to get information about an artwork instantly, art gallery patrons will no longer need to consult a pamphlet or ask a curator about a piece of art decreasing the time and effort to obtain information. Creative patrons will also get the chance to express themselves in an art gallery environment, by allowing them to interact with a virtual canvas and create artworks for themselves that can be viewed by other patrons. Through all these features the GARIE system will attract new audiences to modern art galleries and bring art galleries into the technological age.

2) Design

The implementation of the final interface focused on features that would favour recognition over recall for art gallery patrons. The prototype was aimed at creating a user experience that would reduce cognitive loading on users and provide an experience that was free from frustrations and annoying features. It involved a complete transformation from the low-fidelity cardboard and paper iteration of the prototype to an interactive computer-based unity prototype. This change allowed the functionality of the prototype to be further tested and users to have a further understanding of our vision for the fully implemented final system. Focusing on creating a globalised inclusive view when designing our interface, such that all our features would cross cultural borders and allow all people the opportunity to experience the system was a priority for our final design.

Metaphor Design

To match our system with real world symbols menu icons were created that would be easily recognisable to most if not all people. These metaphors were created by first understanding the functionality required for the specific button, we would require buttons to:

- Change settings such as language and colour filter
- Open GARIE assistant
- Perform functions inside the virtual canvas
- Perform functions inside the interactive art

Potential problem areas were then discussed in order to create consistency and identify any metaphors that may be considered culturally inappropriate. The main problems highlighted that could potentially arise from poor metaphor choice were:

- Ambiguous symbols that users may identify as the wrong thing
- Symbols that may be offensive to some cultures

With these potential problems in mind work began on generating the metaphors for the prototype. The metaphors generated have been used in many applications that are popular today and to most people of all cultures would easily recognise them. The gear symbol is used in many applications to represent settings and in our prototype also represents settings. The flag represents a language change, as almost every nationality can recognise their flag, they can choose the appropriate flag for them and all the interface language will change. Some slightly risky metaphors were the worm representing the GARIE assistant and the eye representing colour blind mode as they are not used as commonly as other metaphors, but the user should be able to recognise this by either interacting with them or from memory.

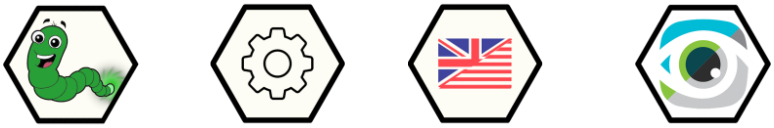


Figure 1 Interface Metaphors

Colour Design

To show the user where to go and to highlight that an area was special, the colour green was used. In the virtual canvas it was used to represent starting the experience. For the Garie tutorial it was used to highlight the path to another simulation. Green is a colour that in most cultures is seen as good colour and represents safety in most western cultures therefore was a perfect candidate for highlighting areas that are of interest and illuminating pathways to new experiences.

The colour red was also used throughought menu choices to highlight a specific menu descision and to indicate that a menu has been expanded, this colour in general has a negative bias and represents danger in western cultures and death in others. This colour is very eye catching and users will obtain very quick feedback that a button has been selected, it also entices the user to want to close the menu again which would allow them to declutter their interface from old menu choices that they may not be using anymore. Consideration was given to using an alternate colour to represent a menu decision as red is such an invasive colour, but we wanted users to reduce the amount of interface clutter by closing menus after they had finished using them and red was the perfect colour to make this happen.

Figure 2 Highlight button red when selected

Expressive Interface Design

In order to reduce frustration, provide feedback and improve the viceral feel of a users interactions on the GARIE interface, expressive interface elements were incorporated into our design. Incorporation of this design methodology also helps to reduce interface clutter as users will only be using what they need at a certain time therefore limiting the need to have certain buttons or features appear on the screen. The elements that provide expressive features include:

- Button highlighting and expansion when a user selects a menu option
- Highlighting of the interactive area around the user and appearance of the green start experience button when they enter the virtual canvas area
- Buttons for interactive art experience only appear when user enters an invisible radius that surrounds an art piece
- When a user selects an experience through the GARIE assistant, an illuminated green trail will appear behind the worm expressing to the user to follow him.

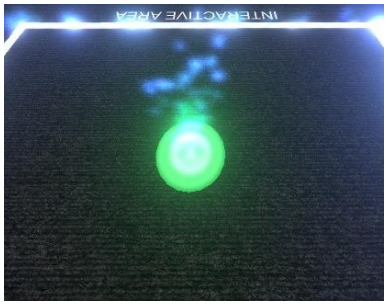


Figure 3 Highlighting interactive area

Error Prevention Design

Ensuring users would not be frustrated by their experience was another big priority when designing our interface. Employing a minimalist design methodology throughout all our design iterations helped to reduce the possibility that a user will accidentally choose a menu option that was unintended throughout the course of their interaction. This methodology was incorporated through:

- Collapsable menu systems
- Buttons and interface elements appearing only when the user is within a certain vicinity

Reducing misclicks was also considered when trying to reduce frustrations. Use of a timing bar on selections meaning that a user had to hold the pinch gesture for a second in order to select a menu option this prevented the likely case where a user would accidentally make a gesture with their hands.

When using the virtual canvas or interactive art experience users may accidentally move out of the interactive area and the interface may disappear, instead of closing the interface and resetting a users progress in an experience the interface remains persistant and any progress they have made will remain. For example a user is creating a piece of art in the virtual experience and accidentally moves outside the working area, the current artwork the user is working on will remain on the canvas and when the user walks back into the interactive area all progress will remain. Alternative to this would be to reset the users progress which would not be ideal as the risk is high that a user would accidentally step outside the working area which would reset their progress and frustrate the user.

GARIE Assistant Design

The GARIE assistant was designed to be a helpful assistant that guides users to new experiences, delivers helpful tutorials about GARIE interfaces and shows users all gestures that they need to use in order to interact with all the different experiences. Anthropomorphism of a glow worm was used to create the assistant with the goal of giving the him a personality that mirrors a human personal assistant. To be as unobtrusive as possible and avoid the mistakes of previous virtual assistants such as microsoft clippy we wanted to make sure he only appeared when the user needed him. Therefore the GARIE assistant only appears when the user selects him from the persistent menu or when the user first starts GARIE. Users can easily remove him by selecting the GARIE assistant button

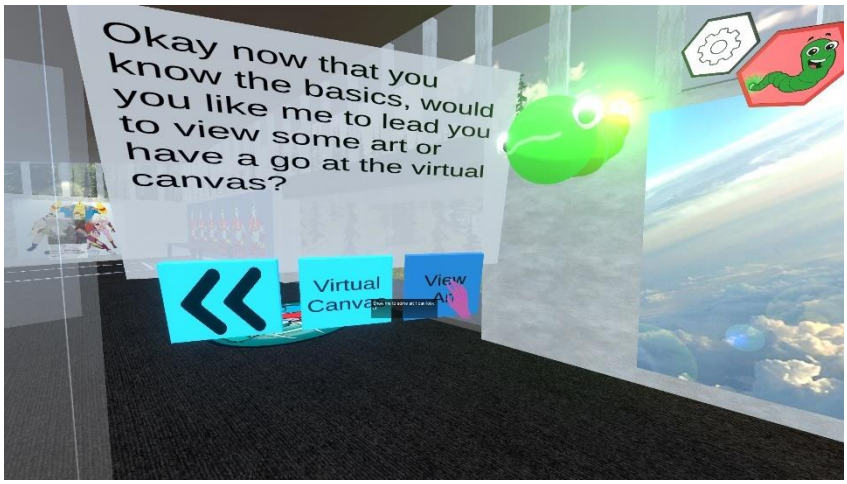


Figure 4 GARIE Assistant

Interactive Art Design

The main consideration when designing this scenario was to make sure that it was as unobtrusive and minimalistic as possible for a user and would not impact on their art viewing experience in a negative way. To do this we employed design features such as:

User proximity button menu

A major objective was to reduce the amount of clutter in our user interface we did not want persistent buttons next to every artwork in the gallery. Early iterations such as the low fidelity prototype had persistent buttons and it wasn't untill it was employed in the virtual environment that we saw that buttons next to every painting was decreasing the visceral feel of our design. Setting a proximity trigger for revealing buttons was perfect for concealing menus untill a user was ready to interact them.

Figure 6 User outside proximity

Figure 5 User inside proximity

User selected artwork description and Immersive experience

By only displaying information about an artwork and producing the artists immersive experience when the user selects the appropriate button we have removed more facets from our design that may be considered obtrusive to the user. A user can select the option they want and deselect it with ease, they are in full control of their art viewing experience.

Figure 7 Artwork Description on selection

Figure 8 Immersive experience on selection

Virtual Canvas Design

The virtual canvas required many design iterations in early low fidelity prototyping and their was a large amount of features that we could prototype in order to create a fully fleshed out experience. Technically it was the most complicated scenario to design and for the sake of time we prototyped only the main features in the high fidelity prototype such as:

Users entering the interactive area

Starting with the design of the interactive area. A designated area was needed inside the gallery that would identify the area that could be used for virtual canvas. A physically marked off area was the best option for this as their would be patrons moving around the gallery that could accidentally enter the virtual canvas area and potentially interfere with the users of the virtual canvas. This area would be labelled to ensure people knew that it was a special area. Early iteration contained a caution message but we felt this may scare off patrons from interacting with the area.

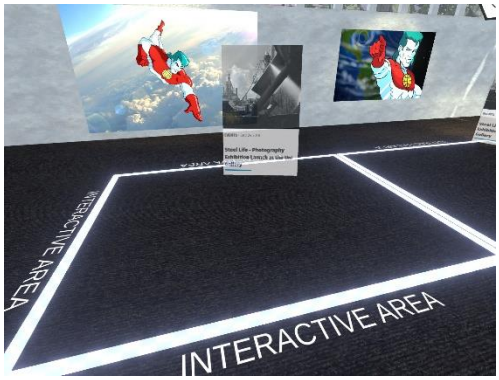


Figure 9 Entering virtual canvas area

After the user has entered the area we decided they needed some expressive feedback to ensure that they are aware that this area was interactive. Our initial idea was to have the area light up and display a “Start Virtual Canvas” button in the centre of the area, for the sake of minimalistic design we went with a green button that users would be drawn to as it is a safe colour. When the user steps onto this button the virtual canvas experience would begin.

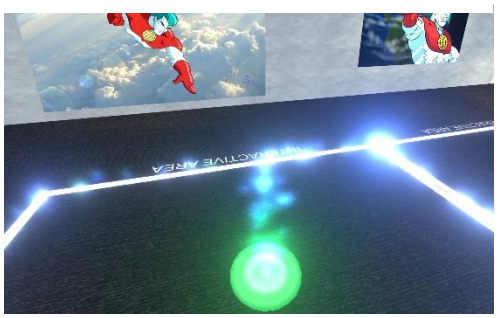


Figure 10 Area Illumination

Figure 11 Spawning Virtual Canvas

Spawning the virtual canvas

As soon as the user steps onto the green button the virtual canvas will spawn onto the invisible wall of the interactive area that the patron is facing. This was designed to reduce the frustration the user would feel losing track of the canvas and reduce the risk that they may think that the experience is not working. After spawning the canvas the patron can immediately begin drawing on the canvas.

Drawing and Erasing on the canvas

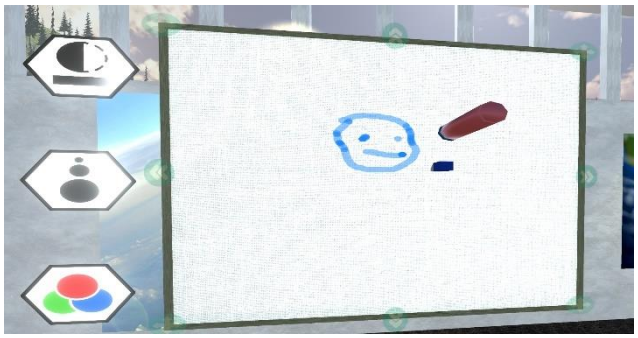


Figure 12 Drawing on canvas

The tools that the user can interact with immediately appear on the canvas indicating that they can start drawing immediately. Inititial iterations gave the user a selection of drawing mediums that they could choose from and they would grab a drawing medium and it would stay in their hand untill they released the pinch gesture. To begin drawing they would move their hand onto the canvas like you would normally bring a pen or paintbrush to a canvas in real life. Testing discovered that after a user has selected a drawing tool it would be difficult to identify when a user had brought their hand to the canvas or lifted their hand from the canvas as they would not be drawing on physical surface as in real life.

The final prototype of this feature uses a drawing medium that is fixed to the plane of the canvas and to draw the user simply pinches the brush to start drawing and releases when they are finished. Issues were identified in testing this method as well such as the user would not be able to move the brush to another area of the canvas without drawing something in between. The remedy for this in the high-fidelity prototype was to make right click move the drawing medium without drawing and left click move the drawing medium with drawing. To implement this into the final product a single pinch gesture on a section of the canvas will bring the drawing medium to the location the user wishes to draw at, and they will release their hand to stop drawing.

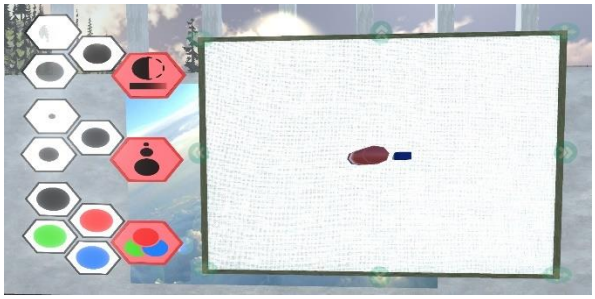


Figure 13 Tool Selection

Colour/thickness/opacity selection

To prototype basic tools inside the virtual canvas a small set of different artistic tools were included. The initial design of the colour selection was a colour wheel that the user would pinch and spin in order to obtain the desired colour, This would be very inaccurate and users may get frustrated when they select the wrong colour.

The low fidelity prototype implemented a colour selection palet with colour sliders at the bottom where the user would simply pinch gesture the desired colour and begin drawing. This is still the planned design for the final implementation. Due to time constraints with the high fidelity prototype a simple colour selection tool was implemented where users would only have the choice of 4 colours.

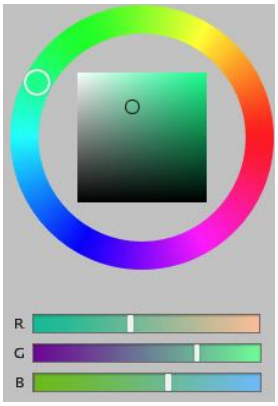


Figure 14 Low fidelity colour picker

Canvas resize/Horizontal Rotation

The resizing of the canvas was designed in the low fidelity with the user bringing both their hands to their front and using a grasping gesture and moving their hands towards each other or apart to decrease the size of the canvas and increase the size of the canvas respectively, whilst grasping the canvas they could also move it to any wall of the interactive area. This is still the planned design for the final implementation but due to restrictions in the high fidelity prototyping method we used, we could not model this behaviour. Instead we had to implement buttons that would resize the canvas and move the canvas when the user clicks and holds the pinch gesture.

Figure 15 Low-fidelity resize/relocate canvas

Figure 16 High-fidelity resize/relocate canvas

3) Implementation/Prototype

The high-fidelity prototype was constructed using Unity version 2019.2.6. Utilising many tools and features from the game engine, we could create an experience that would simulate a visitor to the art gallery performing all the functionality of the GARIE scenarios. The implementation of the art gallery was broken down into design increments. By starting at a base level, we could build a feature and test it before the next increment was implemented.

Design increments

1) Creation of a replica to scale UON gallery

The gallery structure was used as a base to build our scenario functionality inside. The floor plan of the gallery in Appendix A, was referenced to create the framework. This allowed us to replicate the art gallery digitally in the exact dimensionality of the real gallery.

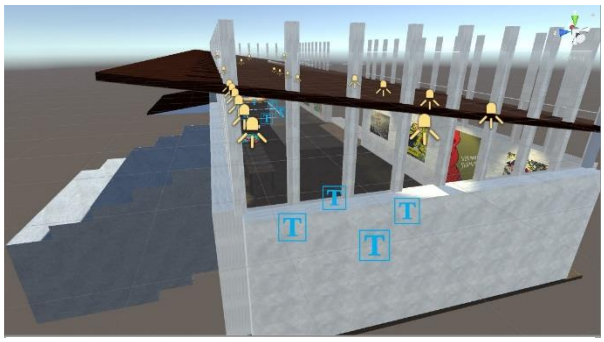


Figure 17 Gallery Framework

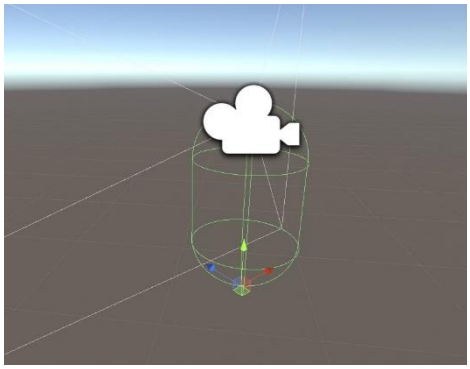


Figure 18 Visitor Model

2) Visitor Modelling

To build a visitor controller that could walk and look around the gallery a capsule frame was used. This model would have collision detection that would stop the modelled visitors being able to leave the boundaries of the virtual gallery. A camera object was place on top of the capsule which would represent the patron's field of view when navigating the gallery.

3) Implement hand gestures

Hand gestures were difficult to implement. Compromises had to be made from the low-fidelity prototype which used two hands to perform certain actions such as resizing the virtual canvas and rotating the canvas to the high fidelity prototype as a user would not have that ability to perform two handed gestures with a mouse and keyboard.

To simulate a hand gesture, the user would push and hold the shift button to simulate bringing their hand up in front of them, then selections would be able to be made by moving the mouse to the desired menu option or clicking and holding till the and holding to draw in the virtual canvas.

Figure 19

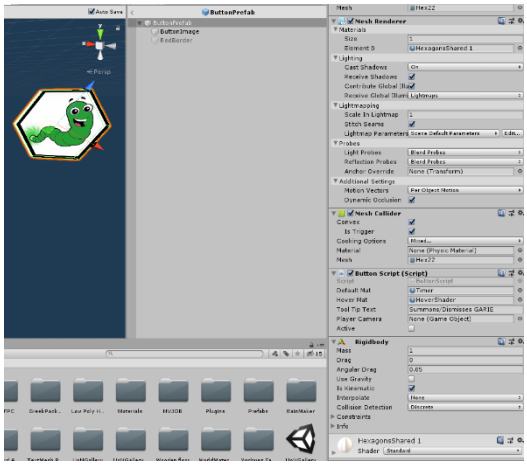


Figure 20 Prefabrication

4) Creation of prefabricated button object

All buttons that were created inside the gallery were children of the prefabricated button object. This allowed buttons to inherit features from button. Such as a timing bar for user selections which would prevent errors in selection, button highlighted/unhighlighted on selection and provide a shape template for the button.

5) Basic Scenario Functionality Implementation

GARIE Assistant

The GARIE assistant comprises of basic capsule shapes and a sphere for the head. The capsules had a material applied to them that was slightly emissive so that they did not have shadows highlighting their form allowing his body to look more connected. Animation was done using just the inbuilt animator where a basic wriggle movement was made and then looped as he moved from scenario to scenario. The light trail is a standard unity trail render and the glowing on both his tail and the trail is done using a special material as a trigger with a script on the camera.

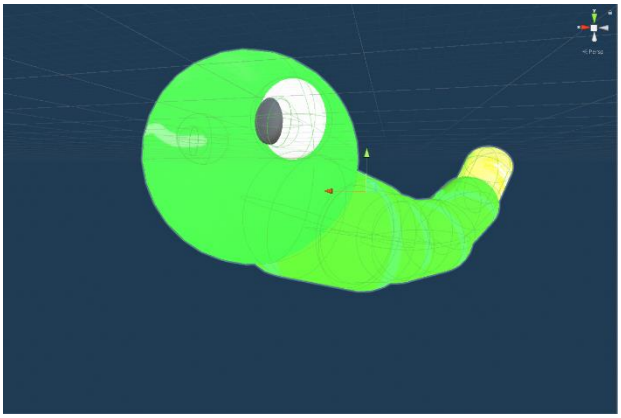


Figure 21 GARIE Assistant Construction

Due to time limitations the full implementation of the GARIE assistant could not be done. With extra time, detailed scenario tutorials with gesture demonstrations and information about the scenario would be implemented. Therefore, just the basic functionality of the GARIE was demonstrated in our prototype, such as bringing up the tutorial window and selecting the experience that you would like the GARIE assistant to guide you too.

Interacting with Art

The interacting with art experience was created by designating one artwork that would be used to demonstrate the user walking up to a piece of art. Upon entering an invisible boundary on the floor, a user would be presented with buttons on the left side of the artwork which could be interacted with using the pinch gesture. When the user selects the immersive experience button, a 3D hologram that is designed to provide an extra layer to what the artist is trying to convey surrounds the user.

Figure 22 Immersive Experience

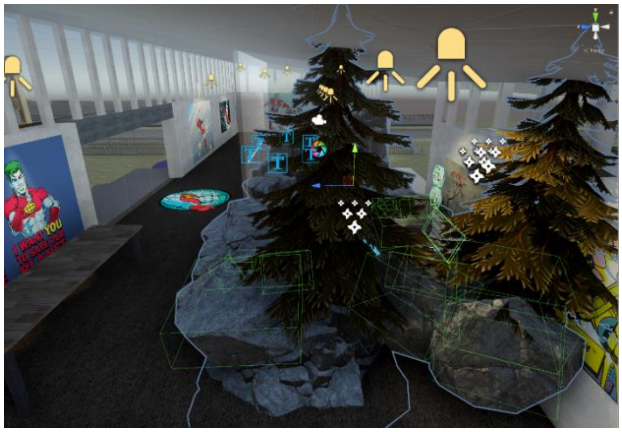


Figure 23 Immersive Experience Construction

To demonstrate an immersive experience for a piece of art like the one displayed, a hologram of a forest was created. To create this the rain, steam and leaves are made with the particle system, the rest of the immersive experience is trees, rocks and a cube with a shader on it to look like water; which were imported from external object libraries. An audio track is played to simulate being in this environment.

Settings Menu

Users are presented with a persistent interface which is always present in the top right of their field of view. To simulate users selecting colour-blind mode, a colour filter was overlayed onto the interface and changes all colours in the world. Implementing this into a real-world AR application may be quite difficult and may not be feasible but in a virtual environment such as unity a simple colour filter can be applied.

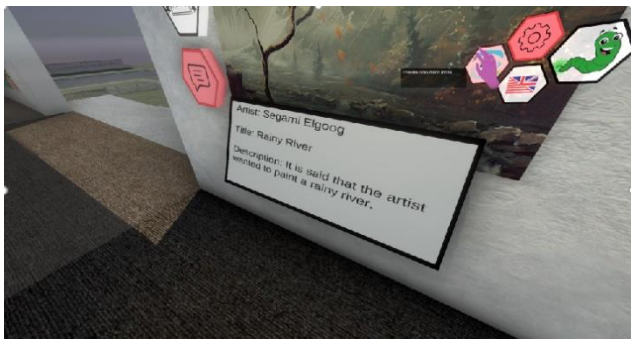


Figure 25 Without Colour Blind Mode

Figure 24 With Colour Blind Mode

Language changes were demonstrated using a font changer, which would change all the text in the GARIE experience to a font that is like the requested language. When the prototype is fully implemented these text changes would obviously be to the users designated language.

Virtual Canvas

The virtual canvas was the most technical scenario to implement. It required the most compromise between the low and high-fidelity prototype as hand gestures were limited by prototyping method we chose to use.

V-Canvas Area

1. The “physical” boundary on the floor of the gallery was created. Initially the text read “Caution Interactive Area” but we decided that this may discourage people from using it, so the word “Caution” was removed.
2. The outer trigger was created to initiate the particle system lighting up the boundary and fading out of the gallery advertising. The reverse applying when the user exits. The canvas is also removed if it has been enabled.
3. The inner trigger was created to initiate the fade in of the central platform and particle system attached to it. The reverse applying when the user exits.
4. The central platform trigger was attached to the platform to make the canvas appear and make itself fade. There is a canvas on each of the boundaries but only the one closest to the users forward direction is enabled.

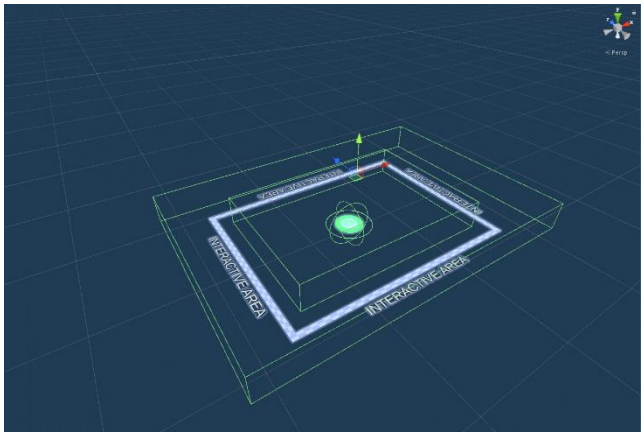


Figure 26 Virtual Area Construction

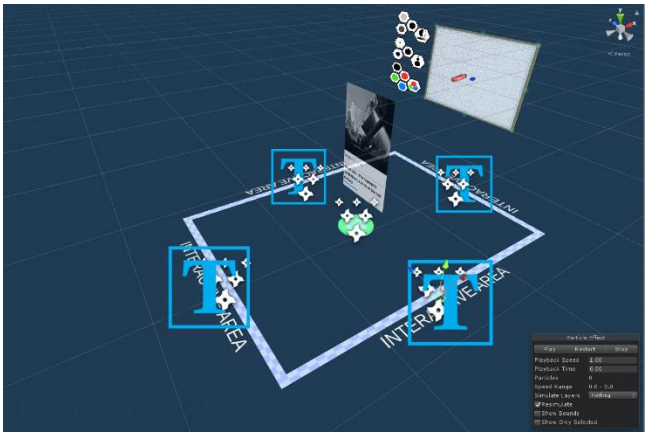


Figure 27 Virtual Area Construction

V-Canvas

The canvas itself was built incrementally as we were required to enable the desired features to implement.

1. Initially just a white rectangular prism as the logic of the floor area was worked out.
2. Added a canvas texture and framing elements
3. Added colliders and required scripting to the sides to enable resizing of the canvas
4. Added colliders and required scripting to the corners to enable movement
5. Implemented free drawing asset “Ink Painter” from the Unity Asset Store
6. Added control buttons
7. Fine-tuned the logic of the scripting for the pen and eraser movement

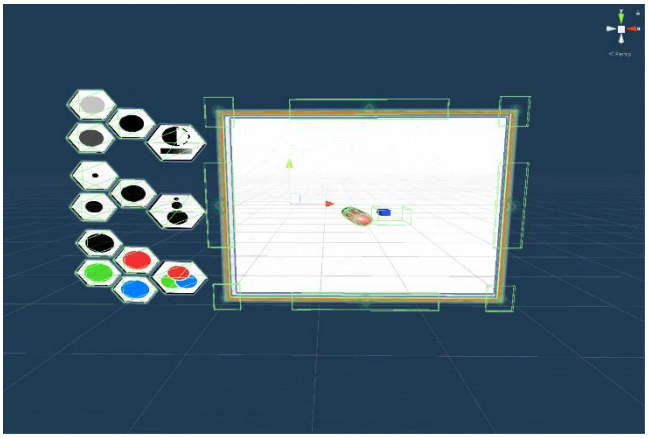


Figure 28 Virtual Canvas Construction

6) Postprocessing layer added to the camera and the background

This design decision was added to provide a polished look to the prototype and to make the gallery feel more realistic whilst the user is performing scenario tasks

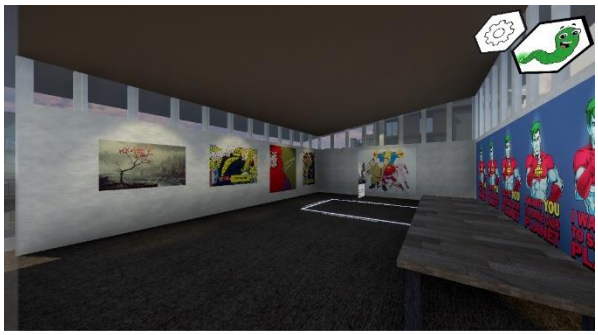


Figure 30 With Postprocessing

Figure 29 Without Postprocessing

Major limitations identified during implementation

- Limited to one mouse input instead of using 2 hands for gestures
- Programming a fully-fledged AI would be too complex for the scope of the project
- Scope and time of the assignment was a limitation, getting ideas to the point where they were fully working was not the priority
- HoloLens may have trouble picking up selections that take place on the outskirts of the display such as selecting GARIE assistant and setting. This has not been tested in the low and high-fidelity prototype and would require a working prototype to be implemented on a HoloLens to test this issue.
- Implementation of colour-blind mode in an augmented reality situation may be quite challenging, as you would have to put a colour filter over the real world.

4) Evaluation

For our high-fidelity prototype, we aimed to create an organic portrayal of a patron exploring the UoN art gallery. To complement this, we sought to establish clear performance measures for testing and evaluation.

One of the solutions to facilitate user freedom, while also maintaining a controlled testing space; required simple, yet direct, user briefings that contained clear goals for the test user to achieve.

1) User testing procedure.

Our briefing asks the users to complete a series of tasks, each one mapping to one of the three scenarios we have developed. Whist the user was performing the test; we had three people assisting. The first person timed how long it took to perform each task. The second person kept a log of what features they used correctly and any mistakes they made. The third person was there to aid the user if requested.

Testing Considerations:
As mentioned previously, our high-fidelity prototype was created in Unity, a gaming engine - we recognized early on that not all users may be competent/familiar with game environments, so it was necessary to provide a basic demonstration on movement and interaction controls.

This ensures that all users testing our prototype are on an even playing field, thus, preserving the integrity of our test results by eliminating corrupt data from inexperienced users.

- Movement Controls: teach users how to move (WASD), look around (move mouse)
- Interaction Controls: button interaction (point and click)

It is important to note, that throughout user testing we requested the user to employ a ‘think aloud’ approach - this was to help us identify any genuine errors made, by allowing us to compare the user's intentions to the user’s actions.

We also tried to test different participants from our low fidelity prototype, to ensure they had no prior knowledge of our system and how to use it. We found this beneficial as we got a new user experience each time, the only downside was ensuring every user was properly briefed each time.

2) How we found our users and how they represent our target audience

We found all the testers in our workshops and labs; this makes our testing slightly biased as they are all have the same minimum familiarity with AR technology. We expect our target user population to vary greatly; ranging from novice to expert. This means that the test results we have gathered do not necessarily translate to our target audience, however, it does give us a good indication of general complexities found within our high-fidelity prototype.

3) User briefing and tasks they performed

Before the users commenced operation, they were given short briefing outlining the functionality of the system. Once they understood, they were asked to complete a set of specific tasks (each subsystem had at least one task).

GARIE Assistant

Users were asked to navigate through the virtual assistant tutorial. The testing primarily assessed the difficulty of interacting and navigating the tutorial, we gauged these metrics by timing the user and counting any errors.

Virtual Canvas

Users were asked to draw on the virtual canvas. The users were observed on what features they used, and what features they neglected. This highlighted what features the users are aware of and what features may need to be made more obvious

Viewing Artwork

Users were asked to access the Immersive Experience of the current artwork and then to change the system language. During testing of this scenario, we timed how long it took for user to complete and we counted any errors along the way. This highlighted the effectiveness of the icons used to represent each feature.

4) Useability problems and solutions.

A few main usability issues were raised for each subsystem throughout the testing of the GARIE prototype. Overall the problems identified were not critical problems and had easy solutions, the useability problems that were identified include

GARIE Assistant

Problem 1: *Gauging interest from the users that to read and understand the tutorials that the GARIE Assistant has displayed.*

Solution: To mitigate this, less text could be used to describe a sub-system of the prototype. The GARIE assistant could also be given the option to output voice tutorials instead of text or both.

Virtual Canvas

Problem 1: *Entering interactive area, one participant thought it required gesturing to start.*

Solution: More detailed briefing could be used to convey the procedure for starting the virtual canvas

Problem 2: *When selecting a tool to use the user sometimes chose a tool that they did not want*

Solution: Re-evaluate icons used for each tool

Problem 3: *Selecting a colour to draw with, confusion over which colour is active*

Solution: Change tile to persistently show which colour is currently selected

Interacting with Art

Problem 1: *Users were confused about the meaning of the buttons that appeared next to an interactive piece of art.*

Solution: Further research into global icons. Finding more appropriate icons to match the task

5) Problems found with the testing procedure.

We found that giving users more freedom during testing did in fact make the art gallery simulation much more realistic by creating a more organic user experience, however, it also highlighted some problems in our high-fidelity prototype that we were not previously aware, which made user testing more difficult:

- **Problem 1**
  Not all artworks in our high-fidelity prototype were set up to facilitate user interaction, we did not identify this as a problem until user testing, as we assumed users would walk to and interact with the correct painting – this was not the case, as we found many users roaming around the entire gallery trying to interact with "dummy" paintings, this wasted a lot of time and skewed the total time spent testing.

- **Problem 2**
  We found that the more controlled tasks – such as the G.A.R.I.E tutorial and the change language settings task – were much easier to test overall, and scenarios that had more pathways for the user to explore were harder to test. It was difficult to distinguish if increased time spent on a scenario/increased clicks were due to the user having difficulty with the scenario, or were a product of the user enjoying themselves, thus spending more time on a task.

- **Problem 3**
  Another difficult problem we encountered was bridging the gap between AR controls to PC controls, it was hard mapping physical gestures to keyboard and mouse controls, and some users noted that some controls we had felt clunky. We iteratively changed these controls to try and make the controls more intuitive, but ultimately fell short. This is mostly a drawback of the material we used to construct our high-fidelity prototype and was one of the rare occasions where the low-fidelity prototype was superior – as it incorporated accurate hand gestures that would be used in the final product.

User Briefing:

Welcome to the University Gallery! You have been selected to test the new Gallery Augmented Reality Interactive Experience (G.A.R.I.E) prototype.

This system will enable users to experience the gallery like never before, extending the users interaction with – and understanding of – art through augmented reality.

We encourage you to speak aloud as you explore the gallery and the navigate the features we have implemented. Throughout this interaction your tasks will be to:

- Navigate the G.A.R.I.E virtual assistant tutorial
- View an artwork, and enter the 'augmented immersive experience'
- Create your own artwork using the Virtual Canvas
- Locate and change the language settings

Let us know when you are ready to commence, and we will give you a quick demonstration of the basic controls.

An interesting observation we identified throughout user testing was that users correctly used features in our high-fidelity prototype that were ignored in our low-fidelity prototype, most notably, the ability to hover over a tile to read the tooltip. We believe that this behaviour change was influenced by the medium we used, as it is more natural to try and hover over buttons when using a computer, then hovering over paper buttons.

The Planeteers User Evaluation Form

G.A.R.I.E Tutorial			**User ID:**	1
Start Time:	**Finish Time:**	**Total Time:**	**Mistakes:**	**Clicks:**
0:00	0:32	0:32	0	3
Observations:				
- User decided to go from tutorial to virtual canvas - User expressed that holding space bar to click was not comfortable				

Virtual Canvas			**User ID:**	1
Start Time	**Finish Time:**	**Total Time:**	**Mistakes:**	**Clicks:**
0:45	1:22	0:37	2	8
Observations:				
- User had trouble with cursor accuracy and missed picking up the pencil object twice - User seemed to enjoy drawing and interacting with this feature				

Immersive Experience			**User ID:**	1
Start Time:	**Finish Time:**	**Total Time:**	**Mistakes:**	**Clicks:**
1:32	1:39	0:07	0	1
Observations:				
- User initially walked to an artwork that we had not prepared an interaction for, we had to guide them to the correct painting - User hovered over all tiles to read tooltips before selecting the correct button				

Language Settings			**User ID:**	1
Start Time:	**Finish Time:**	**Total Time:**	**Mistakes:**	**Clicks:**
1:41	1:44	0:03	0	3
Observations:				
- User instantly identified the settings wheel and changed the language settings without any issues				

The Planeteers User Evaluation Form

G.A.R.I.E Tutorial			**User ID:**	2
Start Time:	**Finish Time:**	**Total Time:**	**Mistakes**	**Clicks:**
0:00	0:44	0:44	0	3
Observations:				
- User decided to go from tutorial to virtual canvas				

Virtual Canvas			**User ID:**	2
Start Time	**Finish Time:**	**Total Time:**	**Mistakes:**	**Clicks:**
0:58	1:50	0:52	5	16
Observations:				
- User had trouble with cursor accuracy and missed picking up the pencil object and the eraser object - User drew for a long time and played with every setting in the virtual canvas				

Immersive Experience			**User ID:**	2
Start Time:	**Finish Time:**	**Total Time:**	**Mistakes:**	**Clicks:**
1:56	2:01	0:05	1	2
Observations:				
- User initially walked to an artwork that we had not prepared an interaction for, we had to guide them to the correct painting - User clicked the artwork description button initially, then identified and clicked the correct button				

Language Settings			**User ID:**	2
Start Time:	**Finish Time:**	**Total Time:**	**Mistakes:**	**Clicks:**
2:04	2:08	0:04	0	3
Observations:				
- User instantly identified the settings wheel and changed the language settings without any issues				

The Planeteers User Evaluation Form

G.A.R.I.E Tutorial			**User ID:**	3
Start Time:	**Finish Time:**	**Total Time:**	**Mistakes**	**Clicks:**
0:00	0:26	0:26	0	3
Observations:				
- User decided to go from tutorial to immersive experience				

Virtual Canvas			**User ID:**	1
Start Time	**Finish Time:**	**Total Time:**	**Mistakes:**	**Clicks:**
0:36	0:50	0:14	1	4
Observations:				
- User had trouble with cursor accuracy and missed picking up the pencil object				

Immersive Experience			**User ID:**	1
Start Time:	**Finish Time:**	**Total Time:**	**Mistakes:**	**Clicks:**
0:26	0:29	0:03	0	1
Observations:				
- User identified the correct icon instantly				

Language Settings			**User ID:**	1
Start Time:	**Finish Time:**	**Total Time:**	**Mistakes:**	**Clicks:**
0:53	0:56	0:03	0	3
Observations:				
- User instantly identified the settings wheel and changed the language settings without any issues				

The Planeteers User Evaluation Form

G.A.R.I.E Tutorial			**User ID:**	4
Start Time:	**Finish Time:**	**Total Time:**	**Mistakes**	**Clicks:**
0:00	0:32	0:32	0	3
Observations:				
- User decided to go from tutorial to immersive experience				

Virtual Canvas			**User ID:**	4
Start Time	**Finish Time:**	**Total Time:**	**Mistakes:**	**Clicks:**
0:56	1:16	0:20	0	8
Observations:				
- User completed task without any mistakes				

Immersive Experience			**User ID:**	4
Start Time:	**Finish Time:**	**Total Time:**	**Mistakes:**	**Clicks:**
0:32	0:44	0:12	1	2
Observations:				
- User struggled to find the immersive experience button - User needed guidance to identify the correct button				

Language Settings			**User ID:**	4
Start Time:	**Finish Time:**	**Total Time:**	**Mistakes:**	**Clicks:**
0:46	0:50	0:04	0	3
Observations:				
- User instantly identified the settings wheel and changed the language settings without any issues				

The Planeteers User Evaluation Form

G.A.R.I.E Tutorial			User ID:	5
Start Time:	**Finish Time:**	**Total Time:**	**Mistakes**	**Clicks:**
0:00	0:28	0:28	0	3
Observations:				
- User decided to go from tutorial to virtual canvas				

Virtual Canvas			User ID:	5
Start Time	**Finish Time:**	**Total Time:**	**Mistakes:**	**Clicks:**
0:35	1:01	0:26	2	6
Observations:				
- User had trouble with cursor accuracy and missed picking up pencil object				

Immersive Experience			User ID:	5
Start Time:	**Finish Time:**	**Total Time:**	**Mistakes:**	**Clicks:**
1:12	1:19	0:07	0	2
Observations:				
- User initially walked to an artwork that we had not prepared an interaction for, had to guide user to the correct painting. - User seemed hesitant while trying to identify the correct button, user hovered over all tiles to read tooltip				

Language Settings			User ID:	5
Start Time:	**Finish Time:**	**Total Time:**	**Mistakes:**	**Clicks:**
1:21	1:25	0:04	0	3
Observations:				
- User instantly identified the settings wheel and changed the language settings without any issues				

The Planeteers User Evaluation Form

G.A.R.I.E Tutorial			User ID:	6
Start Time:	**Finish Time:**	**Total Time:**	**Mistakes**	**Clicks:**
0:00	0:18	0:18	0	3
Observations:				
- User decided to go from tutorial to virtual canvas				

Virtual Canvas			User ID:	6
Start Time	**Finish Time:**	**Total Time:**	**Mistakes:**	**Clicks:**
0:24	0:47	0:23	1	10
Observations:				
- User had trouble with cursor accuracy and missed picking up eraser object				

Immersive Experience			User ID:	6
Start Time:	**Finish Time:**	**Total Time:**	**Mistakes:**	**Clicks:**
0:55	1:08	0:13	1	2
Observations:				
- User initially walked to an artwork that we had not prepared an interaction for, had to guide user to the correct painting. - User struggled identifying the correct button, and clicked the artwork details button before correctly identifying the immersive experience button				

Language Settings			User ID:	6
Start Time:	**Finish Time:**	**Total Time:**	**Mistakes:**	**Clicks:**
1:10	1:13	0:03	0	3
Observations:				
- User instantly identified the settings wheel and changed the language settings without any issues				

The Planeteers User Evaluation Form

G.A.R.I.E Tutorial			User ID:	7
Start Time:	**Finish Time:**	**Total Time:**	**Mistakes**	**Clicks:**
0:00	0:15	0:15	0	3
Observations:				
- User decided to go from tutorial to immersive experience				

Virtual Canvas			User ID:	7
Start Time	**Finish Time:**	**Total Time:**	**Mistakes:**	**Clicks:**
0:34	0:48	0:14	0	4
Observations:				
- User did not seem to have any issues with this task				

Immersive Experience			User ID:	7
Start Time:	**Finish Time:**	**Total Time:**	**Mistakes:**	**Clicks:**
0:21	0:27	0:06	0	1
Observations:				
- User seemed hesitant when trying to identify the correct button, hovered over the immersive experience button before clicking to ensure it was correct				

Language Settings			User ID:	7
Start Time:	**Finish Time:**	**Total Time:**	**Mistakes:**	**Clicks:**
0:54	0:58	0:04	0	3
Observations:				
- User instantly identified the settings wheel and changed the language settings without any issues				

The Planeteers User Evaluation Form

G.A.R.I.E Tutorial			User ID:	8
Start Time:	**Finish Time:**	**Total Time:**	**Mistakes**	**Clicks:**
0:00	0:22	0:22	0	3
Observations:				
- User decided to go from tutorial to virtual canvas				

Virtual Canvas			User ID:	8
Start Time	**Finish Time:**	**Total Time:**	**Mistakes:**	**Clicks:**
0:28	1:03	0:35	3	11
Observations:				
- User had trouble with cursor accuracy and missed picking up the pencil object a few times				

Immersive Experience			User ID:	8
Start Time:	**Finish Time:**	**Total Time:**	**Mistakes:**	**Clicks:**
1:17	1:21	0:04	0	1
Observations:				
- User identified the correct button, completing the task with no issues				

Language Settings			User ID:	8
Start Time:	**Finish Time:**	**Total Time:**	**Mistakes:**	**Clicks:**
1:24	1:33	0:09	0	3
Observations:				
- User instantly identified the settings wheel and changed the language settings without any issues				

6) Summary of user testing data

The goal during testing was to identify areas where the interface is difficult to navigate and determine if we have used appropriate, familiar and user-friendly icons. For each scenario, we identified the expected amount of 'clicks' it would take for the user to identify/select the correct icon for their given task.

Graphical representations of the user evaluation form:

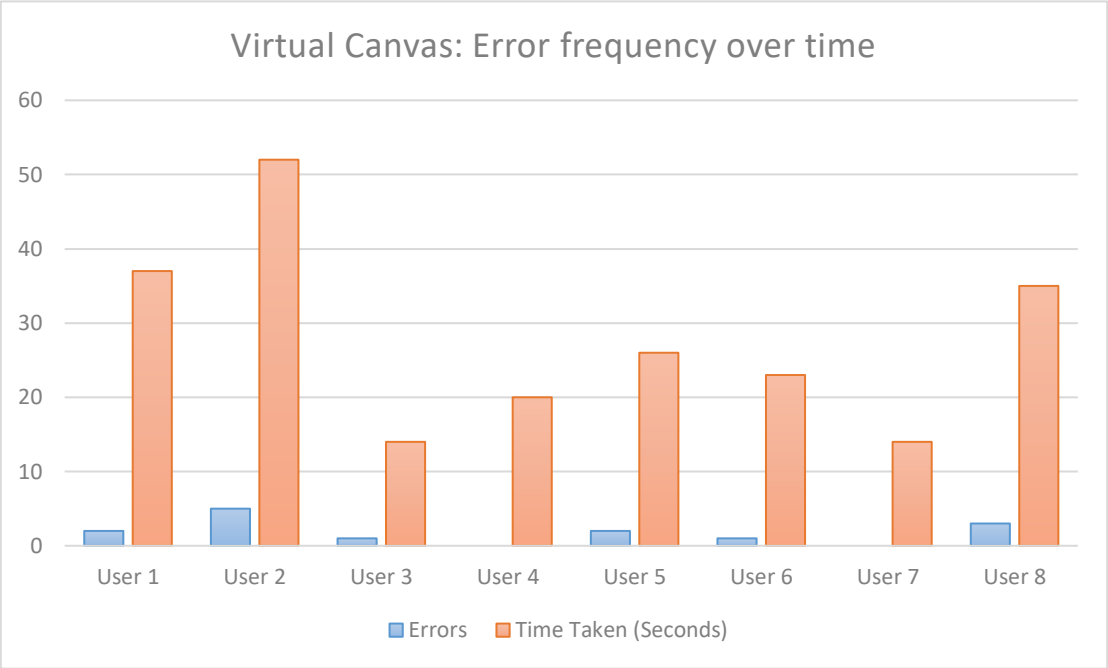


Figure 31 Error Frequency Virtual Canvas

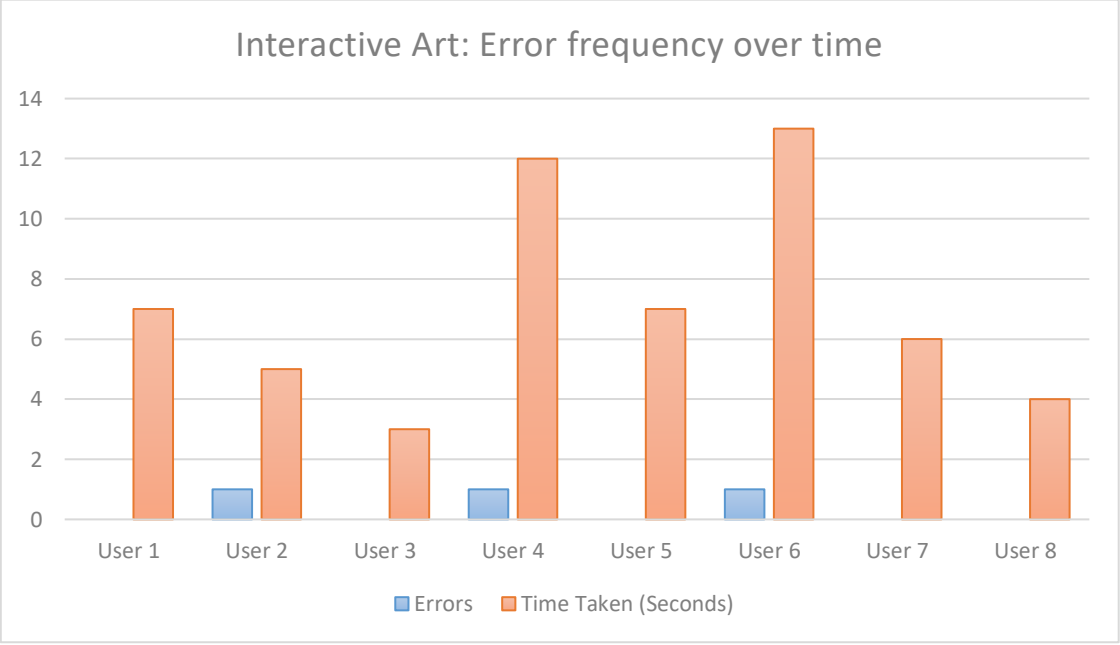


Figure 32 Error Frequency Interactive Art

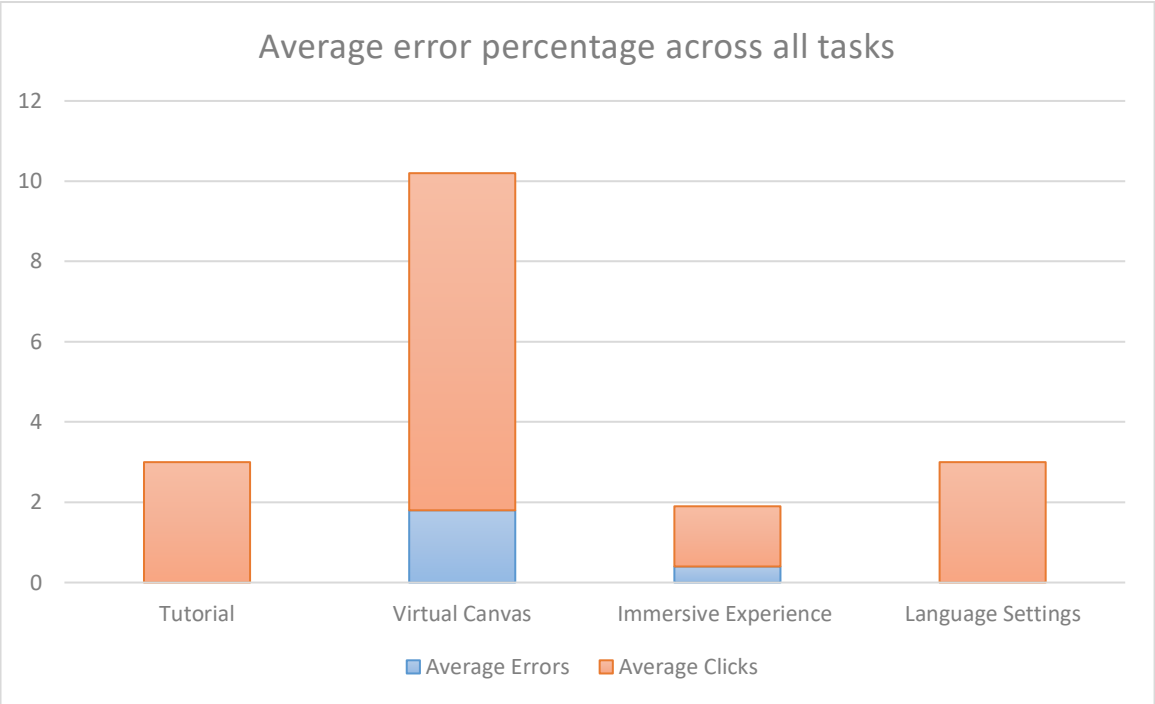


Figure 33 Average Error Percentage

Data result analysis:

We decided to compare errors encountered with time spent on a task to evaluate the difficulty of each user task. Generally speaking, time spent on a task can be related to interest in a task, or difficulty in completing a task – we believe that the correlation between time spent on a task and errors encountered, indicates a degree of user uncertainty when interacting with our system, leading to the higher frequency of errors.

This comparison was only applicable to the Virtual Canvas task and the Immersive Experience task, as the other two tasks – G.A.R.I.E tutorial and Language Settings – did not result in any errors across all users. This notion is reinforced when analysing the average error percentage across all tasks, which highlights a significant portion of the average clicks were in fact errors.

Looking at the results gathered, there is indication of users experiencing a degree of uncertainty or difficulty when completing the Virtual Canvas and Immersive Experience tasks.

User satisfaction:

User satisfaction feedback was mostly positive, the main reoccurring issue users expressed was the controls being a bit clunky, we would expect this issue to be eliminated upon further iterations of the high-fidelity prototype. Another issue expressed by users was that the virtual assistant G.A.R.I.E was not very engaging, going forward we may want to explore different ways to integrate G.A.R.I.E, making the virtual assistant more appealing to users.

5) Reflection

Before we began building the prototype, we used a concept map to decide what areas of the system each member of the group found important. We all suggested main scenarios that would be a good metric for success and attached features to each scenario.

Our approach to prototyping was to provide a mid-point between horizontal and vertical, providing smaller amounts of detail, but building out three scenarios with as many features as time allowed. By communicating the overall feel of the system, if successful, it could then be confidently handed on to the development team.

We knew from the beginning we wanted to attempt an immersive experience using a to-scale cardboard model. We started with the basics. The interface, a way to move minor things around, and from this point we expanded our prototypes to have further physical aids, such as a headset for users to get a feel for the weight and further physical models to represent GARIE.

Using the cardboard was good visually for the tester, to see both user interface and design, but it was not an adequate judge of system performance as it is too hard to control the cardboard is a smooth manner.

Iterations of our design were an important way to explore new options we wanted to add to the system. We aligned testing to be between these iterations so we could see what wasn't being received well by users and determine whether to adjust or remove entirely. Another benefit to hosting intermittent testing rounds was that it allowed us to further evaluate our perceived risks. We identified potential issues that could occur across the scenarios, such as: users having issues with gestures, colour selection, reading text and being distracted from real world environment. When testing we were able to watch participants and, were able to better clarify the severity of each risk.

We found that the material used to represent each prototype greatly affected the resolution of prototyping. Our high-fidelity prototype not only achieved a much faster feedback response time compared to the low-fidelity, but also simulated a much more realistic portrayal of the UoN art gallery. The high-fidelity prototype also increased the range of scope we could cover, providing a deeper level of contextualization for the user experience.

Deciding to have our virtual assistant conduct a tutorial was seen to be a good design decision as it is familiarising users with elements of our system whilst users unfamiliar with augmented reality expose themselves to the technology. When choosing a sprite to represent our virtual assistant we were very careful not to include something that could be offensive. We were wary about using people as a base model for fear that we could land in the Uncanny Valley and have patrons deterred by our assistant. In identifying this risk, we decided to place our assistant quite distant from the leading edge of the Uncanny Valley, in a way that is comforting but almost comical.

This led us to create a playable virtual experience demonstrating the performance of the GARIE system. We initially started with building the gallery within the virtual environment and a way to walk around and did a further 3 major iterations adding a new scenario with a short round of testing each time.

The next iteration

The time constraint was a limitation that forced us to implement a minimal set of features that could illustrate our end goal within the scenarios. Making decisions to provide a minimal subset of tutorial slides and limit the assistant to static waypoint navigation allowed us to focus on the core elements of the design. Limiting the interactive art to one work allowed us to show almost the complete experience without excessive workload and simplifying the interactive features of the virtual canvas, the scenario with the most interactive elements, meant that we were able to produce something that was fully functional, if not simplistic. Given more time these would be able to be expanded to include more detailed features to further user experience.

We started designing the system before we had a chance to experience a real HoloLens. One of the issues we have identified is that the HoloLens field of view is very restrictive for the ideas that we have developed. If we were to redesign this for HoloLens in its current state, we would have to make some large changes to our user interface. Our icons are spread quite far apart, and our virtual assistant GARIE would move quite quickly and be hard to track. If more time was allowed these would be tested on the HoloLens and adjusted before being handed over to the development team.

Users in our degree are likely have high technical knowledge and are more likely to have higher levels of gaming experience than the average art gallery user. If we did this again, we would ideally expand the user testing demographics to get a wider variety of ages, backgrounds, cultures and non-English speakers to see if our designs are adequate in handling these users.

Evaluation of results

Evaluating the results found (in the data), it is apparent that users struggled the most when completing the Virtual Canvas task, and the Immersive Experience task – the two tasks which provide users with the most freedom. This freedom when completing a task could result in a lack of direction, causing users to make more errors when completing their tasks, this sentiment is echoed when evaluating the G.A.R.I.E tutorial task, and the Language Setting task, as these two tasks are the most structured and resulted in no user errors.

Aside from lack of direction, one common error users made, was not being able to identify the Immersive Experience icon, this was one of the only unconventional icons used and caused most errors in the Immersive Experience task. Similar tasks, that used conventional icons, such as the change Language Settings task, resulted in no errors. We believe that it is necessary to re-evaluate the custom icons we have used to reduce errors going forward.

The graphs in Figures 31-33 displaying error frequencies as well as error percentage were evaluated to be acceptable test data. These evaluations are consistent with the findings that users found some tasks simple and struggled with others. These graphs were chosen as they clearly display the trends occurring in the data.

The interactive painting scenario was only implemented for one of the paintings in the gallery to exhibit functionality, there a few edge cases in the data where people didn't go to this painting first. These were kept as a part of the dataset and is evaluated to be acceptable for this level of functionality.

Group Dynamic

To create our low-fidelity prototype, we split the group into three smaller teams, one for each scenario, which helped to distribute the load of the assignment and allowed each group to work effectively on creating the final experience. This worked well and each team was able to contribute similar amounts of work to the final working prototype

For our high-fidelity protype we split into 3 teams again; a prototyping team, final report team and presentation slides team. This formation was not as effective as the teams for the low-fidelity prototype as the team members writing the report did not have much exposure to the back end of the prototype implementation causing the prototyping team to have to provide a lot of information for the report and presentation teams. To remedy this issue in future we would allocate teams to each scenario of the high-fidelity prototype so that they can gain a better understanding of the prototype implementation.

When important decisions regarding individual teams that would affect the whole group had to be made. Each team would decide what they felt was best, pitched all potential options to the group, sought further input into these ideas or whether someone else had a better option. These large group discussions proved very effective to further progress.

In this team of eight people, we were able to utilise the diverse range of multi-disciplinary assets we had available to us from all members. Each member contributed in their own unique and valuable way to form a successfully cohesive unit. Some were very practiced and comfortable with Unity3D so that made the decision to use that application for our high-fidelity prototype a clear one. We also had a graphic designer on the team. Therefore, he oversaw the presentation using his expertise to clearly get our high-fidelity prototype understood. While others had fantastic practical skills and ingenuity that brought GARIE the glow-worm to life and mechanically modelled a headset.

Several have a fantastic eye for detail due to their prior life experience and were responsible for maintaining a high level of detail in our prototypes, presentation and report. Another has a specific interest to work in the cybersecurity industry, so was the perfect candidate for us to create and manage our risk assessments and our leader for this group, instinctively oversaw operations and with the assistance of a talented facilitator ensured the whole project ran smoothly and everyone was content with their roles and input.

Diversity

The diversity in our group was very low in terms of physical diversity. We are all Australian males between the ages of 20-45 thus representing 3 generations with interests in technology, currently studying SENG2260 and through usage of computers including but not limited to general usage, playing video games and working. No females, people of any religion, people with any major disabilities or people without an understanding of technology including HCI principles were included in the development of the prototypes.

The personality diversity however is quite large, but despite this, communication amongst group members was excellent. For example, we have loud characters who love to be heard, diligent workers who prefer being in the background and a few members that are quite cerebral who feel most at home behind a screen. This enabled us to gain different perspectives in group meetings on our ideas and thoughts, but also work independently and make progress individually. There is potential bias being exhibited towards Australian males in this project due to it being constructed by such people, and this could be mitigated by introducing some people from the above-mentioned

groups and having them contribute. Inherently this would provide different perspectives and ideas to those of existing group members.

6) Minutes and Meetings Summaries

Full Group Meetings

Group: Planeteers Place: Flowers Room 5 Date/Time: 30/10 13:00

Apologies
Paul

Agenda

- Notes from last meeting.
    - Nil
- Agenda items (as needed)
    - Run through the presentation slides
    - Perform trial presentation run and time the duration
    - Modifications to specific sections to fit into allocated time
    - A second trial presentation run
- Date, time and place for next meeting
    - Discord meeting to be held on 02/11 at 1000
- Matters for consideration at next meeting
    - What needs to be done to complete the final report

Roles

Role	Responsible
Leader	Chris
Timekeeper	Tomas
Minute Taker	Luke
Participants	All others

Action sheet

Task	Responsible	Due	Notes
Run through the presentation slides	All	30/10	Check the presentation slides to ensure everyone's content is correct
Perform trial presentation run and time the duration	All	30/10	Run a trial to see how long the presentation takes
Modifications to specific sections to fit into allocated time	All	30/10	Presentation went for too long, propose reductions in certain sections to ensure presentation is around 10 minutes
A second trial presentation run	All	30/10	Presentation duration was nearly perfect

Subgroup Meetings

Group: Prototype Place: Discord Date/Time: 20/09 19:00

Apologies
N/A

Agenda

- Notes from last meeting.
    - Nil

- Agenda items (as needed)
    - Setting up Bitbucket repository
    - Improving look and feel of Greg's model gallery
    - Gesture modelling

- Date, time and place for next meeting
    - Meeting to be held on Discord on 27/09 at 20:00

- Matters for consideration at next meeting
    - Specific scenario implementations

Roles

Role	Responsible
Leader	Luke
Timekeeper	Greg
Minute Taker	Greg
Participants	All

Action sheet

Task	Responsible	Due	Notes
Virtual Canvas logic and visual elements.	Greg	Ongoing	N/A
Work on look and feel	Luke	Ongoing	N/A
Gesture modelling	Luke	27/09	abandon two handed gestures for prototype
Ideas for scenario implementations	All	Ongoing	N/A

Group: Prototype Place: Discord Date/Time: 27/09 20:00

Apologies
N/A

Agenda

- Notes from last meeting.
  - Nil
- Agenda items (as needed)
  - Progress reports
  - Getting GARIE to guide users (A.I. or static waypoints?)
  - Bitbucket issues
- Date, time and place for next meeting
  - Meeting to be held on Discord on 27/09 at 20:00
- Matters for consideration at next meeting
  - N/A

Roles

Role	Responsible
Leader	Greg
Timekeeper	Luke
Minute Taker	Greg
Participants	All

Action sheet

Task	Responsible	Due	Notes
Push progress to BitBucket	Luke	28/09	
Merge progress with Luke's work	Greg	28/09	
Continue with development	All	Ongoing	Identify bugs or issues

Group: Prototype Place: Discord Date/Time: 10/10 18:00

Apologies
N/A

Agenda

- Notes from last meeting.
    - Nil

- Agenda items (as needed)
    - Progress report
    - Virtual canvas drawing implementation
    - Virtual canvas functions (move and resize)
    - Bugs and annoyances

- Date, time and place for next meeting
    - Full group

- Matters for consideration at next meeting
    - Group testing and discussion

Roles

Role	Responsible
Leader	Greg
Timekeeper	Luke
Minute Taker	Luke
Participants	All

Action sheet

Task	Responsible	Due	Notes
Implement “Ink Painter”	Luke	17/10	
Implement move and resize features	Greg	17/10	
Identify and fix bugs	All	17/10	

Group: Presentation Place: Discord Date/Time: 23/10 21:00

Apologies
N/A

Agenda

- Notes from last meeting.
    - Nil

- Agenda items (as needed)
    - Designate sections of the presentation to each group member
    - Inform members of their topics and expected talk times

- Date, time and place for next meeting
    - Meeting to be held on Discord on 29/10 at 21:00

- Matters for consideration at next meeting
    - Finalisation of slides

Roles

Role	Responsible
Leader	Brice
Timekeeper	Harry P
Minute Taker	Harry P
Participants	All

Action sheet

Task	Responsible	Due	Notes
Task delegation	All	29/10	
Notify group members	All	29/10	

Group: Presentation Place: Discord Date/Time: 29/10 20:00

Apologies
N/A

Agenda

- Notes from last meeting.
  - Nil
- Agenda items (as needed)
  - Finalisation of presentation slides
- Date, time and place for next meeting
  - N/A
- Matters for consideration at next meeting
  - Nil

Roles

Role	Responsible
Leader	Harry P
Timekeeper	Brice
Minute Taker	Brice
Participants	All

Action sheet

Task	Responsible	Due	Notes
Finalisation of presentation slides	All	29/10	Finish formatting of slides before the presentation

Group: Final Report Place: Discord Date/Time: 02/11 10:00

Apologies
Paul

Agenda

- Notes from last meeting.
  - Nil
- Agenda items (as needed)
  - Final report sections delegated to members
- Date, time and place for next meeting
  - Meeting to be held in Flowers Room 5 on 06/11 at 1300
- Matters for consideration at next meeting
  - Status of Final Report
  - What needs to be completed before submission
  - Assistance to members who may have problems with their sections

Roles

Role	Responsible
Leader	Tomas
Timekeeper	Harry
Minute Taker	Chris
Participants	All

Action sheet

Task	Responsible	Due	Notes
Final report sections delegated to members	All	02/11	Even distribution of report tasks among Final Report team members.

Group: Final Report Place: Flowers Room 5 Date/Time: 06/11 13:00

Apologies
N/A

Agenda

- Notes from last meeting.
  - Nil
- Agenda items (as needed)
  - Update on section progress
  - Expansion on section 5
- Date, time and place for next meeting
  - Meeting to be held in Discord on 7/11 at 1300
- Matters for consideration at next meeting
  - Update on section progress

Roles

Role	Responsible
Leader	Harry
Timekeeper	Tom
Minute Taker	Paul
Participants	All

Action sheet

Task	Responsible	Due	Notes
	All		
	All		
	All		
	All		

7) Appendices

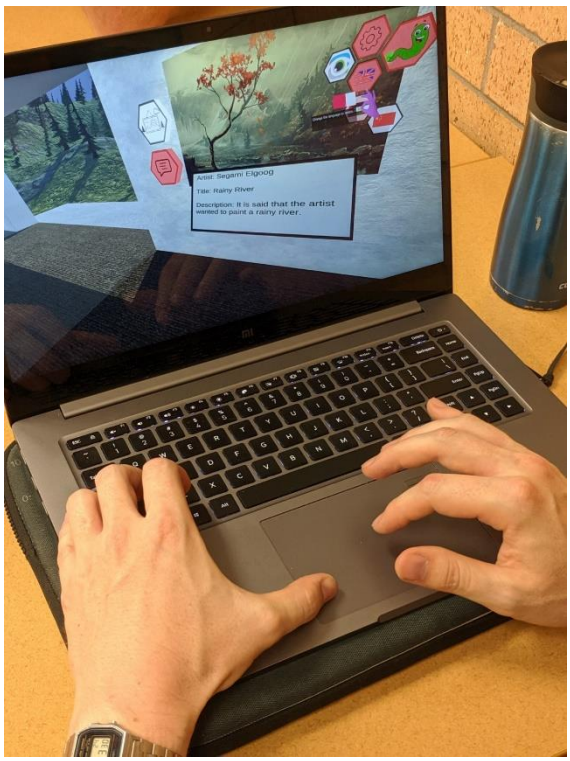
Appendix A: Development of Prototype

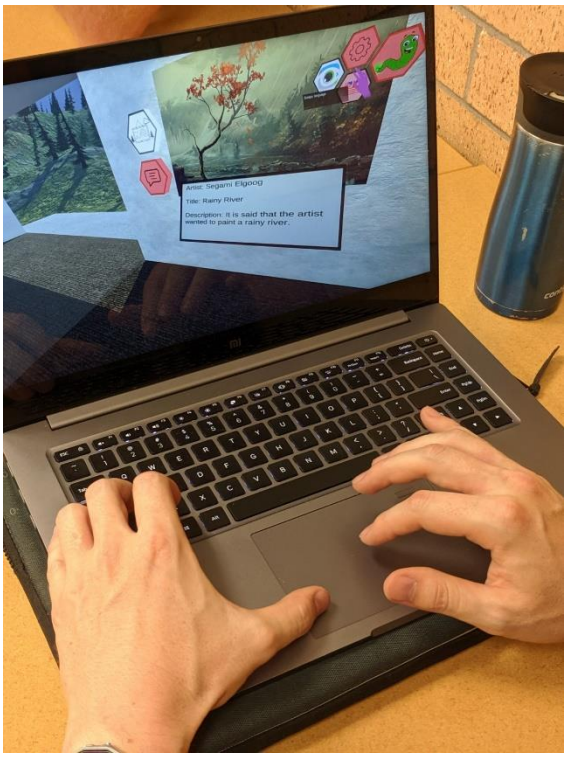
UON Art Gallery Floor Plan:

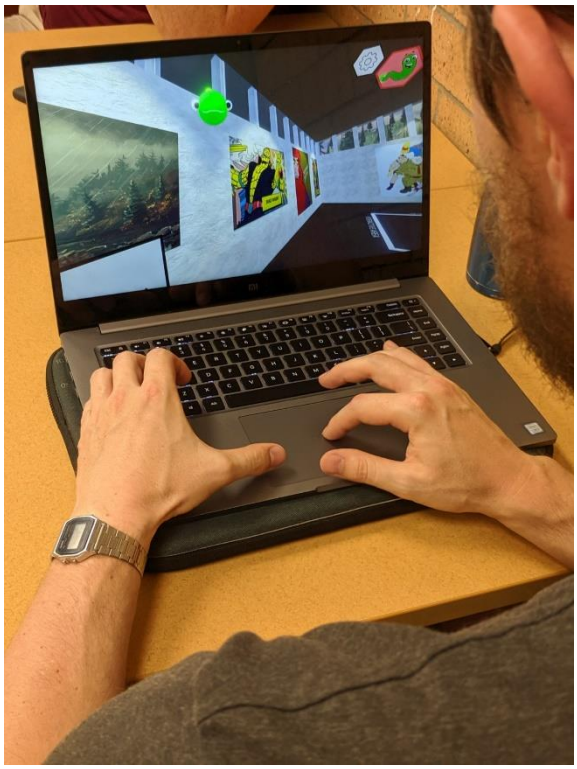
Figure 34 Gallery floor plan (University of Newcastle, 2013)

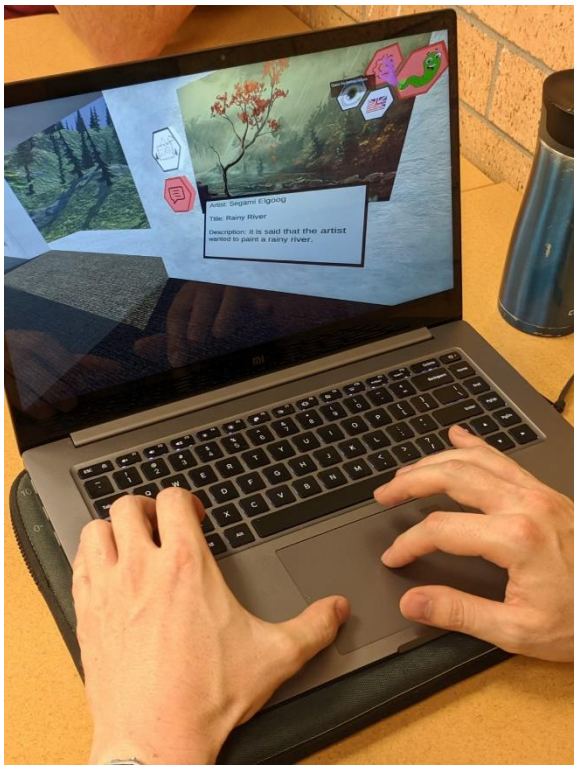
Appendix B: Testing Photos

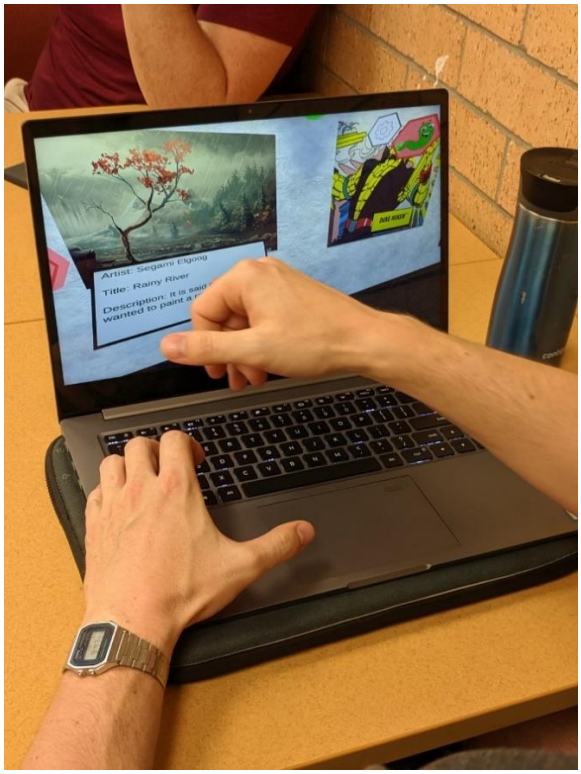
Interactive Art

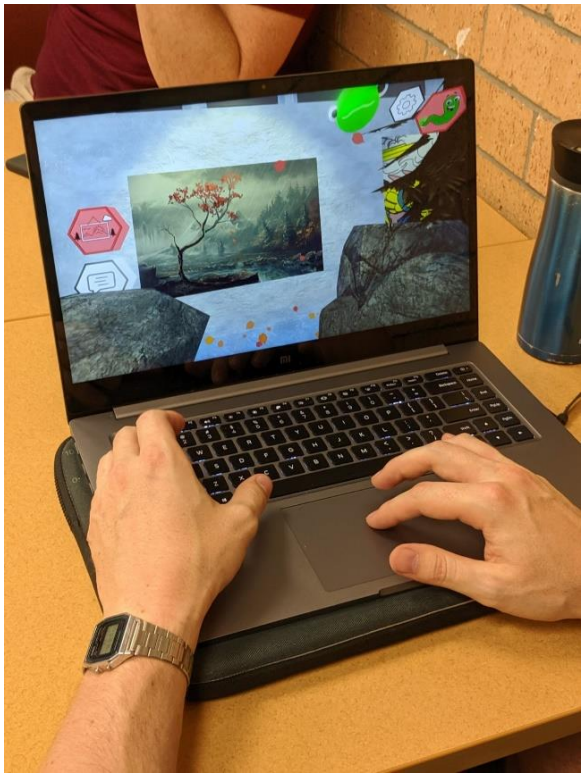


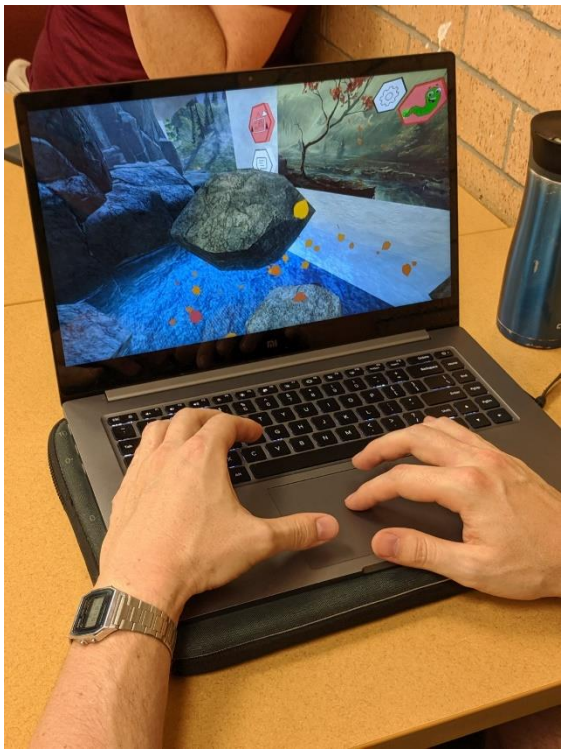


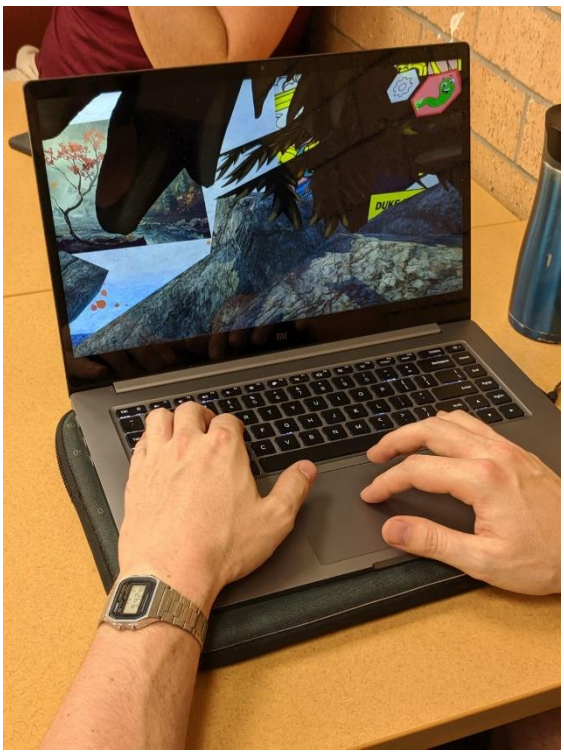


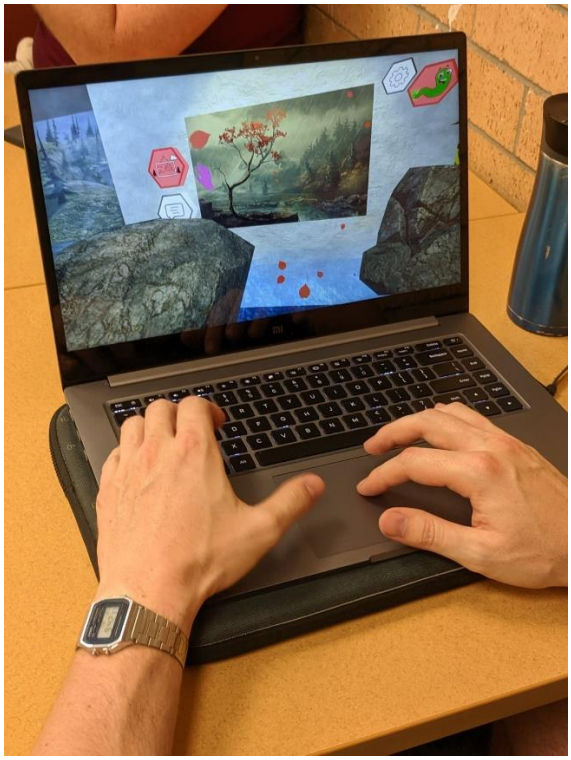


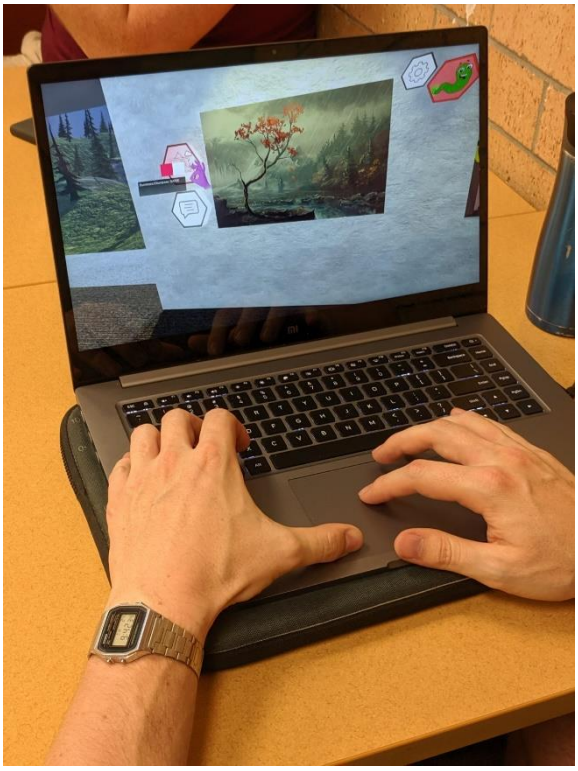

Artist: Segami Ekpong
Title: Rainy River

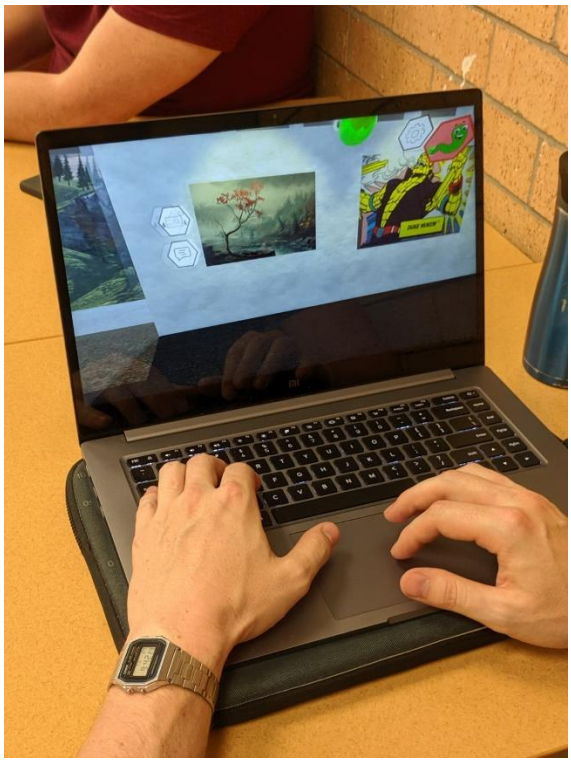


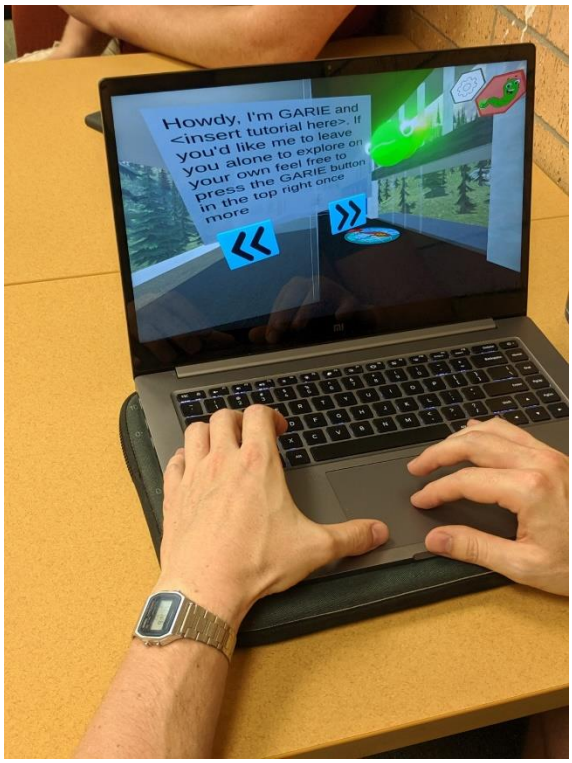




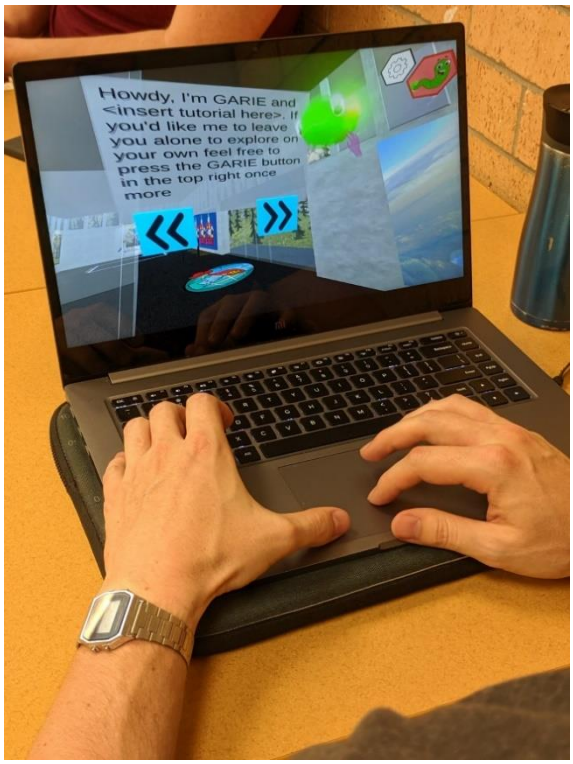


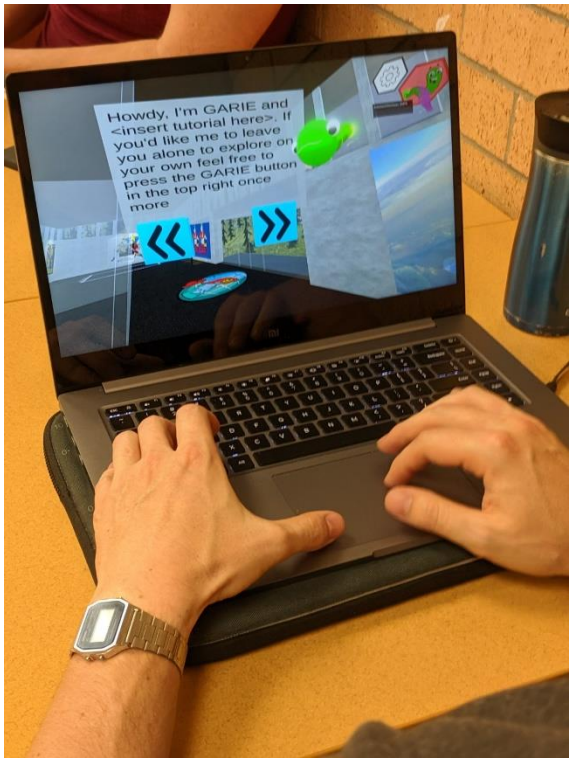




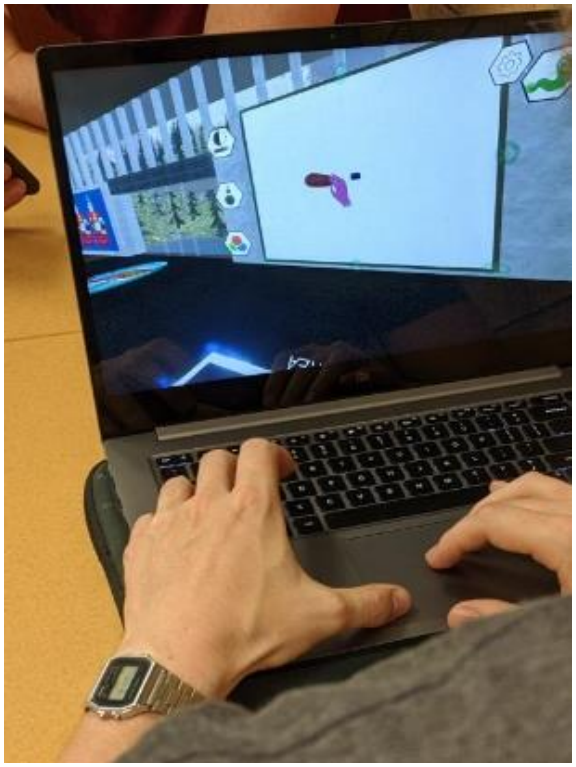

Howdy, I'm GARIE and
<insert tutorial here>. If
you'd like me to leave
you alone to explore on
your own feel free to
press the GARIE button
in the top right once
more

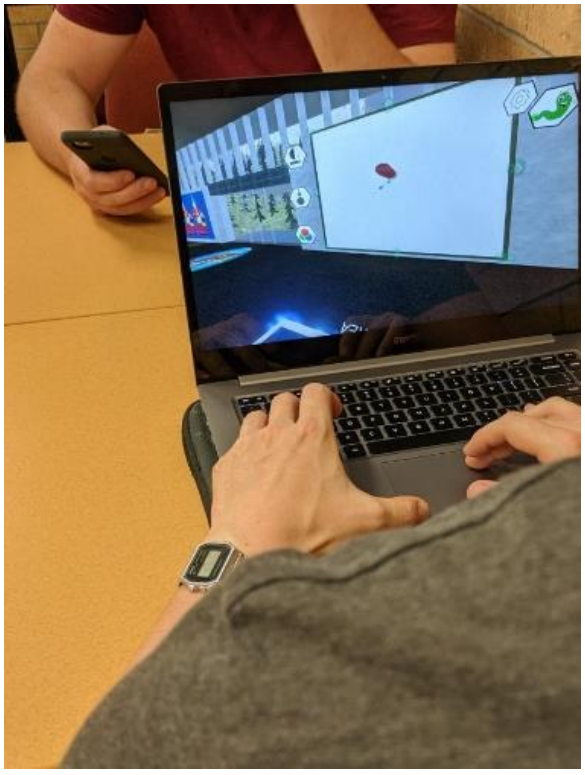
GARIE Assistant

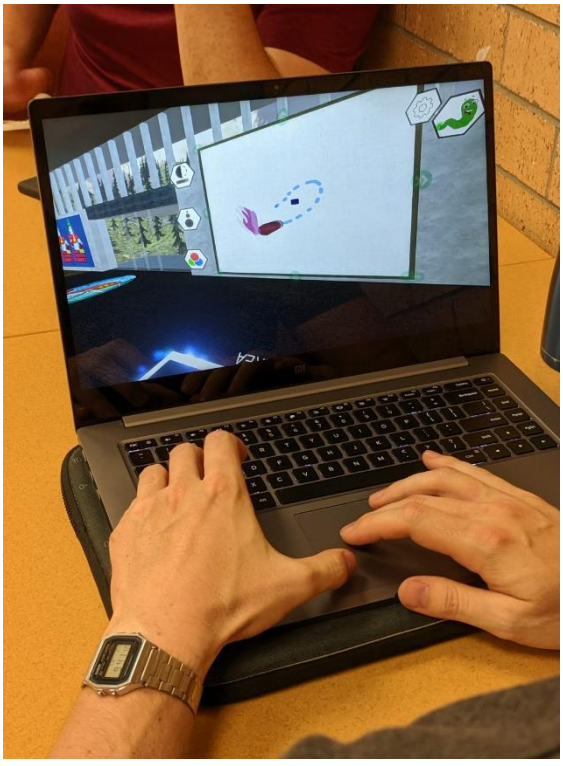


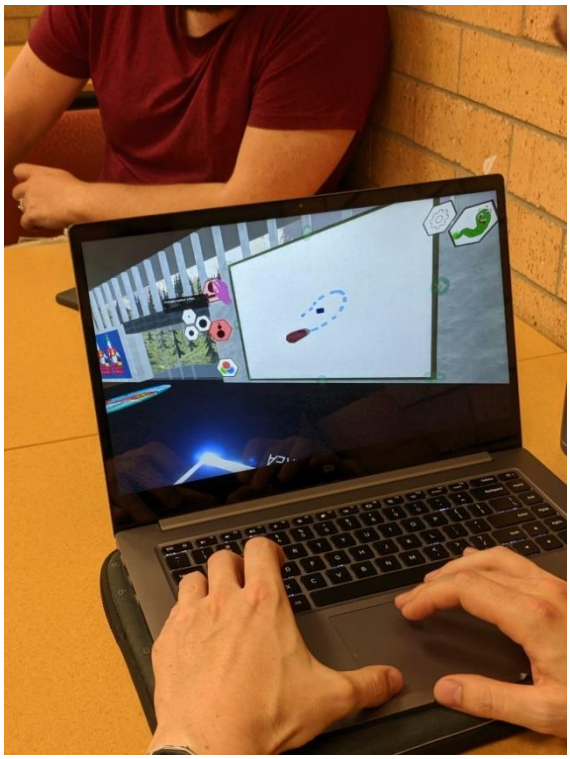


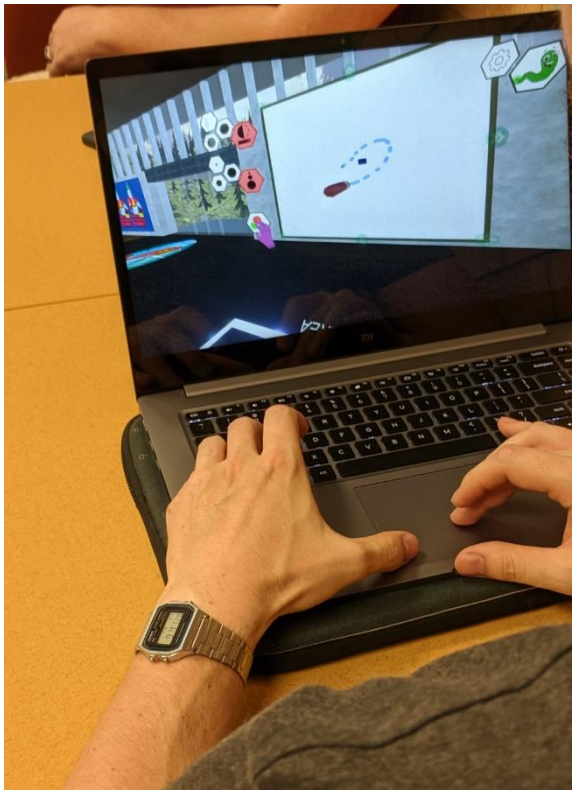
Virtual Canvas











Appendix C: User Feedback

Gallery Augmented Reality Interactive Experience 

Average Age: 25.86

Please colour the response that best matches your experience	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I think this scenario is suited for my age group					
I would recommend this for another age group					
I found the gestures easy to remember					
I was unsure of the scenario objective					
I was aware of my surroundings					
The scenario could enhance the gallery experience					
I would try this scenario if I saw it in the art gallery					
The system behaved as I expected it to					
The system would take a lot of practice to master					
I felt unsafe during the scenario					
The system was easy to navigate					
I found the scenario engaging					
There was enough on-board guidance					
It was easy to exit the scenario					
Overall it was enjoyable					

Gallery Augmented Reality Interactive Experience

(User Completed Example)

Scenario: Virtual Canvas Date: 05/09/2019

Age: 22 User ID: 3

Please colour the response that best matches your experience	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I think this scenario is suited for my age group					✓
I would recommend this for another age group					✓
I found the gestures easy to remember				✓	
I was unsure of the scenario objective		✓			
I was aware of my surroundings			✓		
The scenario could enhance the gallery experience					✓
I would try this scenario if I saw it in the art gallery					✓
The system behaved as I expected it to			✓		
The system would take a lot of practice to master				✓	
I felt unsafe during the scenario			✓		
The system was easy to navigate				✓	
I found the scenario engaging					✓
There was enough on-board guidance			✓		
It was easy to exit the scenario					✓
Overall it was enjoyable					✓

8) References

David D.M. Mason & Conal McCarthy (2006) 'The feeling of exclusion': Young peoples' perceptions of art galleries, Museum Management and Curatorship, 21:1, 20-31,
DOI: 10.1080/09647770600402101

University of Newcastle. (2013). *Post-Graduate Exhibition Proposal Kit*. [online] Available at: https://www.newcastle.edu.au/__data/assets/pdf_file/0008/78929/Post-Graduate-Exhibition-Proposal-Kit-Oct-2013.pdf
[Accessed 8 Nov. 2019].