

Unit Title: 2.4 Design & Develop a Digital media outcome - webVR	
Year level: Year 12	Expected length of unit: 9-10 weeks
Description of unit: This unit involves implementing advanced techniques to develop a digital media outcome to address relevant implications.	
Key Competencies/ How does it relate to the schools connected curriculum: - Managing Self - Participating and contributing - Using Language, symbol & text Cooperative learning - working together to learn the skills needed for the different contexts. Inquiry learning – Students selecting and guiding their own learning	
Achievement Objectives from the NZ Technology curriculum Document (if applicable): <u>Technological Practice:</u> Level 7: Critically analyse their own and others' outcomes and evaluative practices to inform the development of ideas for feasible outcomes. Undertake a critical evaluation that is informed by ongoing experimentation and functional modelling, stakeholder feedback, and trialling in the physical and social environments. Use the information gained to select, justify, and develop an outcome. Evaluate this outcome's fitness for purpose against the brief. Justify the evaluation, using feedback from stakeholders and demonstrating a critical understanding of the issue. Progress Outcome 5: In authentic contexts and with support, students investigate a specialised digital technologies area (for example, digital media, digital information, electronic environments, user experience design, digital systems) and propose possible solutions to issues they identify. They independently apply an iterative process to design, develop, store and test digital outcomes that enable their solutions, identifying, evaluating, prioritising and responding to relevant social, ethical and end-user considerations. They use information from testing and, with increasing confidence, optimise tools, techniques, procedures and protocols to improve the quality of the outcomes. They apply evaluative processes to ensure the outcomes are fit-for-purpose and meet end-user requirements.	
Assessment Method: AS91893 (2.4) – Use advanced techniques to develop a digital media outcome (4 Credits)	
Learning Outcomes (what do we want the students to be able to demonstrate/ know how to do?): To be able to efficiently use advanced techniques to code webVR scenes with 3D models. To be able to create and use 3D models in their webXR site - in relation to applying conventions of the medium to address relevant implications for the project Web media: HTML 5 semantic mark-up	

- CSS typography
- Use of frameworks such as **a-frame.io** (with found / original 3D models & textures)

webVR - with A-frame.io Javascript framework

There are a number of good online resources in addition to the [A-Frame.io documentation](#)

You will note from the list below that the course structures are similar and vary with depth.

Some are text based, others video. Having explored them all I predict the **FrameAcademy** is the most useful as it has both text, video and online interactive Glitch coding windows. It has 4 projects with well scaffolded instructions.

FrameAcademy - webXR - Projects 1-4:

Project 1: Create a 3D Site with Basic HTML (Level 1)

<https://learn.framevr.io/project1/part1>

- **Project 1 - Goals**

- how to build a simple 3D web site with shapes, 3D models, photospheres, and text with basic HTML. in other projects, you'll see how to make it interactive.
- how to share and view your 3D web sites from virtual reality, desktop, and mobile.
- how to continue on your learning journey

- **Part 1: Shapes & HTML**

- Get started with Glitch.com
- Setup your HTML, First Shapes. Position,
- **Challenge #1** - make 3 or more shapes

- [Part 2: Moving Through Space](#)

- Position, Rotation, Scale
- Viewing your site on Desktop, Mobile & VR
- Using A-Frame Inspector to work Faster
 - Move, Zoom, Rotate Camera
 - Change Entity Position, Rotation, Scale
 - **Challenge #2** - Use Inspector to change Position, Rotation & Scale (in front & behind camera), & copy code to Glitch: adapt, refine & test.

- [Part 3: Adding 3D Models to your Scene](#)

- Intro to 3D models
- Finding 3D models on SketchFab
- Converting & Importing your model ([GLB Packer](#))
- Use glTF Model Entity,
- **Challenge #3:** Find 3D Models on SketchFab - convert to GLB and import to your project. Adjust size, position & rotation. Add a-scene background colour.

- [Part 4: Adding Photospheres, Text and Images](#)

- Adding Photospheres ([Flicker Equirectangular library](#)), `<a-sky src="">`
- Adding Images as Textures
 - `<a-plane id="floor"`

- Adding Text (value, colour, position, width, rotation)
- **Challenge #4: Add a photosphere, flat image & test**
- **[Part 5: Debugging, Exploring & Sharing your 3D Site](#)**
 - Debugging & Troubleshooting
 - Exploring the HTML of any site with Inspector
 - Finalizing your Project
 - **Challenge #5: Share your WebXR site to the Gallery**

Project #2 - Adding Animations to your WebXR Site with Components (L2)

- **Project 2 - Goals**
 - how to import and add animations to your WebXR site.
 - how to write your own simple animations with HTML.
 - how to use A-Frame components to bring more sweet features to your VR site
- **[Part 1: Playing Animations on 3D Models](#)**
 - Setup your Project on Glitch
 - A-Frame Components & [Documentation](#)
 - Importing Components into your HTML ([A-Frame Registry](#)) Animation-mixer
 - Finding 3D Models with Animations on SketchFab
 - **Challenge #1:**
 - Bring in an animated SketchFab model. Add animation-mixer component to the head & on a-gltf model element. Test it.
- **[Part 2: Building your own Animations with HTML](#)**
 - Import the Animation Component
 - Animating Position
 - Going Beyond Position (rotation, dur, color)
 - **Challenge #2: Create Some Animations**
 - Setup a few animations in your own project. Tinker with properties on the [documentation page](#)
 - Try setting multiple animations on same element
- **[Part 3: Animate the Camera](#)**
 - Animating the Camera
 - `<a-entity camera wasd-controls look-controls>` - [documentation](#)
 - **Challenge #3: Refine your Animations & Share to Gallery**

Project #3 - Relative Position & Grouping Elements (L2)

- **Project 3 - Goals**
 - how to make an entity in your WebXR scene a "parent" of another entity, and what it means for an entity to be a **child**, **parent**, or **sibling**!
 - how to understand **relative position** in your WebXR site.
 - how to use the A-Frame **Asset Management System** to preload the assets in your scene for better site performance.
- **[Part 1: Meeting the Relatives -](#)**
 - Setup your Project

- Parents, Children & Siblings
- Relative Position
- Looking at Parents + Children in A-Frame Inspector
- **Challenge #1: bring in a few entities (shapes, images, models etc) and nest** some entities inside of others to make **parent-child** relationships. Test with 'Show live' on Glitch. Check for any errors.
 - Ctrl+Alt+i - open A-Frame Inspector, experiment with moving, rotation & scale of parent entities / child entities to see how they relate. Moving a child shouldn't move the parent. Moving the parent should move the child too.
- **Part 2: Keep it in the Family**
 - Inheritance - [Visible documentation](#)
 - Animating Families - global / local position
 - **Challenge #2:** Add Animations to the Family from Challenge #1. Try animating, position, scale, rotation or colour.

Project #4 - Adding Interactivity to WebXR sites with Javascript

- **Project 4 - Goals**
 - some JavaScript basics (for example variables, functions).
 - how to create, publish, and share your own JavaScript A-Frame components.
 - how to let users interact with your WebXR site via mouse or VR controllers!
 - how to build some basic interactivity into your WebXR site with your new JavaScript skills.
- **Part 1: Exploring the Starter Project**
 - Setup your project
 - The Scripts and Assets
 - Scene Structure
 - **Challenge #1: Make the Starter Project your own**, swap assets, add your own images to the walls, add a new photosphere sky, add new 3D models and arrange them. Make a cool gallery about something you love or an e-portfolio that shows off some of your work, or just an exploratory playground.
- **Part 2: Using the Mouse + VR Controllers**
 - Cursors on Desktop + Mobile Mode (listening for events - click, tap/touch, trigger)
 - Virtual Reality Controllers
 - **Challenge #2: Try out "clicking" on the devices you have. Test your project on as many devices as possible** and test out interactivity and "clicking". If you have VR controllers try the Line Component to create a blue laser, **For example: `<a-entity laser-controls="hand: right" line="color: red"></a-entity>`**
- **Part 3 - Diving into Javascript**
- **Part 4 - Modifying your Javascript**

- [Part 5 Creating a Photo Sphere Gallery](#)

[Project #5 - Using Audio + Video & 360 Video in your WebXR sites](#)

- **Project 5 - Goals**
 - how to import and play sounds in your WebXR site
 - how to import and play 2D videos in your WebXR site
 - how to import and play 360 degree videos in your WebXR site
- [Part 1 - Importing Your Assets](#)
- [Part 2 - Playing, Pausing and stopping Audio](#)
- [Part 3 - 2D Video](#)
- [Part 4 - 360 Video & Videospheres](#)
- **Project 6 - Coming Soon!**
 - TBC

Text based [A-frame.io documentation](#) tutorials:

A-Frame.io GUIDES

[Building a Basic Scene](#)

[Building a 360° Image Gallery](#)

[Building with MagicaVoxel](#)

A-Frame School - An Interactive Course for WebVR:

<https://aframe.io/aframe-school/#/>

(Key: **Level 2 Advanced** / **Level 3 Complex**)

- 3.) Basic setup (using Glitch / GitHub)
- 4.) Try Out Examples
- 5.) VR Hello World - basic Primitives (plain, cube, cylinder, sphere, torus knot, text, dodecahedron) Properties(position, rotation, color, scale)
- 6.) Add Textures - Uploading Assets
- 7.) A-Frame Inspector (Ctrl + Alt + i)
 - Change Component Values (text geometry)
 - Attach Physics Components from Registry (static / dynamic body)
- 8.) Compose with Entity Component
 - - Break Primitives Down

- Add a Light Source Sphere (geometry/material color & shader / light - animation position/direction/loop)
- 9.) Extend with Entity Component - From the Registry
 - Particle System / Animation / Outline Effect
- 10.) Use Javascript- DOM APIs - Interactivity
 - Getting Entity - use document.querySelector('a-scene')
 - Modifying Entities - use Entity.setAttribute() (rotation/geometry/material)
 - Create Entities
 - Handling Events - event listeners (L3)
- Add Gaze-Based Cursor Interactions - Add Cursor Entity - 360 Image Gallery
 - Controller-events-handler - click, mousenter, mouseleave
- Add 3D Model - glTF Model
 - Import to <a-asset> use id #
 - glTF Model Animations
 - Uploading 3D Models
- Add Tracked Controls - Add Hand Controls
 - Add Interactivity

For Daily Homework - Short webVR Video Tutorials:

These two ZENVA video courses are recommended for Homework as each video is short (less than 15mins)

ZENVA - webVR basics, video tutorials includes:

<https://drive.google.com/drive/u/1/folders/1-nMOQ2reyZwqE5jvC1xcio9MIgerVKTU>

- Basic setup (using Chrome Web Server) & Co-ordinates
- Rotation
- Scaling
- Parenting
- Primitives
- Textures
- Using the Visual Inspector
- 360 Degree Photos - Equirectangular Photo Sphere
- Reticule
- Interactivity
- Animation & Text
- Importing Models in OBJ format

Making 3D assets

1. Building with MagicaVoxel:

<https://aframe.io/docs/0.8.0/guides/building-with-magicavoxel.html>

2. Download MagicaVoxel: <https://ephtracy.github.io/>

ZENVA Tutorials - 3D Modelling Voxels (MagicaVoxel)

[webM format videos on Google Drive](#)

- MagicaVoxel Introduction
- Camera Controls
- Brush Basics
- Voxel Tree
- Voxel Character
- Colour Palette
- Environment - part 1
- Environment - part 2
- Exporting to Unity

**Other 3D software could be suitable,
as long as Exported 3D assets are in suitable formats (.OBJ, .glTF or .GLB):**

- TinkerCad
- MS Paint 3D
- SketchUp
- Clara.io
- Blender

Image Manipulation of Textures / UV Maps

- gradient fills,
- drop shadows,
- composition layer masks,
- converting colour modes,
- correcting image distortion and noise,
- pixel selections,
- drawing, pen tool
- slicing and exporting for conceptual views
- Conversion between file types
- Masking

[Link to advance procedures NCEA Resources](#)

Useful teaching resources:

InstaVR

If you want a no-code solution and have used 360 cameras to record photos or videos you can link them together online and publish them with InstaVR

<https://www.instavr.co>

For local testing offline with simple web server:

Add to Your Chrome Browser: [Chrome Web Server Extension plugin](#)

GLB Packer -Convert glTF to GLB

<https://glb-packer.glitch.me/>

A-Frame.io

Frame Academy: <https://learn.framevr.io/gallery>

Sonar Learning WebVR

This A-Frame skills video course by **Sonar Learning** has a different presenter with an English accent, it is in less detail and the videos are shorter, you may prefer it:

<https://sonarlearning.co.uk/coursepage.php?topic=web&course=aframe>

1: Setting Up	6: Interacting With Objects	11: Curved Image
2: Drawing A Box	7: Lighting	12: Video
3: Transformations	8: Skybox	13: Video Sphere
4: Textures	9: Model Loading	14: Plane
5: Animations	10: Image	15: Object Loading

Level 3 More in-depth Learning Resource

UDEMY Learn AFrame webVR Course

(more in-depth and more suited to Level 3)

[webM format videos on Google Drive](#)

1. Introduction
2. AFrame Basics
 - a. What is A-Frame
 - b. Installation & Testing
3. Adding & Modifying HTML Elements
 - a. Basic Primitives
 - b. Position & Relative Positioning
 - c. Rotation & Relative Rotation
 - d. Scale, relative scale & reflection
 - e. Image textures and Materials
 - f. Image and curved image primitives
 - g. Breaking primitives down
4. Modifying the Virtual Environment
 - a. Ground
 - b. Sky & 360 image
 - c. Camera Primitive
 - d. Loading and displaying 3D Models
 - e. Animating Objects
 - f. Adding Lights and shadows
 - g. The AFrame Inspector
5. Interacting with the Objects
 - a. Cursor Primitive and component

- b. Event-set component
- c. Gaze-based Interactions
- d. Selective Intersections
- e. Controller-based interactions
- f. Interaction gestures
- 6. Enhancing the Virtual Environment**
 - a. Physics and collision
 - b. Sound and positional audio
 - c. Video
 - d. 360 Video
 - e. Stereoscopic Images
 - f. Antialiasing
- 7. Enhancing the Interactions**
 - a. Semantic Animation
 - b. Animation component
 - c. Text component
 - d. Look-At component
- 8. Moving Around in the Virtual Environment**
 - a. VR locomotion and its limitations
 - b. Smooth artificial locomotion
 - c. Movement controls component
 - d. Navigation meshes
- 9. Testing Your WebVR Scenes on Mobile**
 - a. Using Glitch
 - b. Installing and using a web server
 - c. Installing and using ngrok
 - d. NOTECamera offset on mobile devices
- 10. Resources for Your WebVR Projects**
 - a. Web links to resources used during lectures
 - b. Web links to FREE 3D models & software
 - c. Web links to VR related websites
- 11. AFrame v0.8.x - what has changed**
 - a. Introduction
 - b. Camera Height Offset (ECS syntax)
 - c. SKY colour
 - d. Colour Correction for glTF 3D models
- 12. AFrame v0.8.x - Known Issues**
 - a. Introduction
 - b. Camera moves slowly on Chrome
 - c. Raycaster bug
 - d. Sound component not playing audio asset across multiple entities
 - e. Best practice for colour space management

Potential Learning Experiences, linking to Learning Outcomes	Resources	Timing
Photoshop		
An Introduction to Photoshop CS6 - Learning the Basics of Photo Manipulation - You'll learn about using layers, transformations and retouching techniques,	Basics of photoshop	

along with time-saving tips, tricks and shortcuts		
Pixels • concept of pixels (each one color, one color only) • pixels as building blocks of an image Brush Tool & Options • brush size, hardness, mode, and opacity • foreground & background color chips • Creating own brushes Selections • selecting part of an image with rectangle or oval • moving and copying selections History Panel • using undo to compare last action • using the history panel to step back, memory issues Layers • using layers to draw one image over another • making new layer • moving layer order, deleting layer, flattening Layer masking Magic Wand Tool • setting tolerance and extending selections • using return key when entering numbers Transform • Rotating and scaling selections More Selection Tools • quick selection tool • lasso and magnetic lasso tools • crop tool Clone Stamp Tool • option-click to set source, click to set destination • using between images and layers Image Adjustments	Photoshop Tutorial: Layers & Layer Masks For Beginners	

• histogram as a map of your image changing light, dark, and medium tones • using color balance to change color of an image		
Photoshop and Clara.io - 3d compositions		
Exporting and Importing 3d Models • Exporting 3d models from clara • Importing 3d models into Photoshop Photoshop Manipulation of 3d models	Powerpoint clara and photoshop Compositing 3D Models Into Photographs Using Photoshop Compositing 3D Objects Into Photographs Using Photoshop With Colin Smith	
Design and Typography		
Design Principles:		
Space, Textures, Contrast, Colour,		