CANADA LEARNING CODE

Envisioning Canada in VR

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Duration: 2 hours

LEVEL	SUBJECTS	PROVINCES / TERRITORIES	TOOL
Grades 9-12	Mathematics, The Arts, Applied Design, Skills, and Technologies	Across Canada	A-Frame, Glitch

Overview

Students will learn about Anishinabe intermedia artist Scott Benesiinaabandan and his 2167 VR experience, then build their own WebVR project using A-Frame.

Prep Work

- **Recommended: Introduce HTML & CSS before running this lesson. Try the "Innovation Website," "Tourism Website," or "Superhero Profiles" lessons.**
- Watch the "Content 101: Glitch" video: http://bit.ly/content101-videos
- Have students create a Github account at: github.com ➝ We won't be accessing Github directly, but we'll use this account to save our websites
- Check out this example learner project: http://troubled-bean.glitch.me
- Print the Solution sheet ahead of time: bit.ly/aframe-solution

Key Coding Concepts

- ✓ Sequence
- ✓ Debugging
- ✓ Parallel execution

Terminology

Virtual Reality (VR) is a computer-generated 3D environment that simulates a real experience. The level of interactivity can vary from passively observing to device-assisted interactions.

Augmented Reality (AR) is a computer-generated experience where a virtual world is superimposed on the user's view of the real world.

- You will need computers and access to the internet for this lesson

Lesson

Created in partnership with ImagineNATIVE.

Introduction

Artist profile from ImagineNATIVE:

Scott Benesiinaabandan *is an Anishinabe intermedia artist that works primarily in photography, video, audio and printmaking. He has completed international residencies at Parramatta Artist Studios in Australia, Context Gallery in Derry, North of Ireland, and University Lethbridge/Royal Institute of Technology iAIR residency, along with international collaborative projects in both the United Kingdom and Ireland. Scott is currently based in Montreal.*

About 2167: What does the future of Canada look like? For the 2167 project, five indigenous artists were asked to share their vision of Canada 150 years into the future using immersive media. Scott Benesiinaabandan responded with "Blueberry Pie under the Martian Sky" - a virtual reality experience.

Description from ImagineNATIVE website: "Bringing to life a prophetic Anishinabe legend about a young boy who travels through a wormhole back to his people's place of origin, Blueberry Pie Under the Martian Sky also addresses concerns about the revitalization, growth and evolution of the Anishinabe language."

Watch video recording of of Scott's VR experience: https://vimeo.com/266190823

(Note: this is a video capture of the project, not the actual VR experience)

WebVR is a JavaScript API that makes it possible to experience VR in our browser. We can use WebVR to develop, experience, and share VR projects.

A-Frame is an open source framework for developing WebVR, based in HTML. Because it is cross-platform, we can experience A-Frame projects using anything from an Oculus Rift, to the browser on our desktop computer.

HTML stands for HyperText Markup Language. It is the language of the web, and is used to build the content of a website, including text, images, and hyperlinks.

Curricular Connections

3D transformations, cartesian coordinate system, graphing, measurement & geometry, three-dimensional shapes, elements and principles of design, critical analysis, symbolism, intermedia art

References

ImagineNATIVE: http://www.imaginenative.org/

Scott Benesiinaabandan http://www.benesiinaabandan.com/

TIFF

Reflection

Write common symbols, themes, and descriptive words on a whiteboard.

Possible questions:

- What is your initial reaction to this virtual artwork?
- If you could describe the experience in one word, what would it be?
- Which symbols or themes were apparent in this work?
- What connections can you make between the artist's choice of media and the theme of the work?

https://www.tiff.net/

Pinnguaq
https://pinnguaq.com/

Initiative For Indigenous Futures
http://indigenousfutures.net/

AbTec
http://abtec.org

We're going to create our own virtual artwork in A-Frame based off of one of the themes or symbols discussed.

*Decide as a class on one theme, or have each learner choose their own theme, as inspired by the example VR project.

Code-Along

- Go to https://glitch.com/~aframe
- Select "View Source" to open the project
- Click "Show Live" to preview the project
- Navigate within the scene by using WASD or arrow keys. Click + drag to turn.
- Go back to the project tab and open "index.html"
- Try out a few of the following challenges:
    1. Change the colour of the sphere
    2. Change the position of the cylinder
    3. Change the rotation of the box
- Remind learners to continue to test by previewing the project each time they change the code
- Have volunteers share their solutions with the class
- Q: What did we learn about the position attribute?
    - Measured in meters
    - X = left-right
    - Y = up-down
    - Z = forward-back

Activity

Have learners open up the starter project: glitch.com/~vr-starter-project

Use the Solution Sheet to guide learners through the following steps:
- Changing the background image
- Adding more 3D shapes
- Adding textures
- If time: Adding animation
- Saving and sharing projects

*For any A-Frame related questions check out this documentation: https://aframe.io/docs

*Contingency (offline option): Install a text editor (like https://atom.io) and download project files (http://bit.ly/aframe-offline-files)

Assessment

- Have learners write an Artist's Statement on paper or as a <!--comment--> in their code. For example: "This artwork is titled [Title]. It is a WebVR experience built in A-Frame using HTML. I chose [design decision] because [reasoning behind design decision]."
- Co-create success criteria after looking at the tool and walking through the Code Along. Have learners conduct peer-evaluations and provide constructive feedback for revision before submitting their final artwork.

Extensions

- If you have access to Google Cardboard (https://vr.google.com/cardboard/), have learners experience each other's final projects in VR for the full, immersive experience.
- Explore Scott's portfolio website and have a mini 'scavenger hunt' for common themes, symbols, etc. between his various artworks: http://www.benesiinaabandan.com/
- Hear more from the artist himself! Watch this video of Scott sharing his VR project after students have a chance to try to interpret the artwork on their own: https://vimeo.com/247365954
- Math connection: Using the students' projects or the code-along A-Frame project, calculate the surface area and volume of the 3D entities, using pixels as a unit of measurement. Compare the surface area and volume of existing prisms, cylinders, cones, and/or spheres.
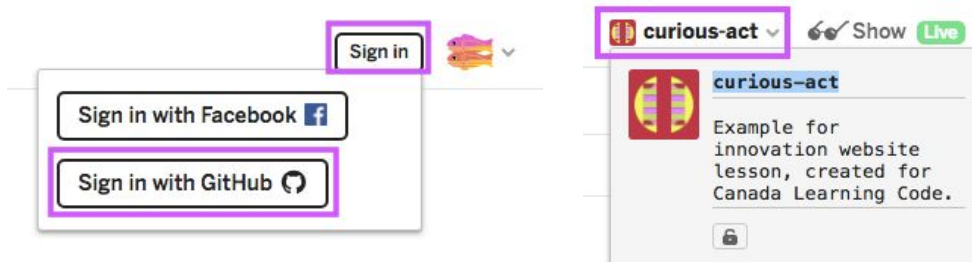
Envisioning Canada in VR

STEP 1: Remix the Starter Project

1. Open the starter project: glitch.com/~vr-starter-project
2. Click "Remix your own" (under the preview image)

3. Sign in using your Github account (top, right)
4. Change the project name (top left)

STEP 2: Change the background image

1. Select a background image from the "assets" folder, or:
   a. Go to https://www.flickr.com/groups/equirectangular/
   b. Find a **360° image** for your background and save it to your computer
   c. Upload it to your A-Frame project by selecting "Add asset" > "Computer→"
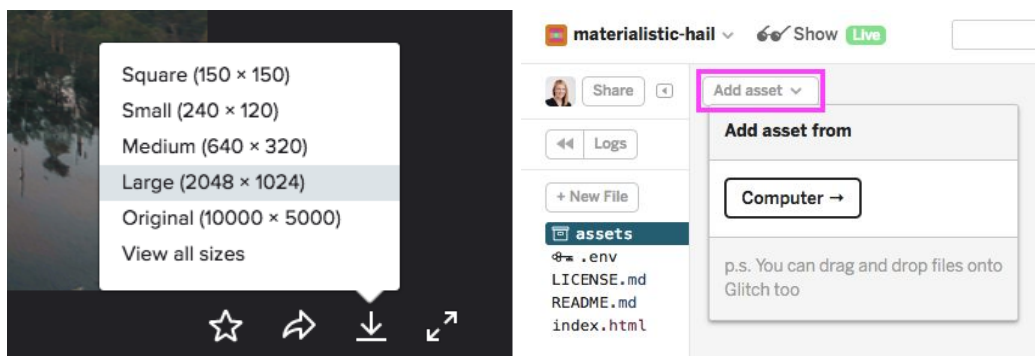
2. Copy the image URL (click on image > "Copy Url")
3. In the index, replace the background URL with your new image URL
4. Update the <!--comment--> above the <img> with information on where your image was taken from
5. Note: We are using an Asset Management System which loads all of our images when the project is opened. All images should be added in between the <a-assets> tags. New images will need a new <img> element with an id (name) and src (url).

STEP 3: Add more 3D shapes

1. Find more 3D shapes in the A-Frame reference: https://aframe.io/docs
    → look under the "Primitives" section
2. Add new primitives **in between the <a-scene> tags**, underneath </a-assets>

```
<a-scene>
  <a-assets>
    <!-- ... -->
  </a-assets>

  <!--Put new primitives here-->

  <a-sphere src="#concrete" position=
  <a-plane position="0 0 -4" rotation
  <a-sky src="#background"></a-sky>
</a-scene>
```

3. TIP: Use the sphere as a reference point. Try using the same position as the sphere for new primitives, then change the position values as needed.

```
<a-sphere src="#concrete" position="0 2 -3" radius="0.5" shadow></a-sphere>
<a-box position="0 2 -3"></a-box>
```

STEP 4: Add textures

1. Select a texture image from the "assets" folder, or:
   a. Go to www.flickr.com/groups/freetextures
   b. Find a **texture** to apply to one of your 3D shapes
   c. Upload it to your A-Frame project by selecting "Add asset" > "Computer→" (same as "Step 2")
2. Copy the image URL (click on image > "Copy Url") (same as "Step 2")
3. In the index, replace the 'concrete' URL with your new image URL
4. Update the <!--comment--> above the <img> with information on where your image was taken from.

```
<a-assets>
  <!-- Add images here-->
    <!--Background image by photoguy 2005 from Flickr
    <img id="background" src="https://cdn.glitch.com/
    <!--Concrete texture by Kyden from Flickr-->
    <img id="concrete" src="new-url-goes-here.jpg"/>
</a-assets>
```

5. You may want to update the name, as well - from 'concrete' to whichever word describes your new texture. ***Be sure to update the name in both places**: in the <img> element and the 3D shape you are applying the texture to.
6. If adding textures to new shapes, you will need to add a src to that shape (see example below)

```
        <img id="concrete" src="new-url-goes-here.jpg"/>
    </a-assets>
    <a-sphere src="#concrete" position="0 2 -3" radius="0.5" shadow></a-sphere>
```

ADD-ON: Adding animation

We can use <a-animation> to animate entities within our scene. Nest it within the entity you want to animate (e.g. between the <a-sphere> opening and </a-sphere> closing tag).

```
<a-sphere src="#concrete" position="0 2 -3" radius="0.5" shadow>
    <a-animation attribute="position" to="-1 1.5 -3" direction="alternate"
    dur="2000" repeat="indefinite"></a-animation>
</a-sphere>
```

- **Attribute** specifies which part we are animating (e.g. position, rotation, scale.. even material.color!)
- **To** is the value we are animating it to (e.g. 1 meter higher than the original position)
- **Direction** is the direction of the animation (between from and to)
- **Dur** is how long it takes (in milliseconds)
- **Repeat** is the amount of times this happens

See the Animation page in the a-frame reference for more information:
https://aframe.io/docs/0.8.0/core/animations.html

Finished? Saving and sharing projects

1. Remind learners to rename their project (top left)
2. Have them share the URL that appears in their preview tab with you. This is the link they can use to access their VR experience on any browsers - including on mobile devices, and with Google cardboard / VR Cardboard.