

Overview

Module Title: WebVR Lesson

Activity Title: 3D Project

Image: ----->

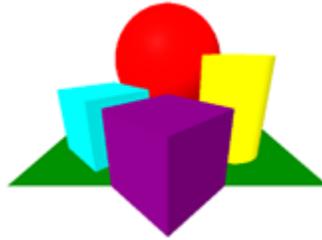


Image credit: Image from www.aframe.io

Made by: Leticia Munoz, Michelle Garcia, Changing Expectations WeTeach_CS Collaborative, & Mozilla

Time: Lesson total time 2 hours and 15 mins; can be over a 3 day span(1st day do the offline activity and then up to step 4 on lesson 1, 2nd day review steps 1-4 and continue with lesson 2 leading to steps 8 and 9, 3rd day finish up lesson 2 and complete lesson 3. If time allows you can spend one full day letting students manipulate the code to change the final look of the project.)

Activities: Target audience: Grades 6-8, very basic as is and not advanced unless you include the coordinate plane after the 3rd lesson. Three separate lessons that develop a scene using HTML for a WebVR goggle set. To make it a more advanced lesson you could include details of how to place the first box in a coordinate plane and changing where it first appears. Then continuing from there building on the coordinate plane concept from Math.

Read | Write | Participate on the Web creating a WebVR scene

The following lesson includes these 21st Century Skills:

- Collaboration
- Communication
- Creativity
- Problem-solving

The following lesson includes these Web Literacy Skills:

- Search
- Synthesize
- Evaluate
- Design
- Code
- Compose
- Revise
- Open Practice
- Contribute
- Share

Academic Content Area Connections: Language Arts, Math, Science

Learning Objectives:

- Create a scene for Web VR using Thimble and A-frame
- Design a shape to add to the scene created above but use a different color
- Design created shape to move within the scene created above

Audience:

- Beginner WebVR user
- Beginner HTML coder

Materials:

- <https://thimble.mozilla.org/en-US/>
 - Computer
-

Preparation

Facilitator should follow these steps

1. Join thimble to create an account.
 2. Go through each step in the lesson to create the product your students will be expected to complete
 3. Access www.aframe.io to see where the code is coming from and other resources available for creating WebVR.
 4. Another website to browse through to get an idea of what WebVR can actually do is: <https://www.blog.google/products/google-vr/come-play-webvr-experiments/> or <https://andykinsella.com/> or <https://aframe.io/blog/awoa-01/> - this will help you with weekly lessons on how to use WebVR
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Equity, Empathy, and Inclusion of Students of Color

Historically there have been inequities within the field of computer science. It is critical to reach our goal of bringing computer science to all students. This can be accomplished by focusing on our minority groups within

your classroom and school. Create an inviting atmosphere for all levels of computing. Include a picture in the advertisement for the class that shows a diverse group of students. Talk up the class to students that you feel are left behind because of assumptions made by others or themselves. You can also use this lesson as the beginning lesson to an evening class for families during our celebratory months throughout the year. An example might be:

MONTH	Ideas for celebrating Diversity
<u>February</u>	African American History Month
<u>March</u>	National National Women’s History Month, Irish-American Heritage Month
<u>April</u>	(create a “HOP on over to coding” evening)
<u>May</u>	Asian Pacific American Heritage, Older Americans Month and Jewish American Heritage Month
<u>June</u>	Gay Lesbian Pride Month
<u>July</u>	American Heritage celebrate July 4th
<u>August</u>	Back to school
<u>September</u>	National Hispanic-Latino Heritage Month (Sept. 15-Oct. 15)
<u>October</u>	National Disability Employment Awareness Month and National Italian American Heritage Month
<u>November</u>	National American Indian Heritage Month
<u>December</u>	“Burrow into coding”

We will use this lesson to provide basic steps to write code that will design a scene for a Virtual Reality tool. It will introduce students to tools that are readily available online to help with writing code. It will open doors to the untraditional computer science student.

All students can succeed in computer science when given the right support and opportunities, regardless of prior knowledge or privilege. This lesson provides clear step by step instructions on how to create a scene for WebVR. The steps provide the pathway to help eliminate stereotypes of who should be writing code or is able to write code to create scenes on the web. Participants can take these lessons and add to it through other resources online. (aframe.io)

As students work through the day's lessons be sure to use any opportunity to sincerely encourage first steps. This can also take the form of writing out a word of encouragement by mentioning a "CS career" on their assignments that are turned in. This type of boost costs no money and can be quick and sweet but will stick with a student that is struggling to help pave the road past frustrations of the first days of coding. Much like Gloria Townsend mentions in her personal approach to using encouragement in the National Center for Women & Information Technology brochure with the title of the article: "One Professor's Approach to Broadening Participation in Computing (Case Study 3) *Increasing Persistence in Computing Through Encouragement*"

Encouraging participation in CS groups or classes is paramount to increasing a student's success in a career in the future that can open new horizons to their families. Most students have a cell phone and this is an avenue that could be developed to meet the needs of students who do not have a personal computer or internet connections at home. A report commissioned by Google through Gallup indicates of the hispanic student population polled over 72% use a cellphone or tablet daily and over 81% of Black students polled use a cellphone or table daily. Referencing this data indicates a need to include in CS development a Cell Phone or Tablet avenue to develop their expertise in coding or other CS genres. Perhaps they could read an article, study vocabulary or even look up code examples to accomplish tasks they are working on in the classroom to bring back to class with them the next class period.

Most shocking are the numbers generated in a US Census Bureau study of Employment in STEM occupations in 2011 of Civilians aged 25-64. This study shows a large discrepancy between the total amount of STEM employees and the individual demographic groups. Out of 7 million employed in a STEM occupation only 6.4% are Black Americans, 6.5% Hispanic Americans and 26% of those employed in a STEM occupation are women. These numbers show a gap that needs to be mended in a way that opens the doors to students without the background of STEM occupations in their family. Being aware of the gaps as you develop classes will help build a presence of the underrepresented groups opening doors to families that have not been opened before.

Introduction

Have students write on the center of a piece of paper **“COMPUTERS CAN...”** and then have them spend 2 mins writing out on the page what the things are that a computer can do or help the operator complete. Give a few students the opportunity to **share out their ideas** from their paper.

Offline Activity

Welcome students to your class. It is going to open their mind to the world of HTML coding for a WebVR scene. This activity will give students perspective of what we are actually creating online.

1. First select a picture of a box for students to draw on a piece of paper. This picture should be relatively easy to draw and simple enough that it will not take longer than 2 mins to draw. Provide a projected picture to draw.
2. Students should be greeted and seated. Give each student 1 piece of copy paper to complete a copy of the box you selected. They will be getting into groups of 4 after they have drawn the picture.
3. Once this individual process is completed ask students to get into groups of 4. In their group they will select the drawing that will be the easiest to provide depth either by adding to their drawing or creating something to show depth with paper, scissors and glue. Give each group 5 mins to create their box.
4. Have one person from each group share the selected picture from their group with the whole class.
5. Then have a whole class discussion about the variety provided by the drawings. Leading students to the idea that each box was different with each showing the perspective of the person drawing or creating it. This is great but sometimes we need an exact copy and in order to get an exact copy we would need to take a picture of it and print that out for our copy. Just like a Science experiment. If I want to get the exact same results I am going to have to do the experiment exactly as it was performed to get the same results. But a Science experiment could also have a human element in it that might make the data not match. Now what if you could get an exact copy of the picture in a project you were creating? This can only be done by providing a code to your brain to duplicate an exact copy of the give picture. If the shape I wanted you to duplicate exactly looks like this:



Then I would give you this code for the box:

```
<html>
<head>
  <script src="https://aframe.io/releases/0.5.0/aframe.min.js"></script>
</head>
<body>
  <a-scene>
    <a-box position="-1 0.5 -3" rotation="0 45 0" color="aqua"></a-box>
  </a-scene>
</body>
</html>
```

If you were a computer you would provide an exact duplicate of that picture. We would continue adding input to produce the complete visual given and you would be able to duplicate it exactly. (stop here if there aren't any computers available for each student or you could print out the full lesson and see if they can make suggestions for you, the facilitator, to complete on your computer. This is how we can use computers at a most basic level. As we build on this simple shape today we will be learning HTML code and how simple it really is to create shapes from words through the computer.

Online Activity

Step 1: Creating an Account

Go to <https://thimble.mozilla.org> and create an account.

Step 2: Changing the Title

Changing the title: `<title>Made with Thimble</title>` to the following `<title>My3DProject</title>`

Step 3: Changing the Heading

Now change the heading of your project by using the following `<h1>Welcome to Thimble</h1>`

Example: `<h1>3D Fun</h1>`

Step 4: Adding a Blue box

Go to line 12 and erase the line

Make something `amazing` with the web!

Go to line 13 copy and paste the following code.

```
<script
src="https://aframe.io/releases/0.5.0/aframe.min.js"></script>
<body>
  <a-scene>
    <a-box position="-1 0.5 -3" rotation="0 45 0" color="aqua"></a-
box>
  </a-scene>
</body>
```



This code will add a blue box shape

CHECKING YOUR PROGRESS

Your code should resemble the following:

```
<!DOCTYPE html>
<html>
  <head>
    <meta charset="utf-8">
    <meta name="viewport" content="width=device-width, initial-scale=1">
    <title>Made with Thimble</title>
    <link rel="stylesheet" href="style.css">
  </head>
  <body>
    <h1>Welcome to Thimble</h1>
    <p>
      <script src="https://aframe.io/releases/0.5.0/aframe.min.js"></script>
      <body>
        <a-scene>
          <a-box position="-1 0.5 -3" rotation="0 45 0" color="aqua"></a-box>
        </a-scene>
      </body>
    </p>
  </body>
</html>
```

Step 5: Adding a Red Sphere

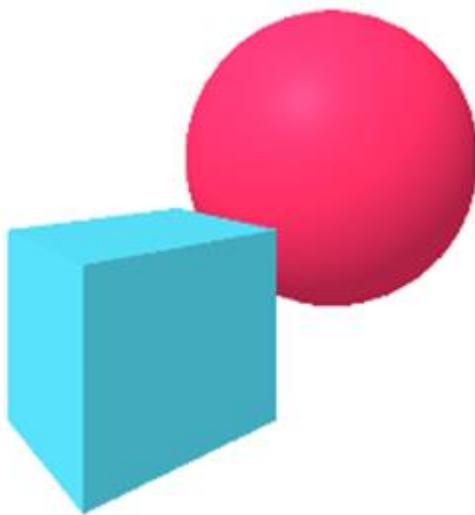
To add a sphere copy and paste following code into your HTML editor on line 16.

```
<a-sphere position="0 1.25 -5" radius="1.25" color="red"></a-sphere>
```

This code should add a red sphere to your 3d picture.

The code should be pasted **after the code you used for the blue box** on line 15.

```
<a-box position="-1 0.5 -3" rotation="0 45 0" color="aqua"></a-box> and before the <a/-scene>
```



CHECKING YOUR PROGRESS

Your code should resemble the following:

Your HTML coding progress so far should look like the box below.

```
!DOCTYPE html>
<html>
<head>
  <meta charset="utf-8">
  <meta name="viewport" content="width=device-width, initial-scale=1">
  <title>Made with Thimble</title>
  <link rel="stylesheet" href="style.css">
</head>
<body>
  <h1>Welcome to Thimble</h1>
  <p>
    <script src="https://aframe.io/releases/0.5.0/aframe.min.js"></script>
    <body>
      <a-scene>
        <a-box position="-1 0.5 -3" rotation="0 45 0" color="aqua"></a-box>
        <a-sphere position="0 1.25 -5" radius="1.25" color="red"></a-sphere>
      </a-scene>
    </body>
  </p>
</body>
</html>
```

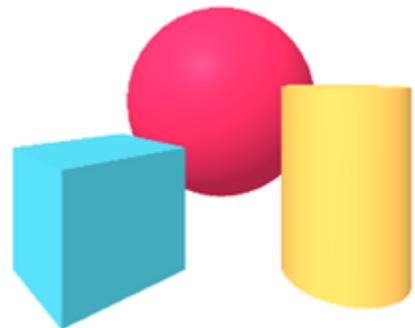
Step 6: Adding a Yellow Cylinder

To add a cylinder copy and paste following code into your HTML editor on line 17

```
<a-cylinder position="1 0.75 -3" radius="0.5" height="1.5" color="yellow"></a-cylinder>
```

The code should be pasted **after the code you used for the red sphere** `<a-sphere position="0 1.25 -5" radius="1.25" color="red"></a-sphere>` and before the `<a/-scene>`

This code should add a yellow cylinder to your 3d picture



CHECKING YOUR PROGRESS

Your code should resemble the following:

Your HTML coding progress so far should look like the box below.

```
<!DOCTYPE html>
<html>
  <head>
    <meta charset="utf-8">
    <meta name="viewport" content="width=device-width, initial-scale=1">
    <title>Made with Thimble</title>
    <link rel="stylesheet" href="style.css">
  </head>
  <body>
    <h1>Welcome to Thimble</h1>
    <p>
      <script src="https://aframe.io/releases/0.5.0/aframe.min.js"></script>
      <body>
        <a-scene>
          <a-box position="-1 0.5 -3" rotation="0 45 0" color="aqua"></a-box>
          <a-sphere position="0 1.25 -5" radius="1.25" color="red"></a-sphere>
          <a-cylinder position="1 0.75 -3" radius="0.5" height="1.5" color="yellow"></a-cylinder>

        </a-scene>
      </body>
    </p>
  </body>
</html>
```

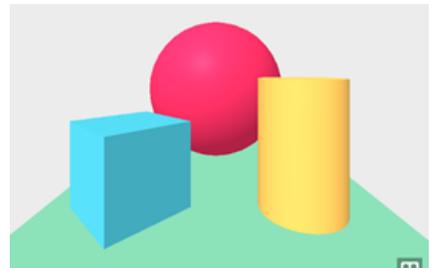
Step 7: Adding a Green Plane (floor)

To add a plane to the bottom of your shapes, copy and paste following code into your HTML editor on line 18.

```
<a-plane position="0 0 -4" rotation="-90 0 0" width="5.5" height="6" color="green"></a-plane>
```

The code should be pasted **after the code you used for the red sphere** `<a-sphere position="0 1.25 -5" radius="1.25" color="red"></a-sphere>` and before the `<a/-scene>`

This code should add a green plane (floor) to your 3d picture.



CHECKING YOUR PROGRESS

Your code should resemble the following:

Your HTML coding progress so far should look like the box below.

```
<!DOCTYPE html>
<html>
  <head>
    <meta charset="utf-8">
    <meta name="viewport" content="width=device-width, initial-scale=1">
    <title>Made with Thimble</title>
    <link rel="stylesheet" href="style.css">
  </head>
  <body>
    <h1>Welcome to Thimble</h1>
    <p>
      <script src="https://aframe.io/releases/0.5.0/aframe.min.js"></script>
      <body>
        <a-scene>
          <a-box position="-1 0.5 -3" rotation="0 45 0" color="aqua"></a-box>
          <a-sphere position="0 1.25 -5" radius="1.25" color="red"></a-sphere>
          <a-cylinder position="1 0.75 -3" radius="0.5" height="1.5" color="yellow"></a-cylinder>
          <a-plane position="0 0 -4" rotation="-90 0 0" width="5.5" height="6" color="green"></a-plane>

        </a-scene>
      </body>
    </p>
  </body>
</html>
```

Second Lesson

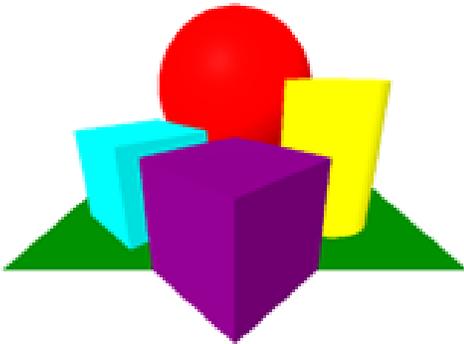
Step 8: Adding a Purple Cube

Add another cube to your design by copying and pasting the following code into your editor on line 19

```
<a-entity id="box" position="0 .5 -2" rotation="0 45 0" width="8" height="5" geometry="primitive: box" material="color: purple"></a-entity>
```

The code should be pasted **after the code you used for the green plane (floor)** `<a-plane position="0 0 -4" rotation="-90 0 0" width="4" height="4" color="green"></a-plane>` and before the `<a/-scene>`

This code will add a purple cube shape



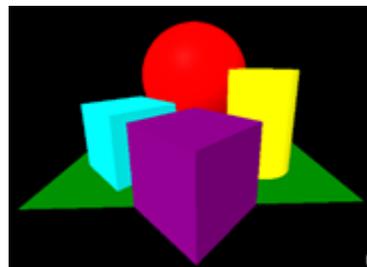
Step 9: Adding a Black Background

To add a background copy and paste the following code into your HTML editor on line 20.

```
<a-sky color="black"></a-sky>
```

The code should be pasted below the code that you used for the purple cube `<a-entity id="box" position="0 .5 -2" rotation="0 45 0" width="8" height="5" geometry="primitive: box" material="color: purple"></a-entity>` and before the `<a/-scene>`

This code should add a black background to your 3d image



Step 9a: Changing colors of the

shapes

This lesson we will be going back into the current code and changing the color of the shapes. All you need to do is go into the code that is in Thimble and change the color of the shapes. Play around with the colors and manipulate each shape.

Here is the code you will change:

```
<a-box position="-1 0.5 -3" rotation="0 45 0" color="aqua"></a-box>  
<a-sphere position="0 1.25 -5" radius="1.25" color="red"></a-sphere>  
<a-cylinder position="1 0.75 -3" radius="0.5" height="1.5" color="yellow"></a-cylinder>  
<a-plane position="0 0 -4" rotation="-90 0 0" width="5.5" height="6" color="green"></a-plane>  
<a-entity id="box" position="0 .5 -2" rotation="0 45 0" width="8" height="5"  
geometry="primitive: box" material="color: purple">
```

What if you changed the position? What about the width? What about the height? What happens when you manipulate the rotation? What will happen if you change the shape name? example: "sphere" to "cylinder"

LESSON THREE

Step 10: Adding animation to the Purple Cube

To make the purple cube move copy and paste the following code into your editor on line 19. The

code should be pasted after the code you used for purple cube `<a-entity id="box" position="0 .5 -2" rotation="0 45 0" width="8" height="5" geometry="primitive: box" material="color: purple">` and before the `</a-entity>` at the end of the purple cubes code.

```
<a-animation attribute="position" to="0 2.2 -5" direction="alternate" dur="2000" repeat="indefinite"></a-animation>
```

This code will animate the purple cube and cause it to move back and forth

Try making other shapes move. Congrats, you have completed the first three lessons to learn how to create a WebVR scene. Next lessons we will work with the WebVR goggles.

Here is what the final code should look like before you made changes to the color and shapes:

```
<!DOCTYPE html>
<html>
<head>
  <meta charset="utf-8">
  <meta name="viewport" content="width=device-width, initial-scale=1">
  <title>My 3D project</title>
  <link rel="stylesheet" href="style.css">
</head>
<body>
  <html>
    <head>
      <script src="https://aframe.io/releases/0.5.0/aframe.min.js"></script>
    </head>
    <body>
      <a-scene>
        <a-box position="-1 0.5 -3" rotation="0 45 0" color="aqua"></a-box>
        <a-sphere position="0 1.25 -5" radius="1.25" color="red"></a-sphere>
        <a-cylinder position="1 0.75 -3" radius="0.5" height="1.5" color="yellow"></a-cylinder>
        <a-plane position="0 0 -4" rotation="-90 0 0" width="5.5" height="6" color="green"></a-plane>
        <a-entity id="box" position="0 .5 -2" rotation="0 45 0" width="8" height="5" geometry="primitive: box"
material="color: purple">
          <a-animation attribute="position" to="0 2.2 -5" direction="alternate" dur="2000" repeat="indefinite"></a-animation>
        </a-entity>
        <a-sky color="black"></a-sky>
      </a-scene>
    </body>
  </html>
```

END OF THREE LESSONS

Reflection

5 minutes

Finally, facilitate a brief, reflective discussion about the day's learning using prompts like these - or make your own!

- In your own words, can you describe how today's WebVR worked?
- How did our human machines activity connect to our Thimble project?
- How would you describe working with HTML code?
- What other examples of HTML would you like to try?
- How would the activity have been different if you had to start from scratch instead of following the steps provided?
- What surprised or frustrated you about the activity or about HTML?
- What else do you wonder about HTML?
- How would you improve this lesson?

You can record learners' responses for the purpose of assessment, as well, but be sure to do so in a way that doesn't disadvantage those who struggle with composing in any particular medium. For example, be ready to record spoken answers, as well as to read typed or written responses.