Experiential Design Integrated Project Proposal

Presented By:

OrangeCaramel

2023

Table of Contents

Section 1 - Introduction

Project Background

The goal of this project is to create an education-related XR World that encourages real-time interactivity, replayability, progression system with a great user experience. From there, we narrowed it down to a Virtual Reality (VR) math game, specially catered towards young children.

This is how we came up with Elle's Wonderland - a Mathematics carnival, where players can play games and uncover various fun facts there, all while putting their Math abilities to the test.

Design Rationale
Color Scheme

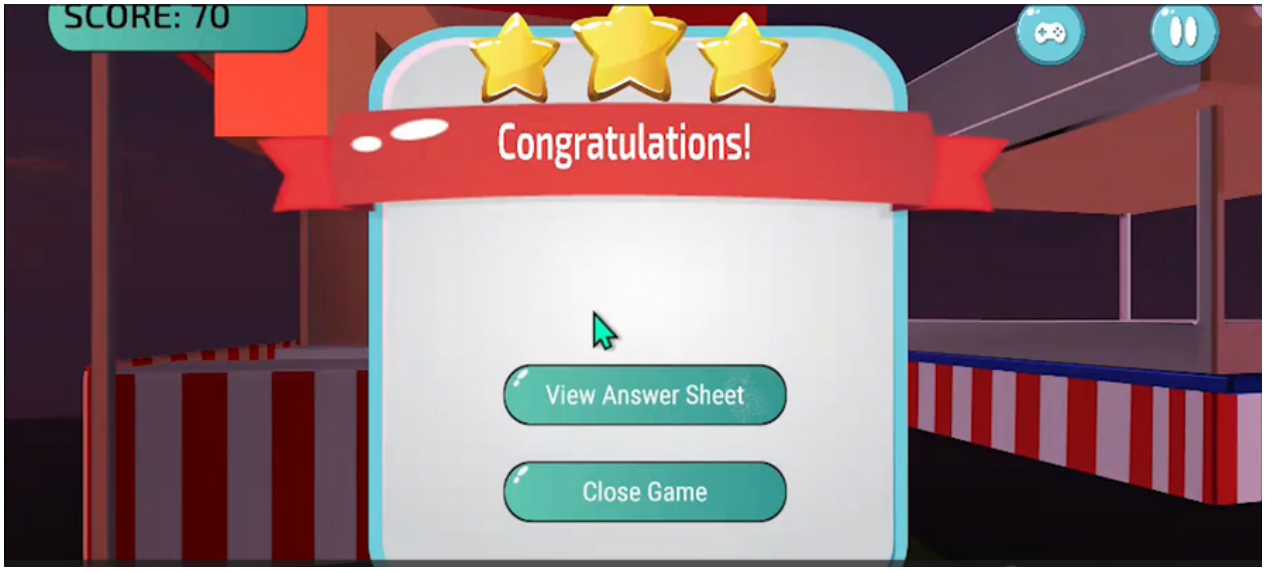
How color affects children

What a typical carnival looks like

Research have shown that children tend to prefer bright colors as such saturated colors are easier for them to see. Hence, to entice them, we decided to incorporate bright and cheerful colors.

Since carnivals are typically brightly colored, having a XR world that resembles the real world offers the players an even more immersive experience.

On the other hand, when children are exposed to bright colors for an extended period of time, it can be overstimulating. Therefore, we sought to strike a balance, by having the most of the UIs in a cool and calming color - blue.



An example of the game UI

Design Rationale

Fonts

Examples of easy to read fonts

The rule of thumb we stuck with when selecting the font to use was to make sure it is easy to read. Examples of such fonts would be - Helvetica and Roboto.
While we were not able to find the exact fonts in Unity and Maya, we ensured that all our UI content and 3D model texts were clear.
The only exception is the title of the game in the login UI, where a font called carnival-like font was used.

Only the game name use a fancy font

High Concept

Elle's Wonderland transports the player to a carnival where they are free to play the games and uncover the fun facts there, all while putting their math abilities to the test. They can refer to the instruction manual and video demonstrations if neccessary.

Goals & Objectives

Introduce VR to Children

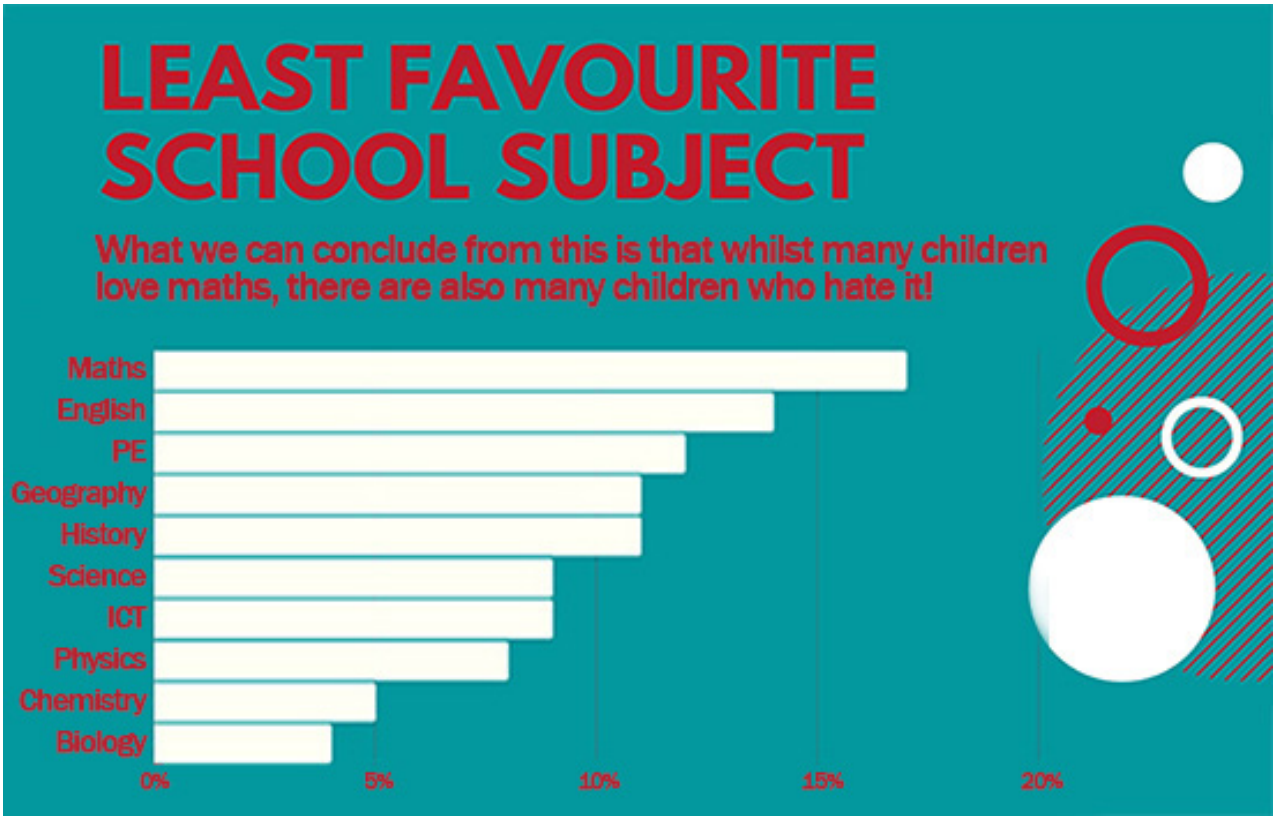
VR is a rapidly growing technology that allows users to interact and explore a virtual environment in a manner that is similar to reality. Integrating such technology into education can help children to increase memory power and knowledge retention, improve understanding of complex, conceptual subjects as well as build emotional intelligence, and communication skills.

Essentially, there are plenty of soft skills that can be developed through this piece of technology.

Make learning math fun

Studies have shown that children's least favorite subject is Math (EducationQuizzes, 2020)

Given that there are plenty of benefits when it comes to integrating VR into education, we want to utilize it to create an immersive and engaging experience that revolves around Math in hopes of changing children's perception of the subject and eventually, coming to like the subject more.



Children's least favorite school subject

Target Audience

Our target audience is children aged 8 to 12 years old.

Target Platform

Our target platform is Meta Quest 2

Unique Selling Points

- Introductory to VR, specially catered towards children
  - Easy to learn and play
- Friendly to those who are not tech savvy
  - Plenty of UI that will guide you along the way
- Play at your own pace
  - It is not about speed. Enjoy the games.
- Stunning set design

Section 2 - Game Design Document

Game Overview

Title: Elle's Wonderland
Platform: Windows PC + Meta Quest 2
Rating: 8+
Target: Children (aging from 8 -12)
Release date: February 2023
Publisher: OrangeCaramel

Elle's Wonderland is a first-person Virtual Reality (VR) Mathematics game where the player is free to explore the entire environment. They can play the different games available and uncover various fun facts there, all while putting their Math abilities to the test.

Platform Minimum Requirements

To be able to run Meta Quest 2:

- Processor: Intel i5-4590/AMD Ryzen 5 1500X or greater
- Graphics card: GeForce Nvidia 9 series and above (see exceptions here)
- Memory: 8GB or more of RAM
- Operating system: Windows 10
- USB ports: 1x USB port

To set up a Meta Quest 2 headset:

- Must install the Android Build Module
  - allow Unity to communicate with the headset
- The Oculus App
  - allow players to control Quest 2 headset through the desktop and, it acts as the middleman between the headset and Unity
- Oculus Integration package
  - needs to be imported into the Unity Project so that Unity can communicate with the headset

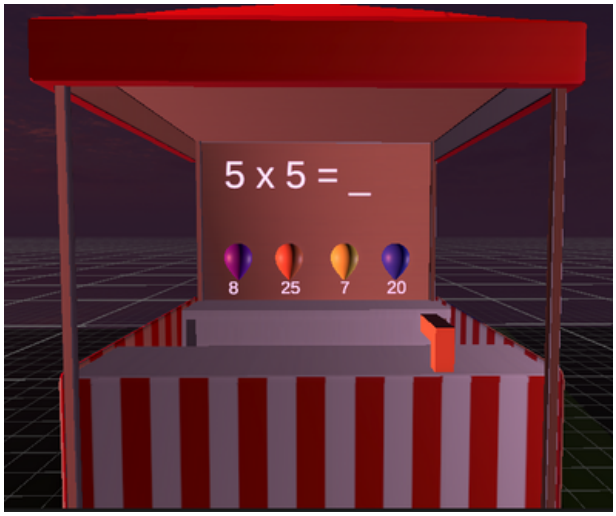
Synopsis

Having been magically transported to Elle's Wonderland, you have to navigate your way through this exciting carnival - play games, uncover different fun facts about Math, all while putting your Math abilities to the test. Enjoy your time here!

Game Rules

To unlock the game booths, players will have to pick up the corresponding tickets from the guided versions booth. Then, place it on the table of the actual game.

The Basketball Toss Game



The Balloon Pop Game

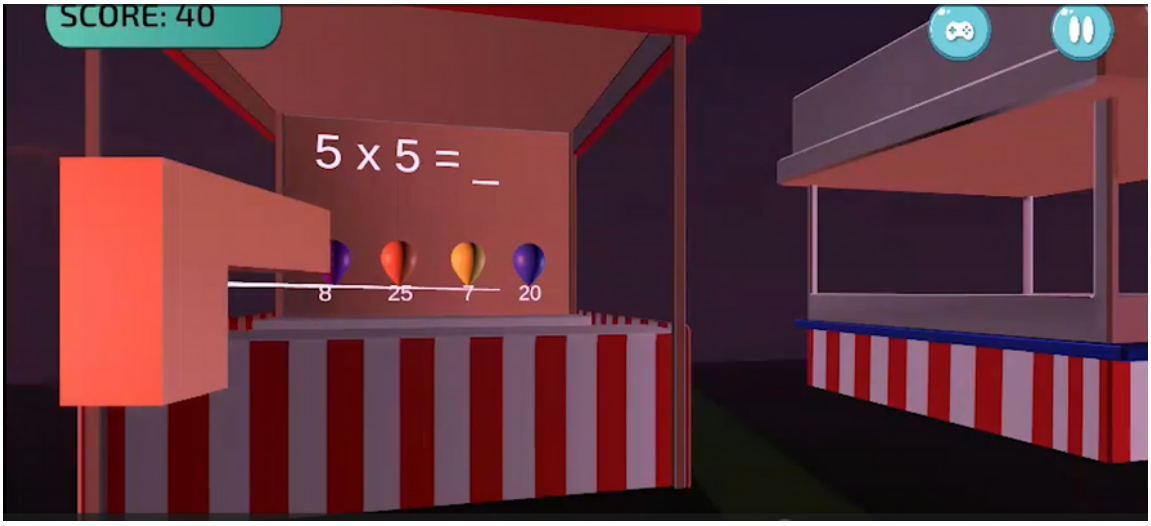
Games Rules

For Basketball Toss

Players have to grab their desired ball using their right hand, and slowly move it forward until it snaps to the socket interactor

For Balloon Pop

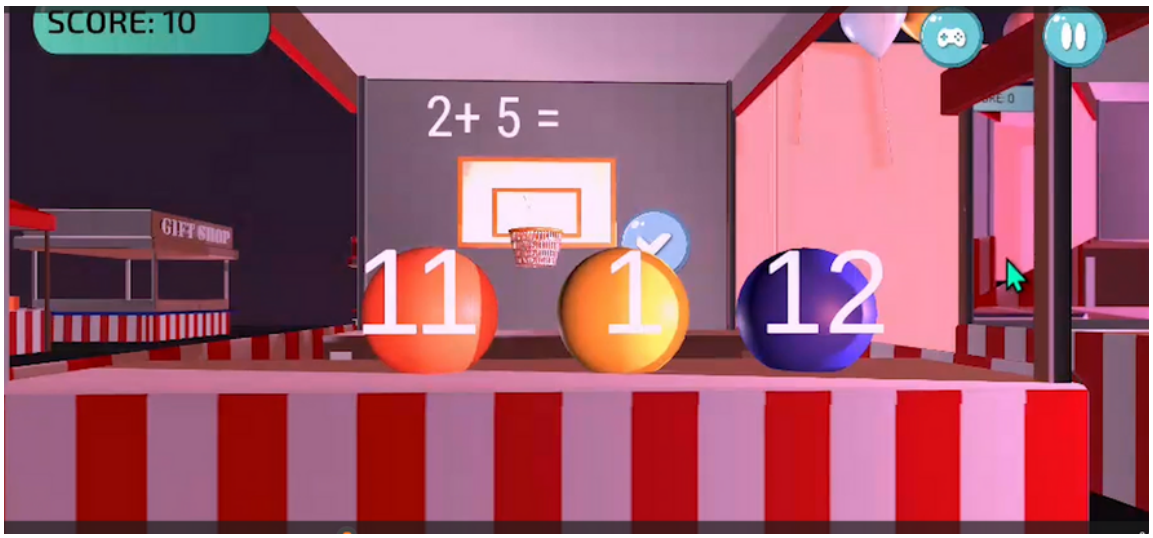
Players will have to grab the gun, then aim it at their desired balloon, then press on trigger to fire the bullet.



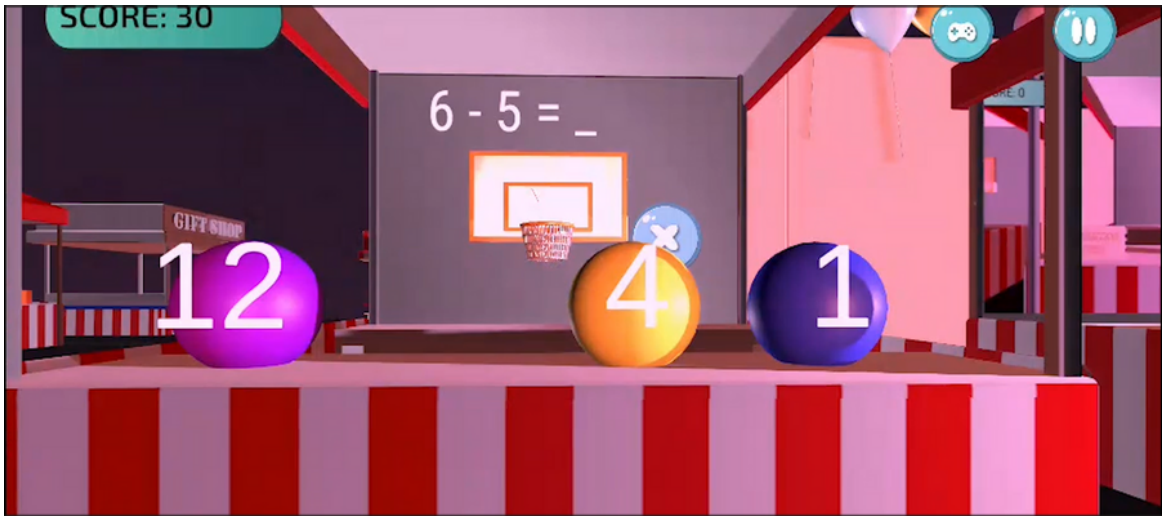
Games Rules

Scoring

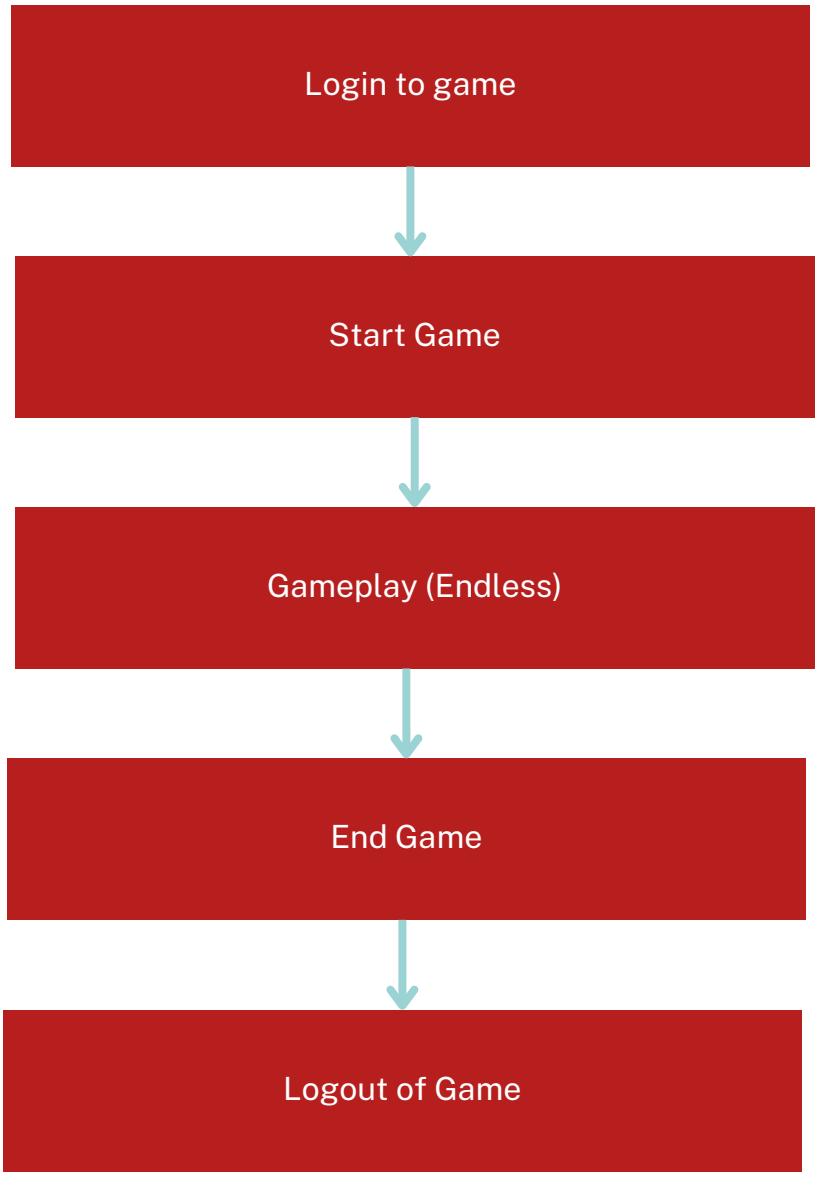
For every equation answered correctly, players earn 10 points



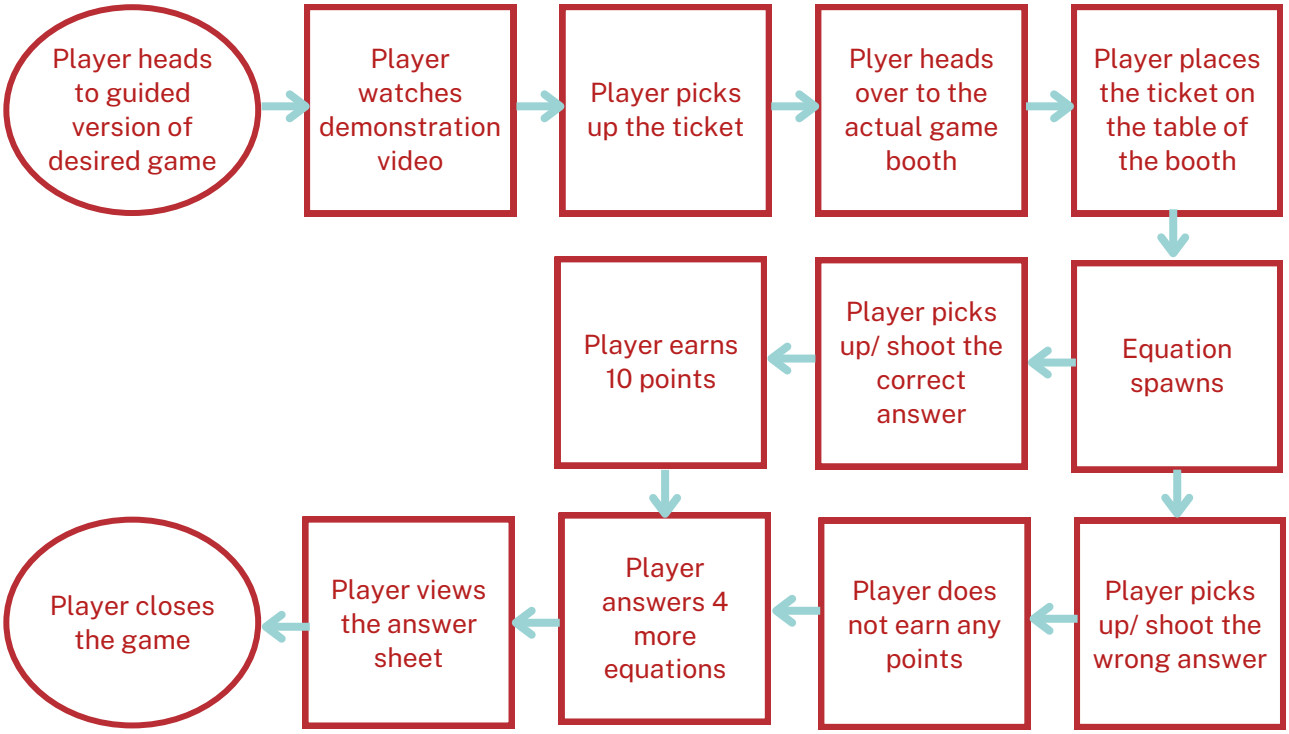
For every equation answered wrongly, no points will be added



Game Structure

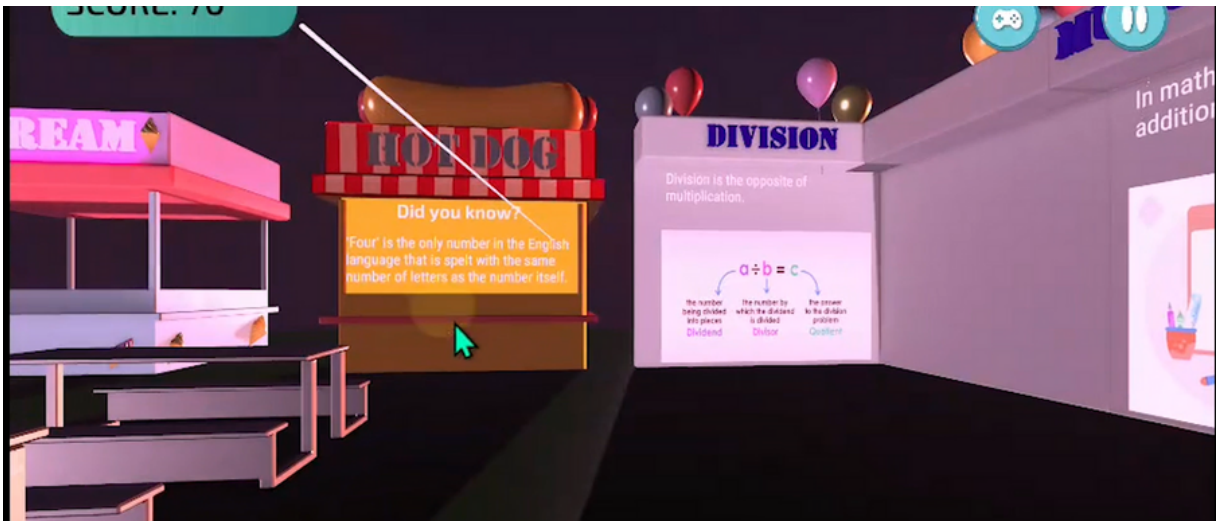


Core Gameplay Loop

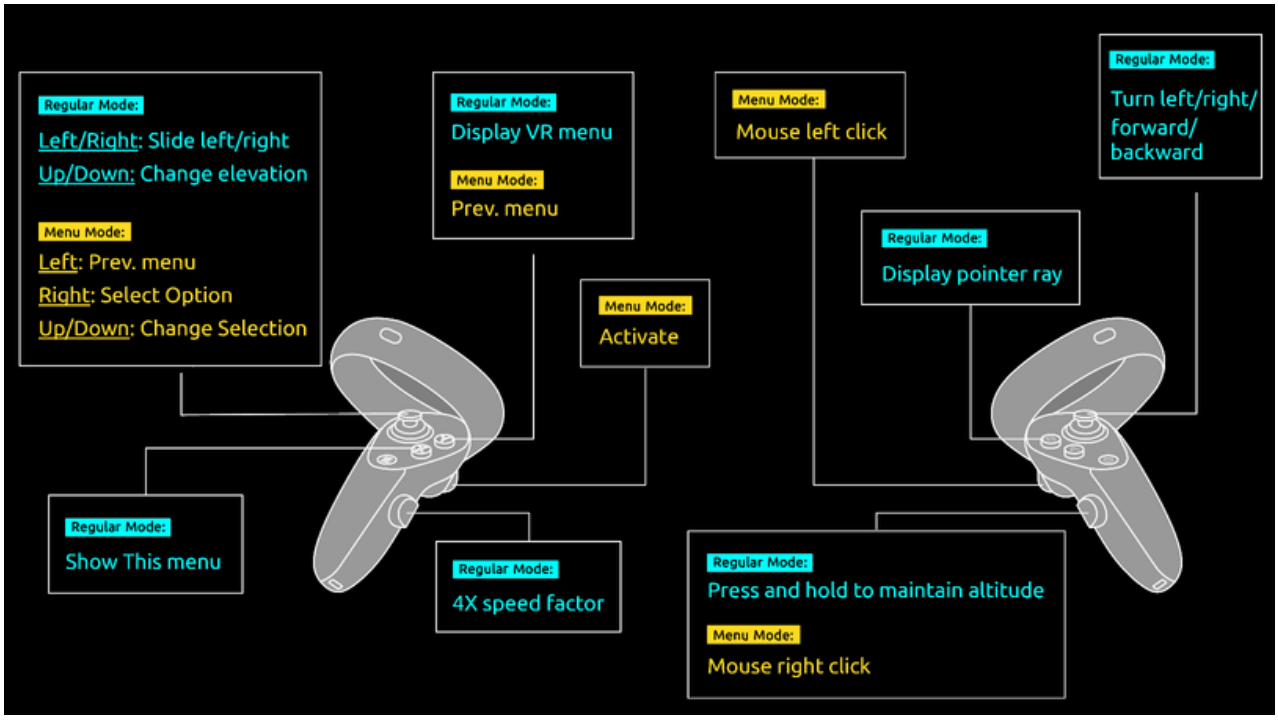


This is the core game loop for the the basketball toss and balloon pop game. If players wish to, they can also view the summary on each operator before playing the games.

Additionally, they can also view some Math fun facts by hovering the right hand over food stalls, the gift shop and Ferris wheel.



Game Controls



Oculus Quest 2 Controls

For Oculus Quest 2

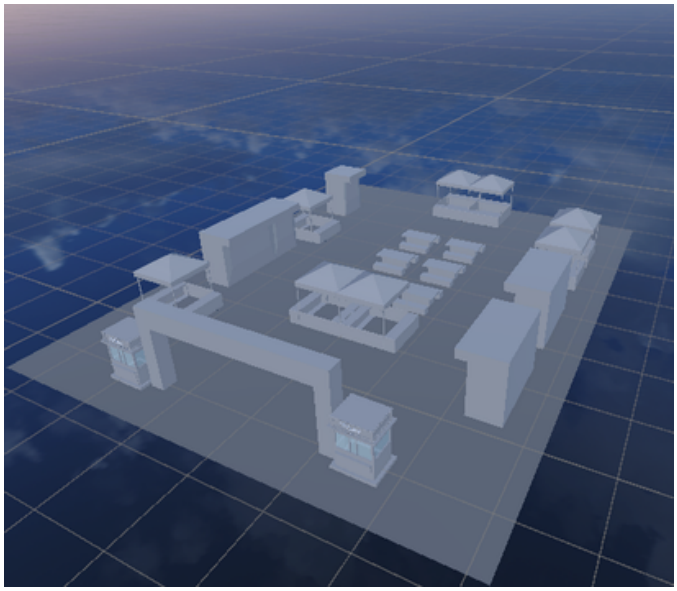
- Trigger, A, and X buttons: Press to select things.
- B and Y: Press to go back to the previous screen or menu.
- Oculus button: Press to go back to Oculus Home or press and hold to reset your controller orientation.
- Grip button: Press to grab objects or make a fist when using your virtual hands.
- Menu button: Press the menu button from Oculus Home to bring up the menu.
- Any button will wake up the controller after you turn on your headset

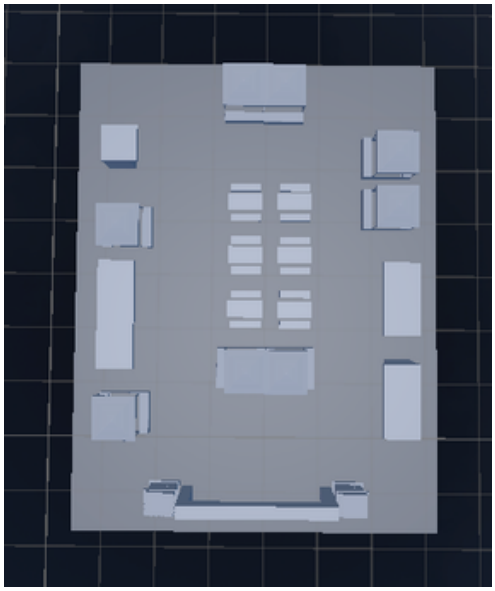
Note : It is recommended to use the left hand to pick up the ticket from the game stalls because it snaps to the hand better. If you were to use the right hand, the ticket will not snap to the hand nicely and will consequently move all over the place when you move around.

Player
Weapon

This is the gun for the balloon pop game.
Players have to grab this gun, aim and shoot at their desired balloon.

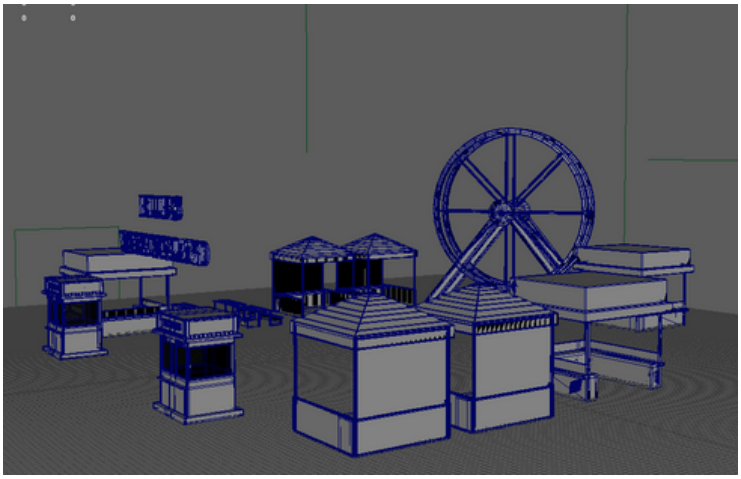
Level Design & Setting

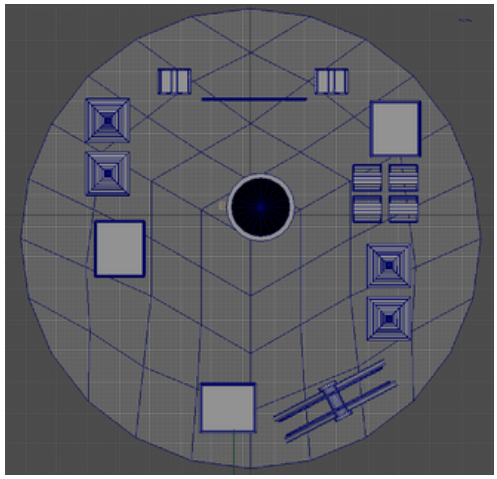




Initial whiteboxing done in Unity

At first, we intended to have the game stalls laid out in a simple rectangular manner. However, we soon realized that this was too basic and does not enhance the user's experience in any way.
To tackle this issue, we tried out other layouts - such as placing the game stalls in a circle and having an information counter at the heart of the carnival.

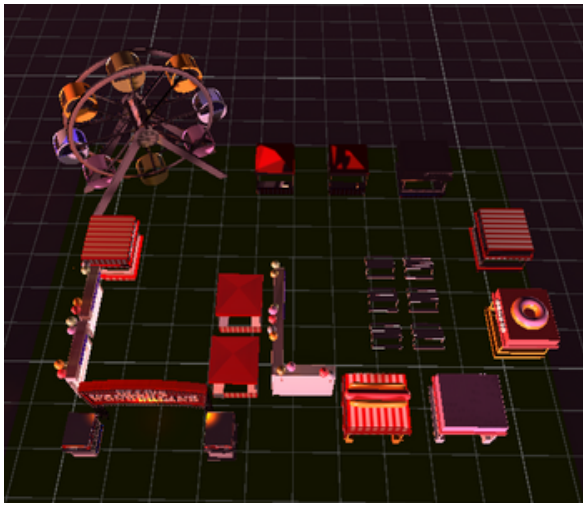


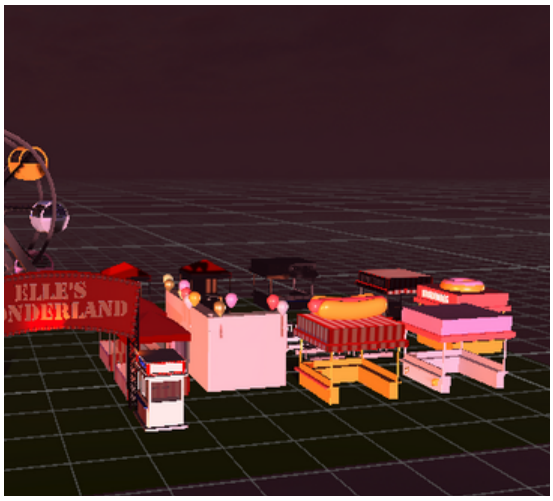


Alternate version of whiteboxing done in Maya

While this layout does look more interesting and carnival-like, we did not proceed with it because it too, lacks a sense of direction and progression.

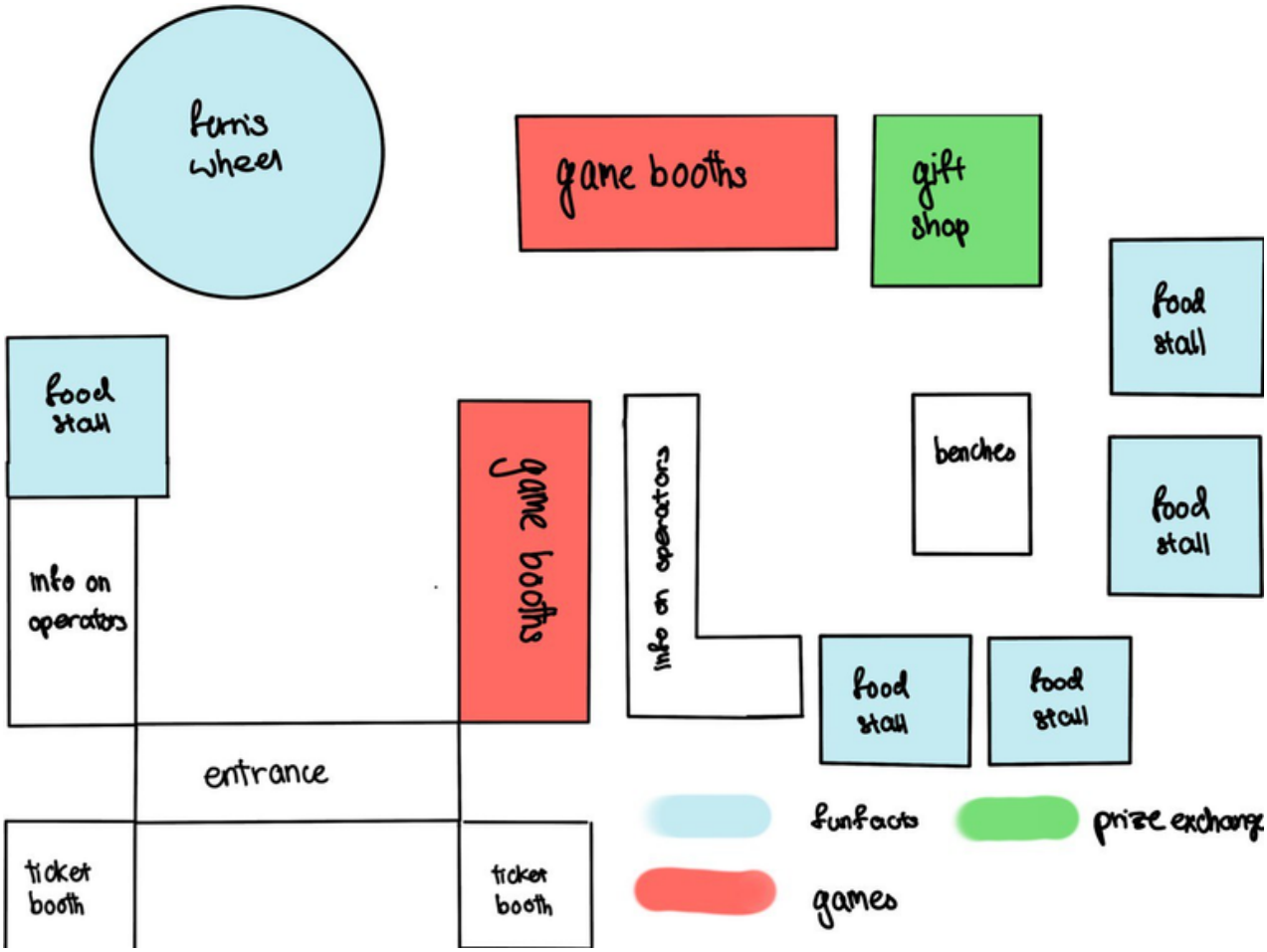
Level Design & Setting





Final layout in Unity

Rough Map



MVP (Minimum Viable Product)

- Limited number of games
- Built for Meta Quest 2

Wishlist

Randomized equations

Currently, the equations for the game stalls are fixed. Thus, after a while, players may feel that the game is rather repetitive.

In the future, if possible, we would like to have randomized equations so players will not end up memorizing the answers. It will also make the games more challenging, encouraging players to actively apply their Math knowledge.

Increase the number of game stalls

Due to the lack of manpower and time constraint, there are only 2 playable game stalls.

If given the opportunity to further expand on this game, we would like for there to be more games

More prizes

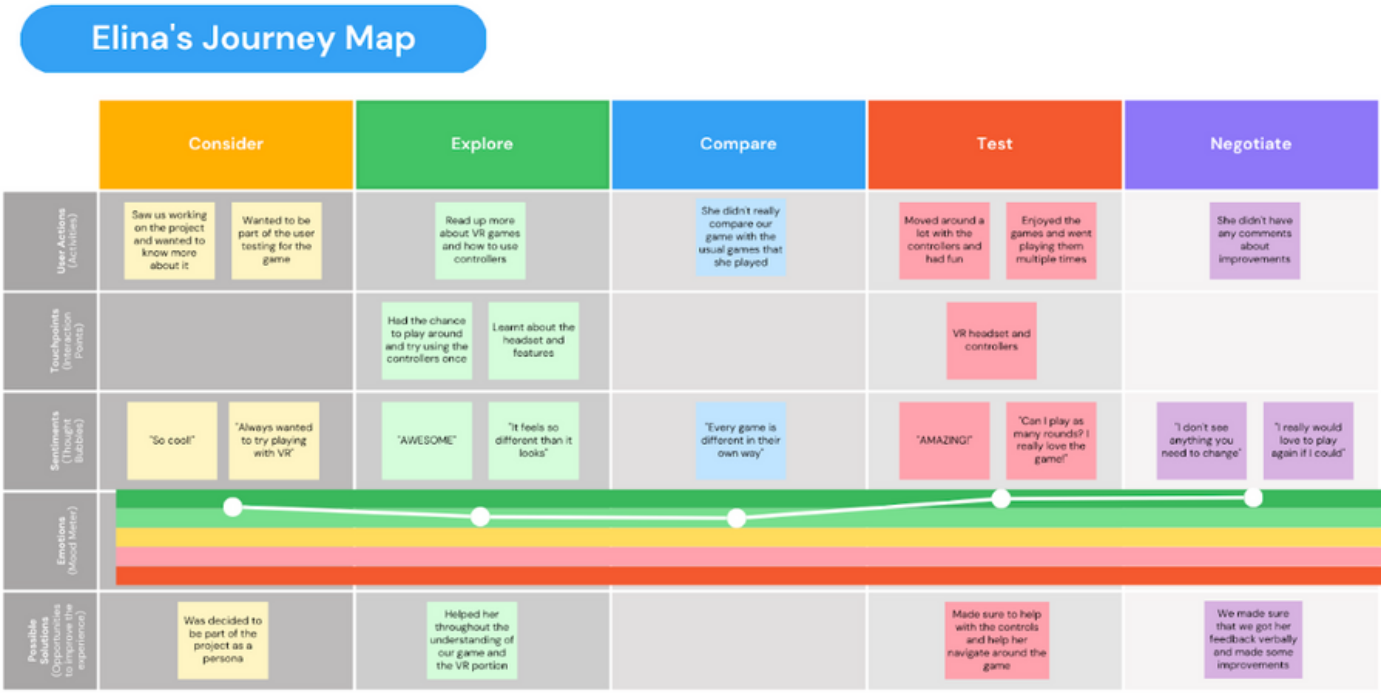
Due to the lack of manpower and time constraint, there is only 1 prize you can exchange for at the end of each game.

It would be good if there were more prizes for players to choose from.

Section 3 - UX Documentation

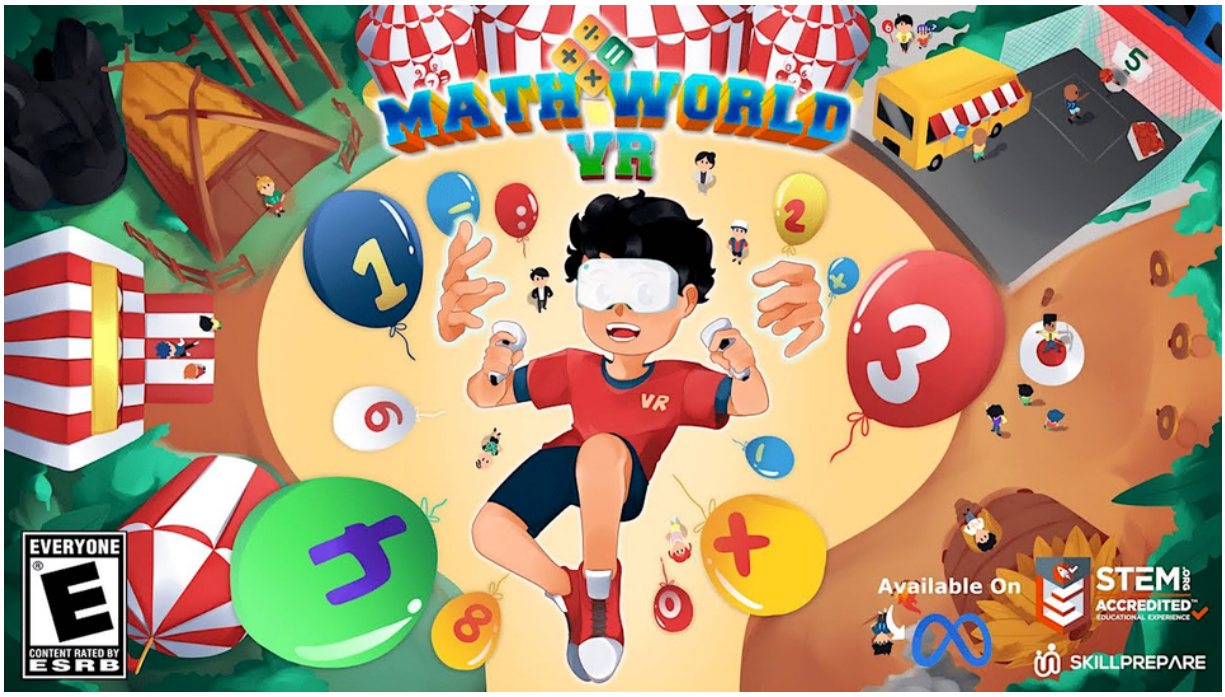
User Persona

User Journey



Competitive Analysis

Direct competitor



Math World VR

Math World VR is an educational math game that requires players to use simple math to complete the 8 mini games available.

Devices Supported:

- Meta Quest
- Pico

Competitive Analysis

Indirect Competitor

Carnival Games VR

Carnival Games VR is a themed carnival alley where players can earn tickets through playing games and use them to exchange for exciting prizes or unlock other games.

Devices Supported:

- HTC VIVE
- PlayStation VR
- Oculus Rift

Competitive Analysis

	Math World VR (direct)	Carnival Games VR (indirect)	Elle's Wonderland

Strengths	• 8 mini games available
	  ◦ Game controls are more versatile
	• Disabled player friendly
		• 12 different games available
		• Level design is well done, brings out the carnival theme well
			• Game controls are simple enough for children to understand
			• Friendly to those who are not tech savvy
			  ◦ Instruction manual and video demonstrations are available

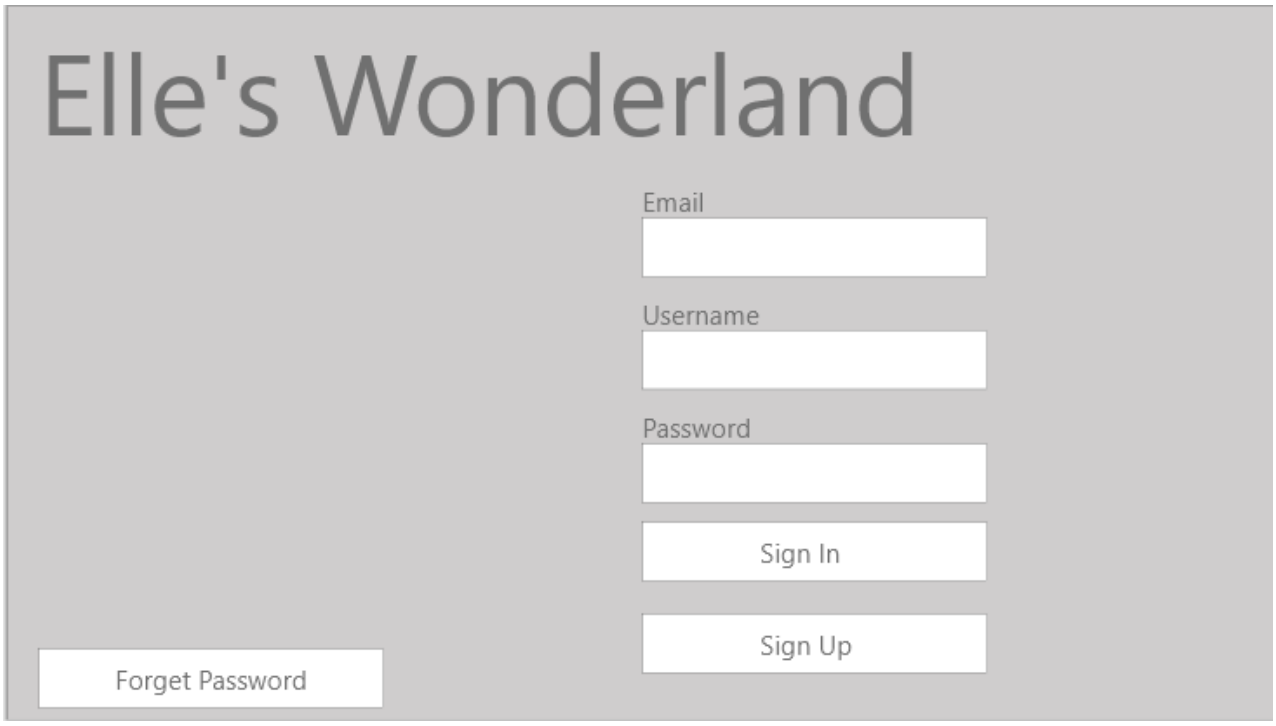
Weaknesses	• Since the game controls are more versatile, children aged 8 -12 may not fully understand how to play each game	• Plenty of control and camera issues that negatively affect the overall gameplay • No inclusive designs	• Only 2 game stalls available

Verdict

Although Elle's Wonderland does not have as many games and fancy controls as the other 2 competitors, it offers a more holistic experience for children because it incorporates aspects of learning and piquing children's interest in Math.

Low-Fidelity Wireframes

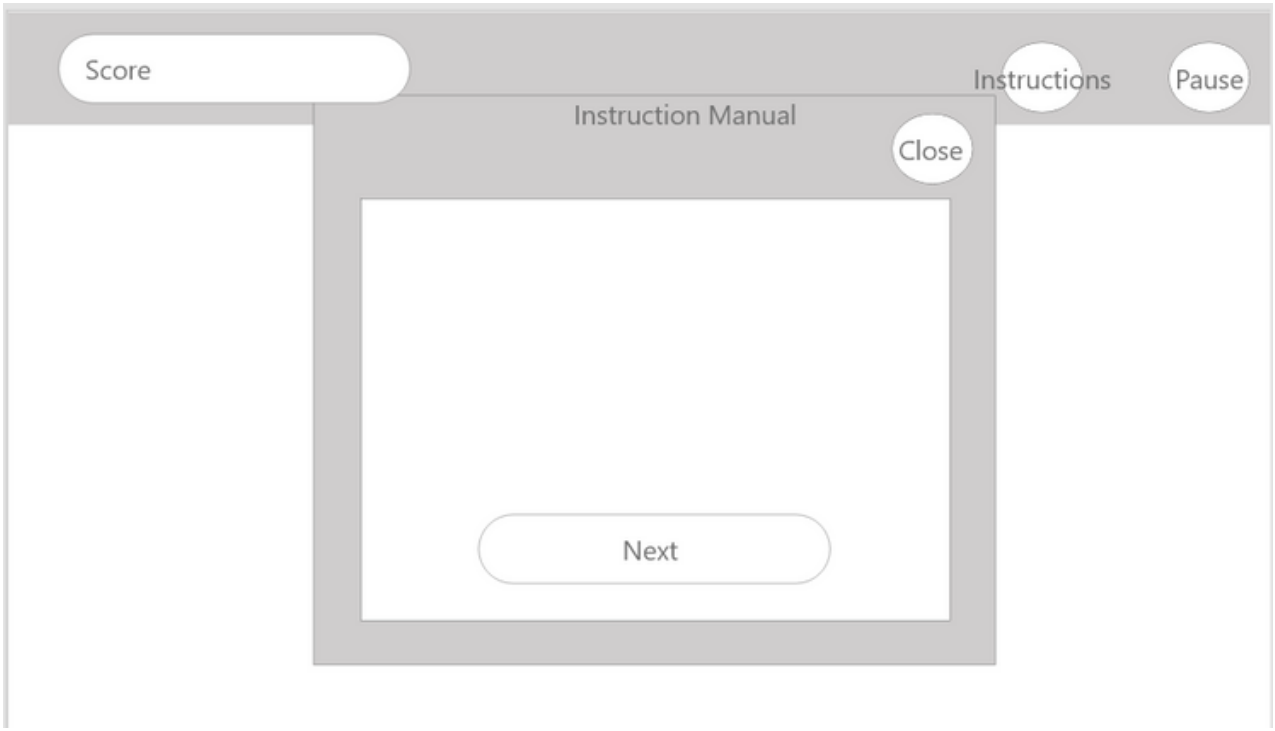
Login Page



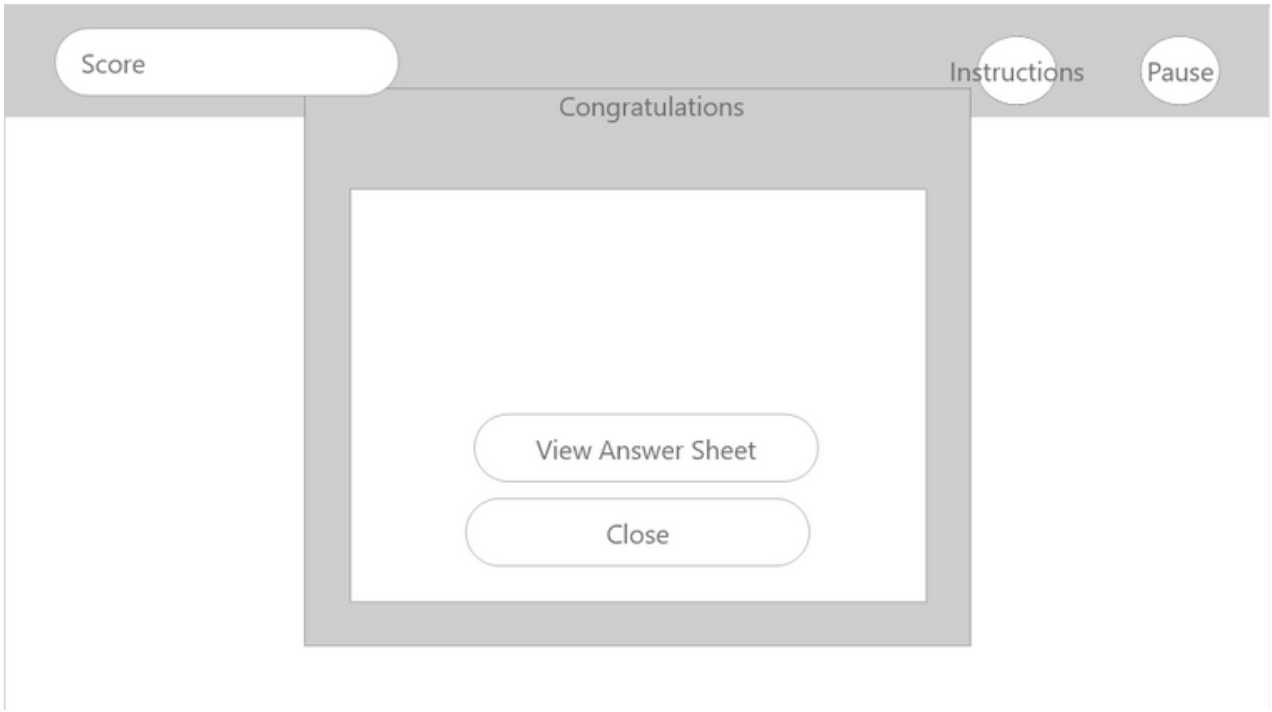
UI that show when the player is playing the game

Low-Fidelity Wireframes

Instruction Manual

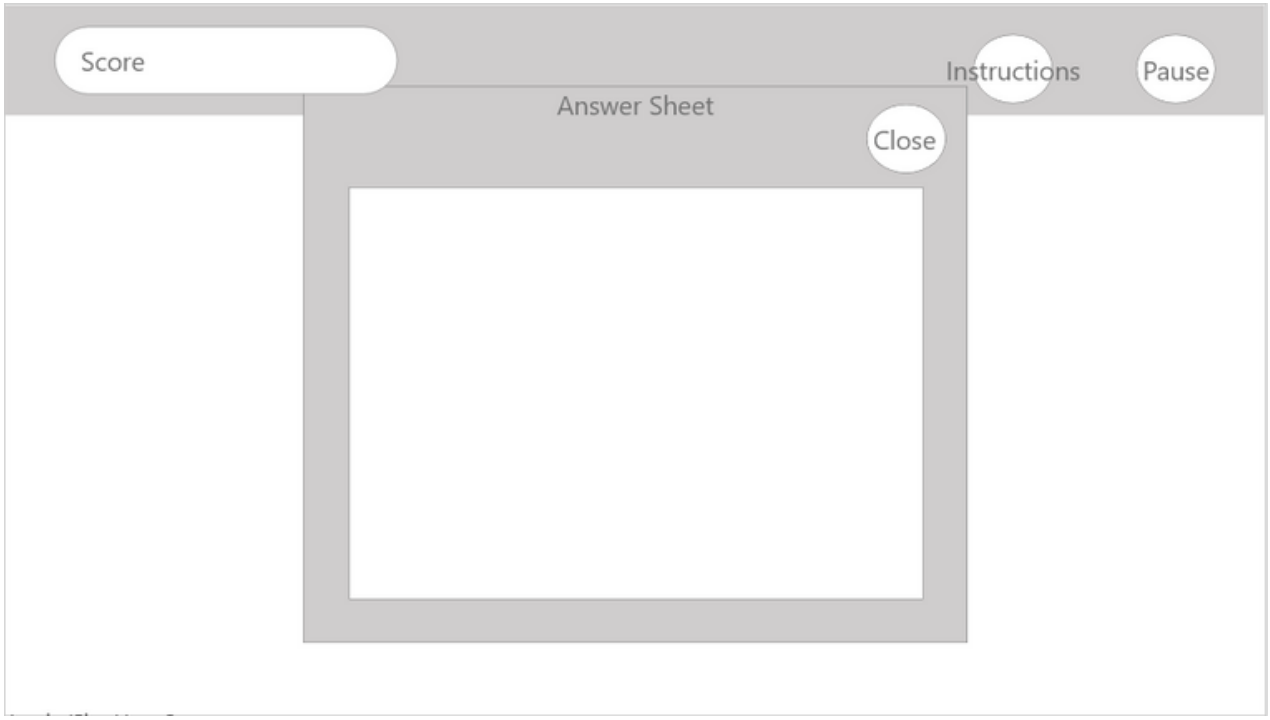


Congratulations UI that shows after player has completed a game

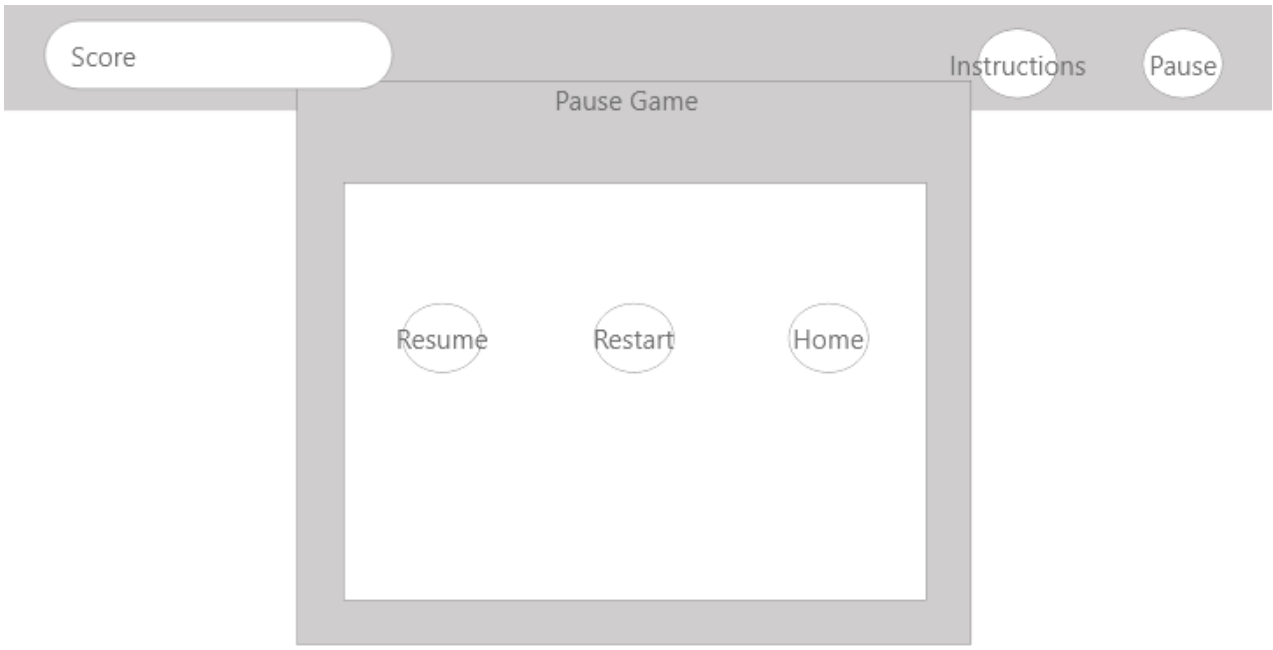


Low-Fidelity Wireframes

Answer Sheet UI

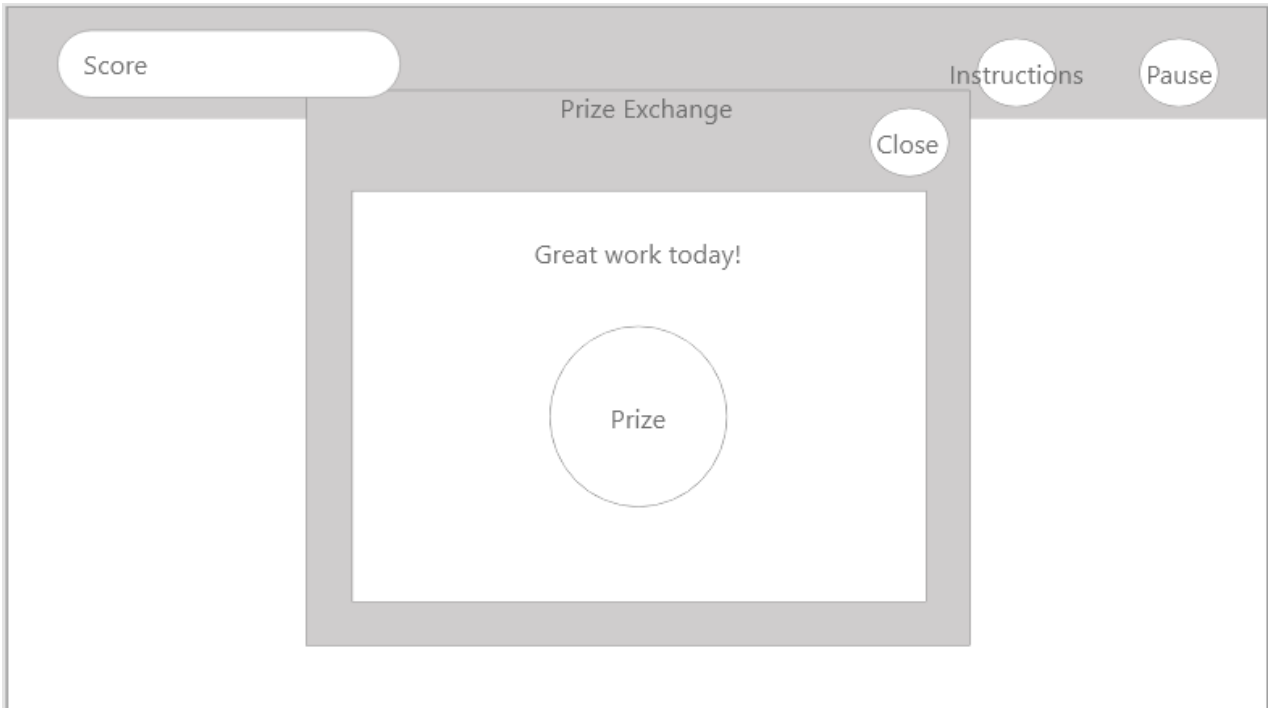


Pause Game UI



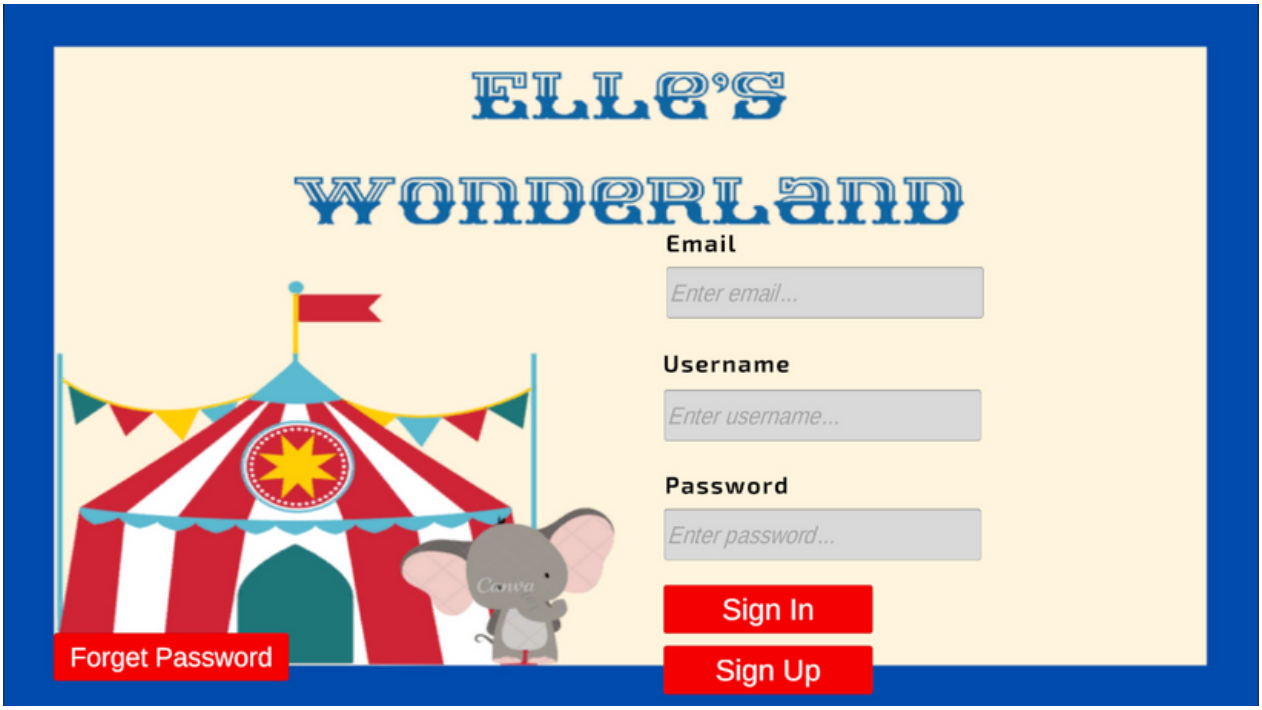
Low-Fidelity Wireframes

Prize Exchange UI



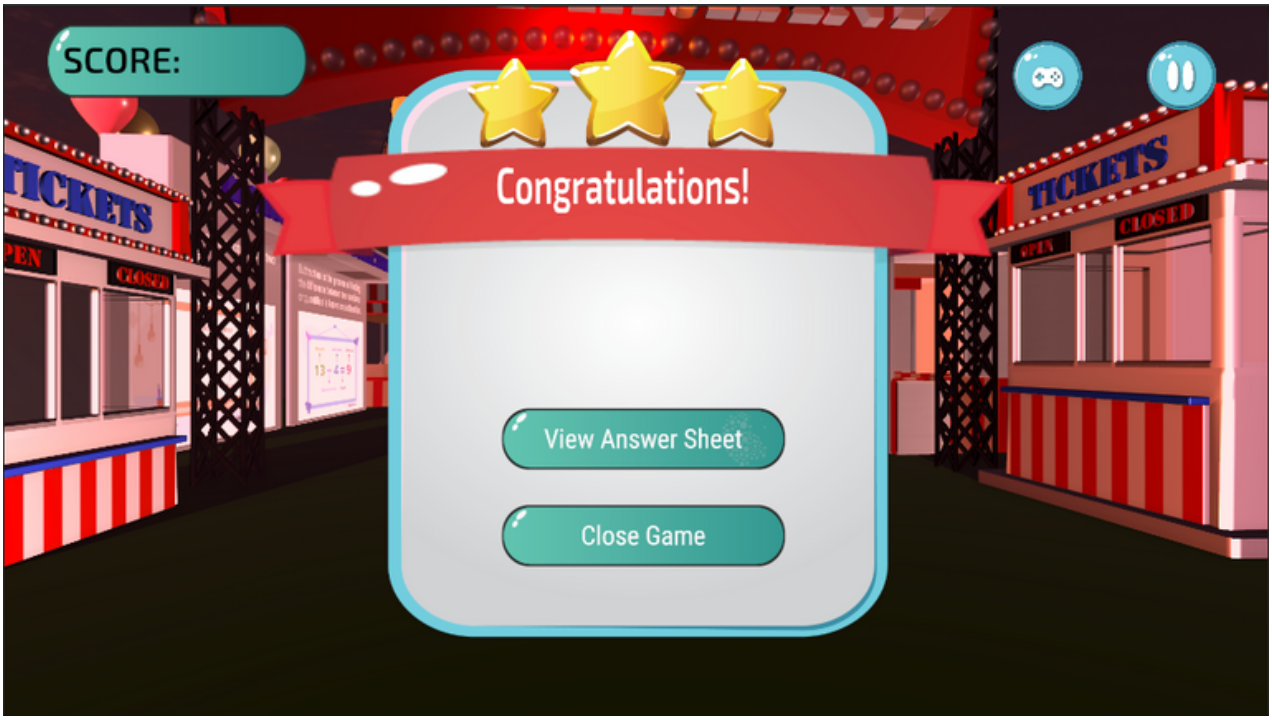
Visuals

Screenshots from actual Unity Prototype



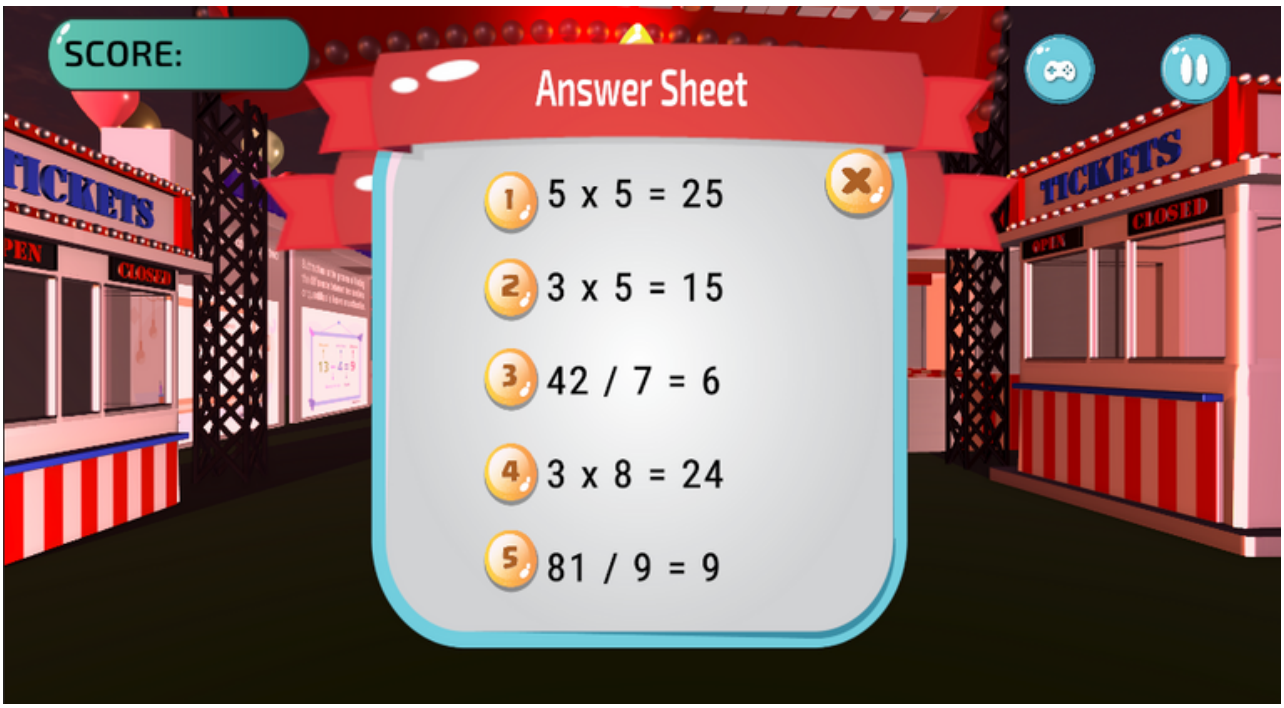
Visuals

Screenshots from actual Unity Prototype



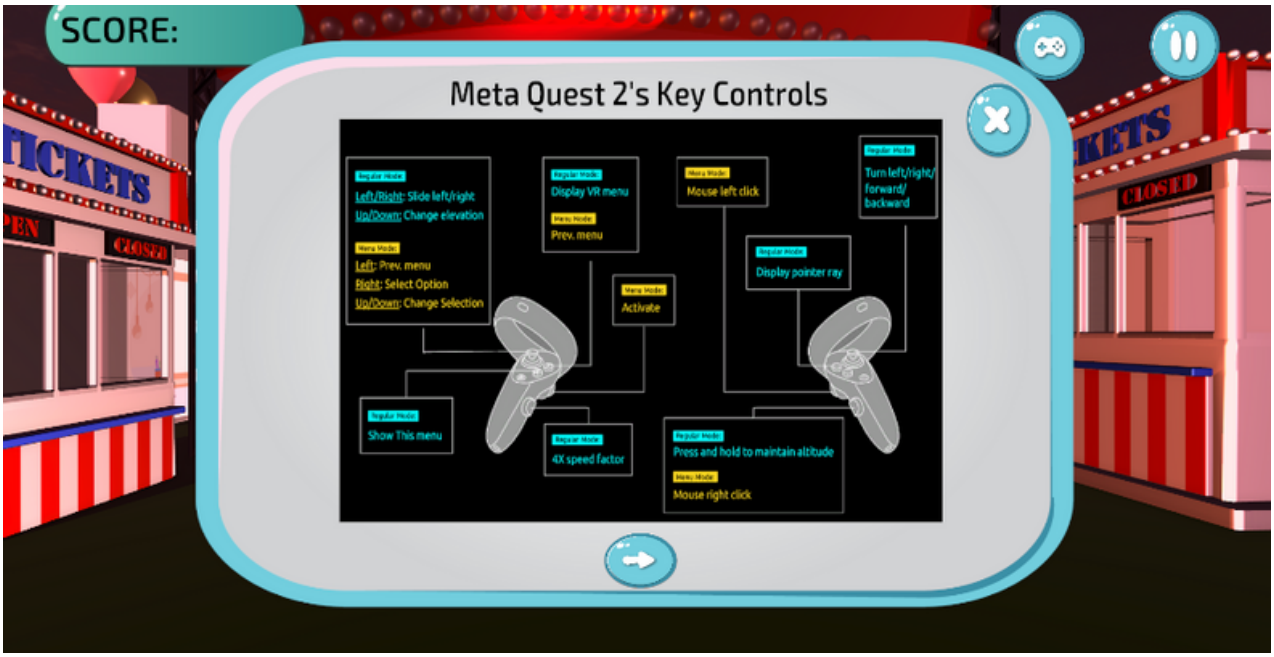
Visuals

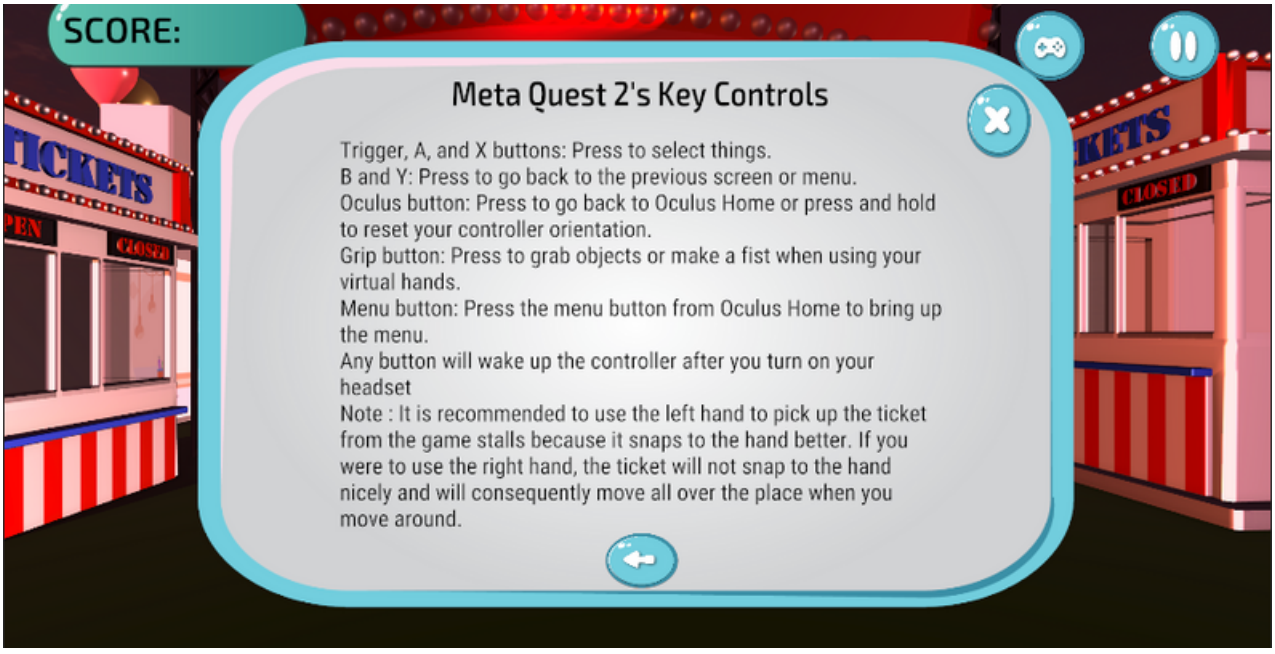
Screenshots from actual Unity Prototype



Visuals

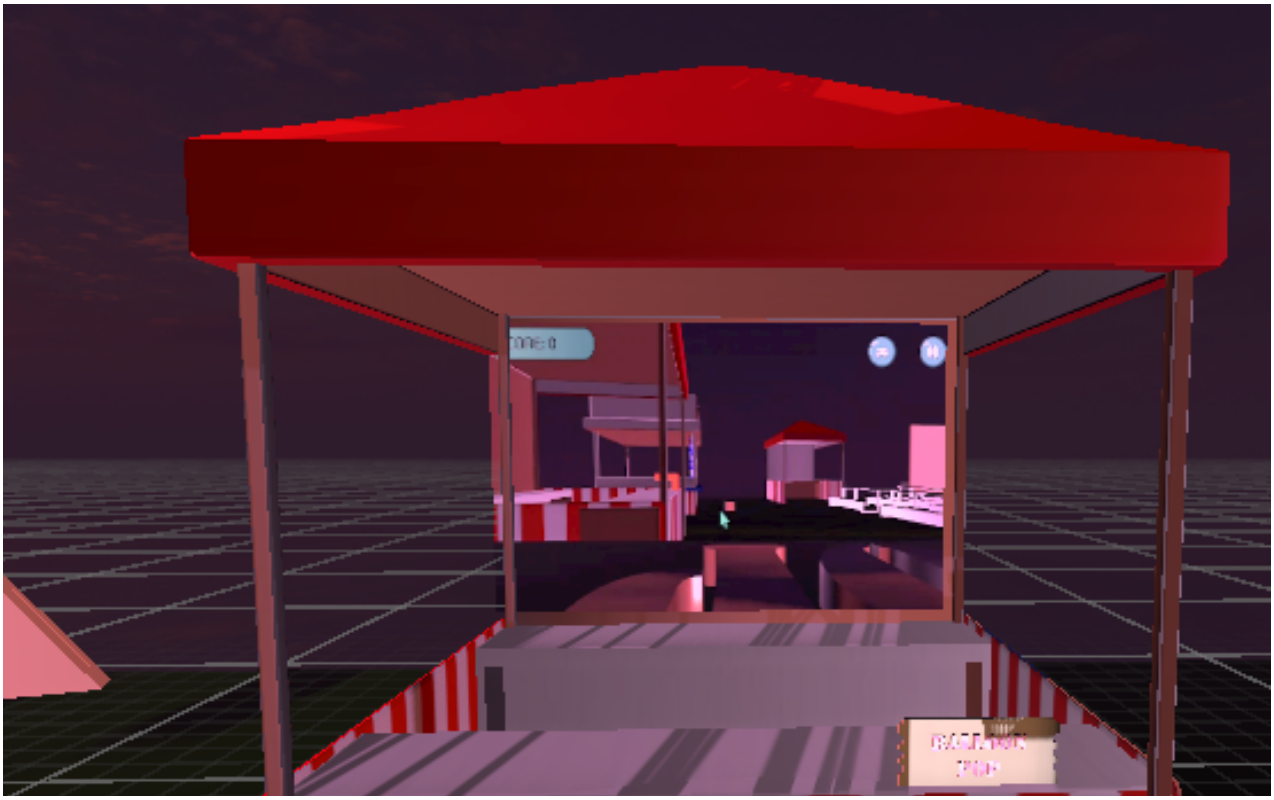
Screenshots from actual Unity Prototype





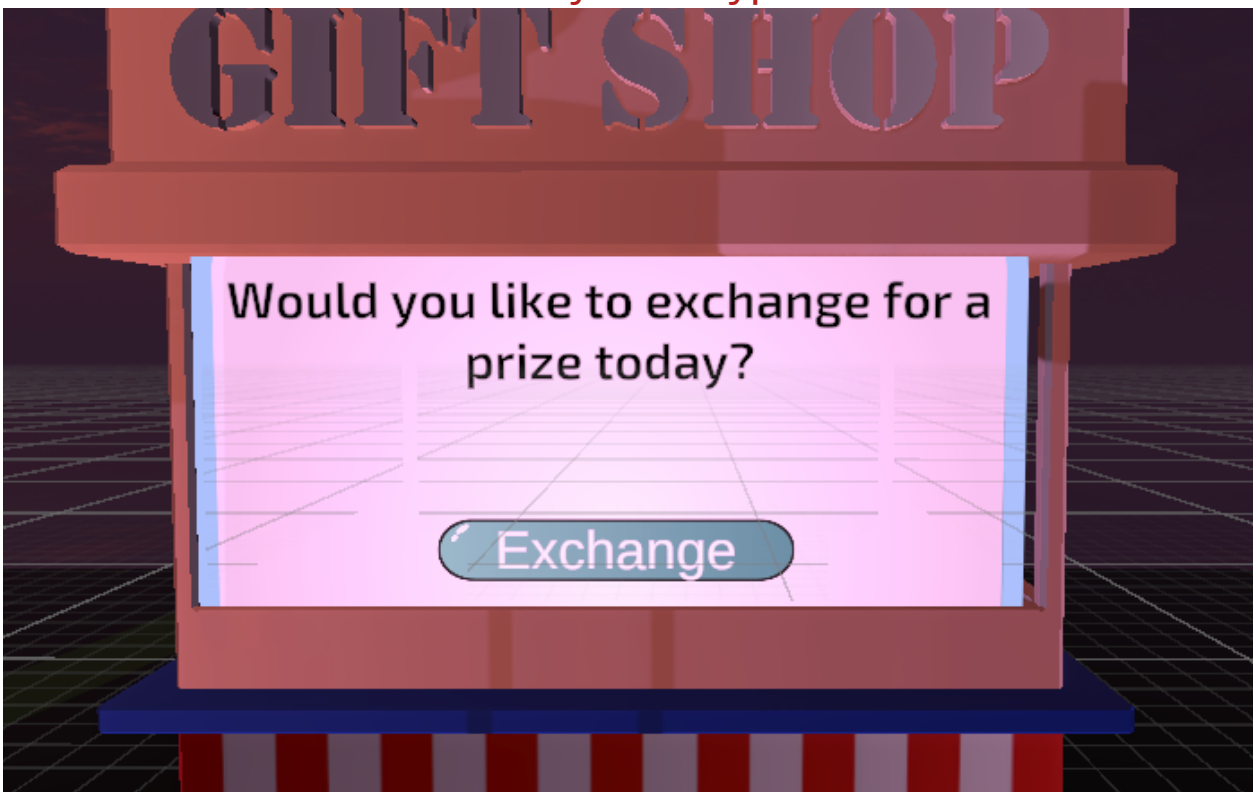
Visuals

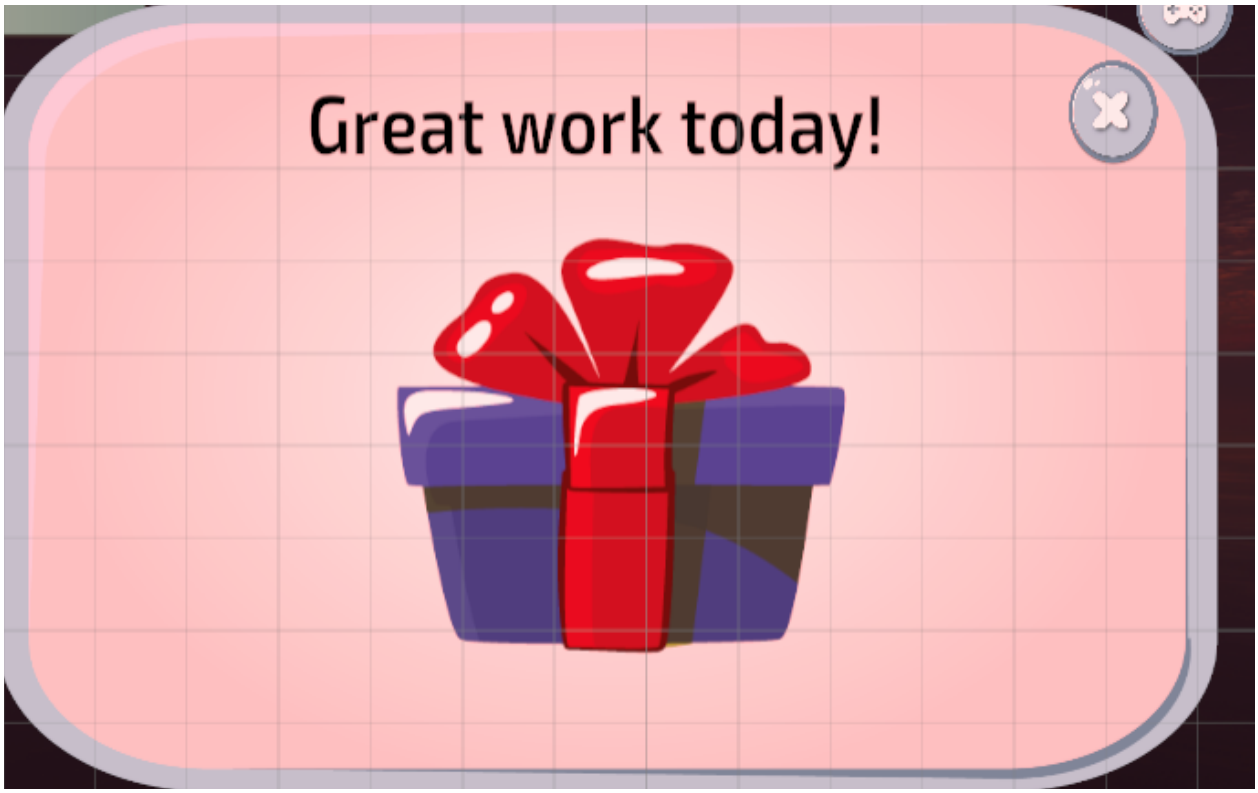
Screenshots from actual Unity Prototype



Visuals

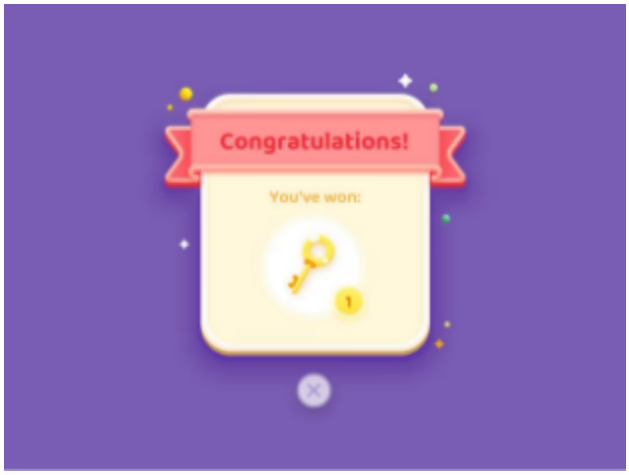
Screenshots from actual Unity Prototype

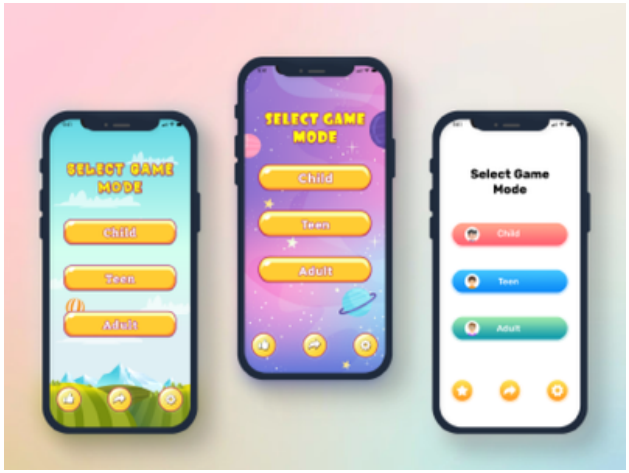




Visuals

Supporting Visuals





Supporting Research

Major points of Consideration for UX when designing a solution on Meta Quest 2

Scale of objects in relation to real-world

In VR, size is based on the distance between the user and a piece of content, so it is crucial to understand the scale of content and appropriate viewing distance. (Marvel App, n.d.)

As such, when designing the UIs and interactable, we have to make sure that the proportions of are correct and players can clearly see the content.

Interaction

We also have to take into account for both left and right hand dominant users. For example, most of the interactions require users to use the right hand controller. This will not be an issue for most as the vast majority of the world's population are right-handers.

On Hardware

For a smooth and enjoyable user experience, we have to be aware of the limitations of the Meta Quest 2.
If the world has too many interactions that Meta Quest 2 cannot handle, it might start lagging. This hurts the user experience.

We cannot have a game that is too lengthy as well, as people may feel uncomfortable (neck strain, eye strain, motion sickness) after wearing the headset for an extended amount of time.

Considerations to Inclusive Design

Caters to those who:

Are not tech savvy

Given that not all children have used VR before, we made sure that the game had plenty of UI to guide them along the way.

May be easily simulated

While we incorporated bright colors in our assets and environment UI, we tried as much as possible to ensure that they are not overstimulating. This is because some children may be overwhelmed by bright colors. We sought to strike a balance by using cooler colors for the UI since our environment was more bright.

Have short attention span

We did not want to create an overly lengthy game as children have a limited attention span. (British Council, n.d.). A child's maximum attention span is about two to three times their age. Based on our target audience's age, we ensured that our game did not exceed 30 minutes .

Doing so will ensure that children can enjoy the game until the end without any diversion of attention. And on top of that, learn something - be how to use the VR controllers or about the math operators.

Considerations to Inclusive Design

Caters to those who:

Groups who may be excluded by the design

Those who are colorblind may be excluded by the design as we did not choose the colors scheme based on their needs.

Categories of Practises for Inclusive Design

Avoid Stereotypes

The player's gender is neither mentioned nor emphasized. This is simply because it has no correlation to the gameplay and goals of the game. Anybody can enjoy VR games.

The choice of words in the UI do not reference disabilities in any way.

Use color mindfully

As stated in the design rationale and above, we incorporated bright colors to entice children. But we also included cool colors in the UI to strike a balance and prevent them from being overstimulated.

Annex

Bezmalinovic, T. (2022, December 8). *Play games to practice math with Math World VR on Quest 2.* Retrieved from Mixed News: https://mixed-news.com/en/play-games-to-practice-math-with-math-world-on-quest-2/

British Council Malaysia. (n.d.). *How to Increase Your Child's Attention Span.* Retrieved from British Council Malaysia: https://www.britishcouncil.my/english/courses-children/resources/attention-span#:~:text=A%20child's%20maximum%20attention%20span,well%2Drested%20and%20not%20hungry.

Class VR. (2022, August 16) *Advantages of Virtual Reality in Education.* Retrieved from: Class VR: https://www.classvr.com/blog/advantages-of-virtual-reality-in-education/#:~:text=So%2C%20in%20summary%20virtual%20reality,skills%20needed%20for%20the%20future.

Ecole Globale. (2020, April 25). *Color Psychology: How Color affects your child* Retrieved from Ecole Globale: https://www.ecoleglobale.com/blog/how-color-affects-your-child/

Education Quizzes. (2020). *Least Favourite School Survey.* Retrieved from Education Quizzes: https://www.educationquizzes.com/surveys/least-favourite-school-subject/

Marvel. (n.d.) *Designing for VR: A beginner's Guide.* Retrived from: Marvel: https://marvelapp.com/blog/designing-vr-beginners-guide/

Marfice, C. (2022, May 10). *What are the easiest fonts to read?* Retrieved from Superhuman: https://blog.superhuman.com/easiest-fonts-to-read/

SideQuest. (n.d.) *Math World VR.* Retrieved from SideQuest:: https://sidequestvr.com/app/7811/math-world-vr

Steam. (n.d.). *Carnival Games VR.* Retrieved from Steam: https://store.steampowered.com/app/458920/Carnival_Games_VR/

TerraExplorer Pro User Manual. (n.d.). *Oculus Rift and Quest Controls.* Retrieved from TerraExplorer Pro User Manual: https://www.skylinesoft.com/KB_Resources/TED/WebHelp/User%20Guide/Oculus_Rift_and_Quest_Controls.htm

Usability Testing Link

https://ivid2.np.edu.sg/media/EXD_OrangeCaramel_Usability_Testing/1_ianv5t3f