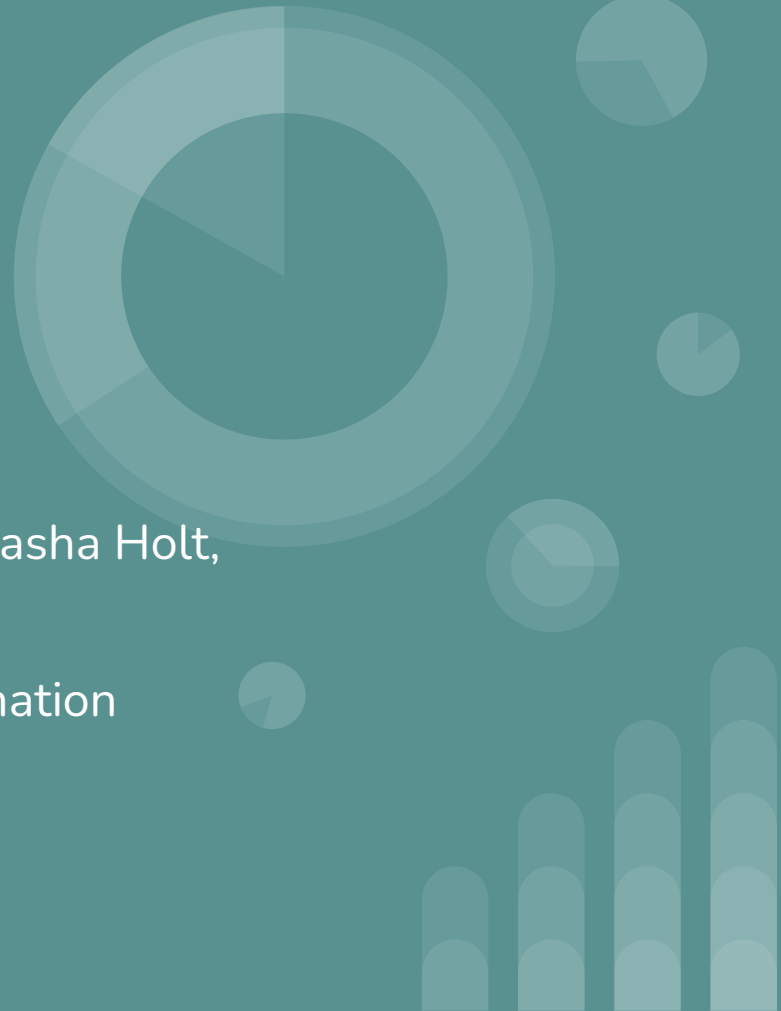


# KidDataViz Project

Andrew Ahn, Joshua Yang, Heechan Lim, Sasha Holt,  
Timothy Kelley, Jack Homer

CS4624 Multimedia, Hypertext, and Information  
Access, Dr. Fox  
Virginia Tech, Blacksburg VA 24061  
11/29/2022



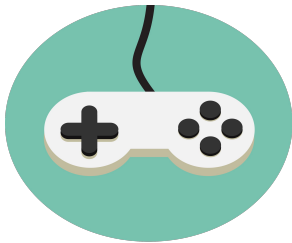


# Outline

1. [Project Overview](#)
2. [Timeline/Milestones](#)
3. [Work Completed](#)
4. [Website Implementation](#)
5. [Game Implementations](#)
6. [Lessons Learned](#)
7. [Future Work](#)
8. [Acknowledgements](#)
9. [References](#)

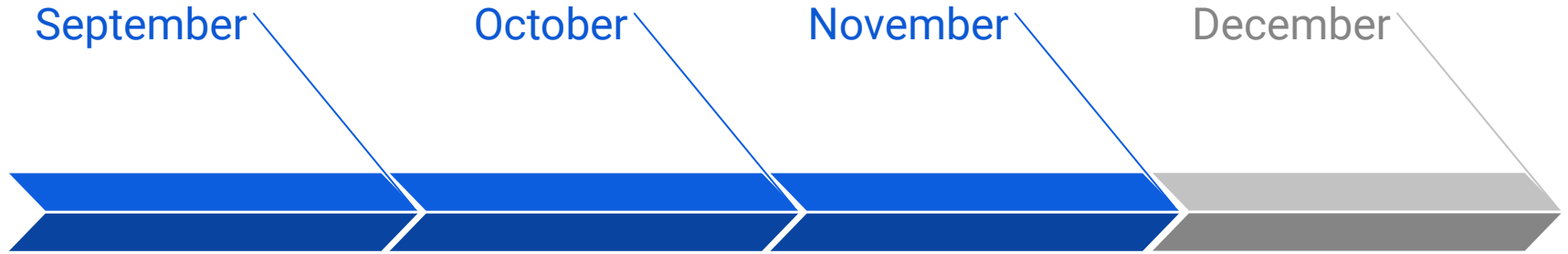
# Project Overview

- Client: Dr. Sally Hamouda
- Games for helping with data visualization concepts for kids
- Kids will be able to access our website and navigate to games
- Games will consist of varying designs aimed at different groups
- Categories are split into 1st and 2nd grade; 3rd and 4th grade; and 5th grade





# Timeline/Milestones



September

October

November

December

## Phase 1

Research data  
visualization tools,  
brainstorm simple  
game ideas,  
website/game design

## Phase 2

Begin website and  
game development and  
implement data  
visualization  
components

## Phase 3

Testing and surveys  
conducted, feedback  
received

## Phase 4

Revise and  
re-implement design  
and finalize website



# Work Completed

- Website Implementation
  - React application for front end
  - Hosted on Vercel
  - Collapsible for mobile use in the future
- Game Implementations
  - 6 games fully implemented for testing
  - Playable from the website
- Testing Preparation + Deployment
  - Google form with detailed questions and prompts created
  - Sent out to users on 11/29



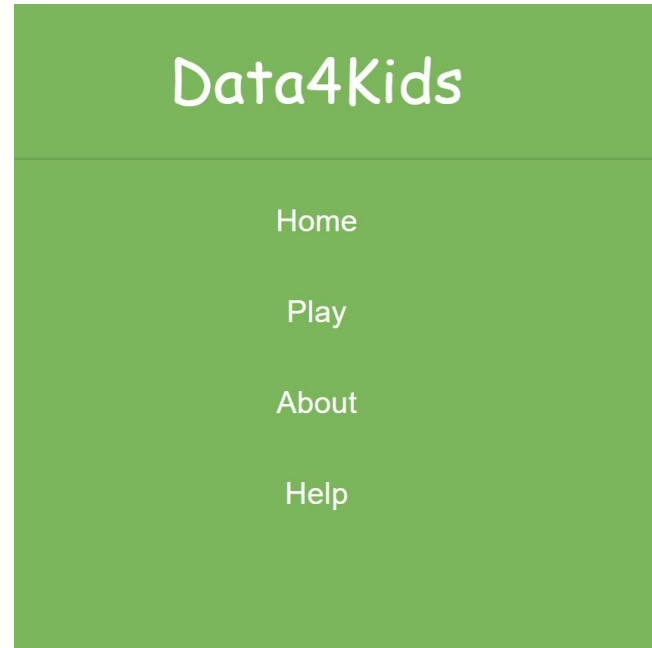
# Website Implementation



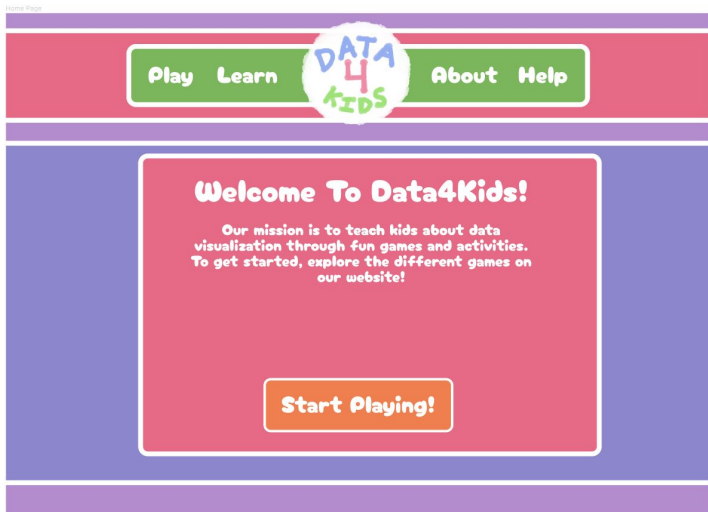


# Changes in Implementation

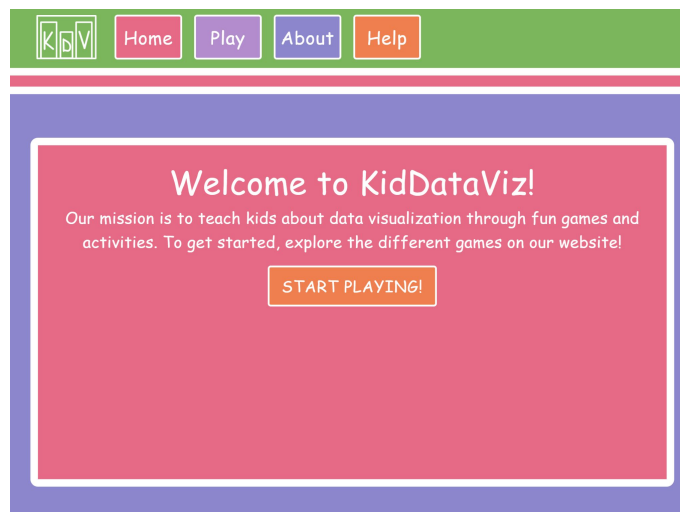
- Design was changed to be more accommodating to mobile users
- Menu/Taskbar now collapses into dropdown menu
- Changed to be scrollable
  - Scales better on mobile
  - Less static menus on the side or top of the screen



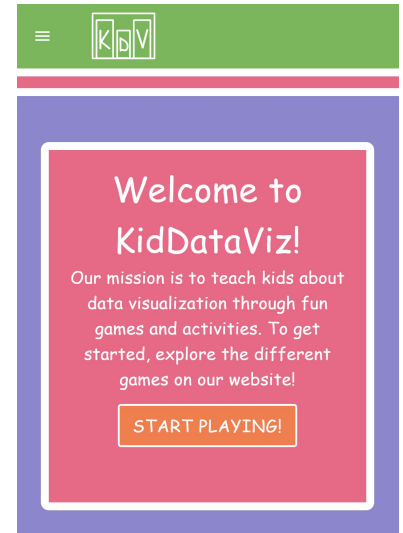
# Website Design vs. Development - Home



Wireframe



Application (Desktop)



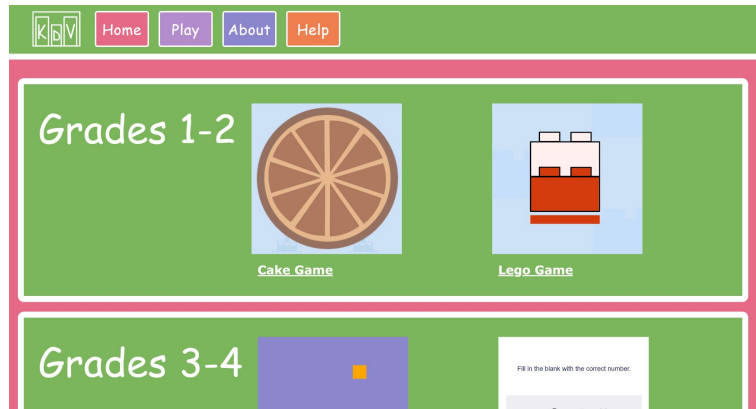
Application (Mobile)



# Website Design vs. Development - Play



Wireframe



Application (Desktop)

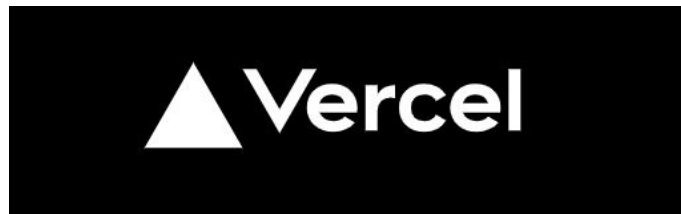


Application (Mobile)



## Hosting Changes

- Application was initially hosted on AWS Amplify but was moved to Vercel for better integration with the Unity games
- Front end is still built directly from the project GitHub, allowing for continuous deployment
  - Whenever a change is pushed to main it rebuilds the application
- Allows for integration with backend tools like MongoDB



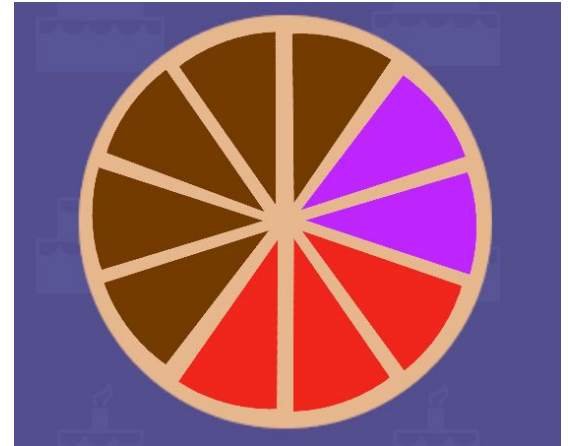
The background is a solid orange color. In the top-left corner, there are three vertical bars of varying heights, each composed of several overlapping semi-transparent orange circles. In the bottom-right corner, there are four vertical bars of increasing height from left to right, each also composed of several overlapping semi-transparent orange circles.

# Game Implementations

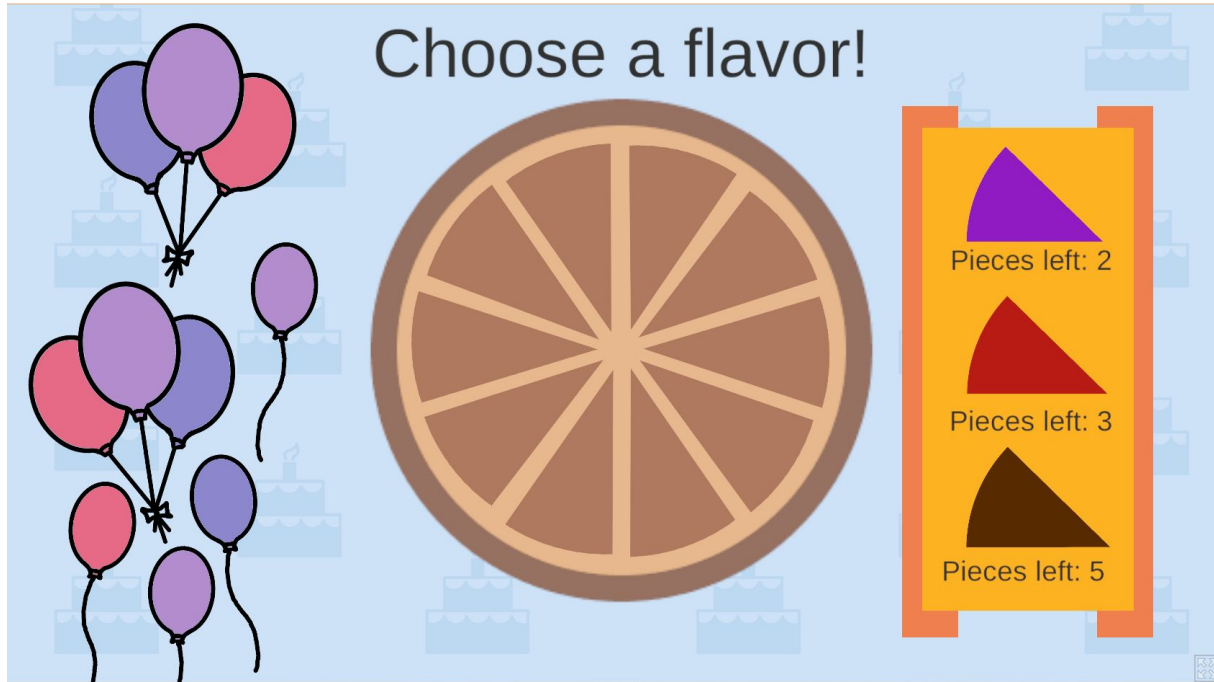


# Game 1 - Cake Bake

- Basic Idea: The user will be creating a pie chart based on different cake flavors they put into place.
- After the game the user will:
  - Be familiar enough with the data to answer percentage/fraction questions about it.
  - Actively use the pie chart to answer those questions.



## Game 1 (continued)



- Players will choose flavors from the table.
- Will then place them on the tray.
- Once finished, their custom cake will be used to answer questions.

# Game 1 (continued)

Use your cake to answer the following questions.

What fraction of the cake is made up of the red flavor?

$\frac{4}{10}$

$\frac{3}{5}$

$\frac{6}{10}$

$\frac{3}{10}$



Click on a fraction to continue.

- Basic fraction questions for 1st and 2nd graders.
- Goal is for players to already be familiar with the data set, and be able to evaluate it.

## Game 1 (continued)

# Great Job!

You correctly answered each question  
and made a cake!

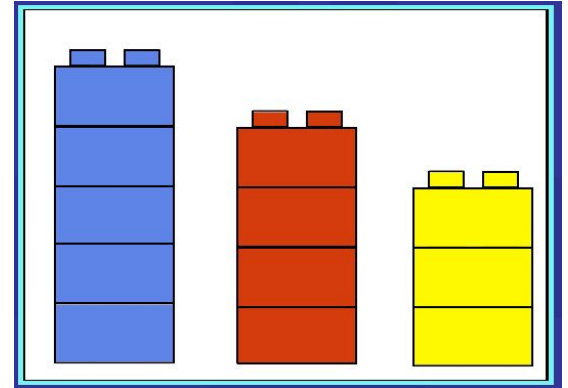


Number of incorrect answers: 0



## Game 2 - Lego Game

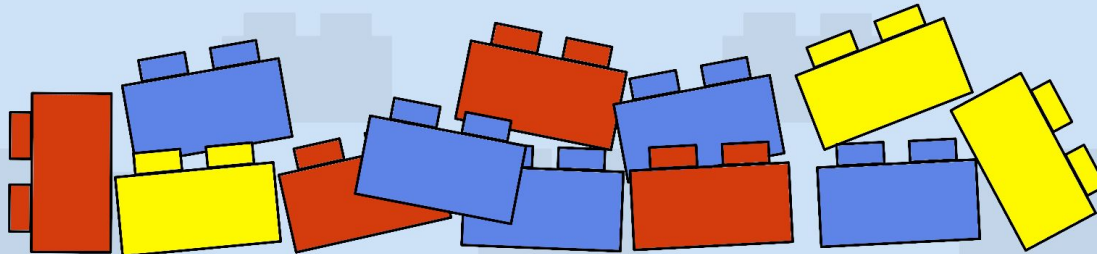
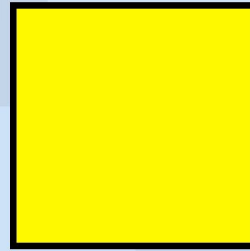
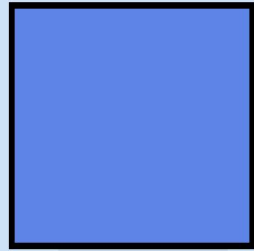
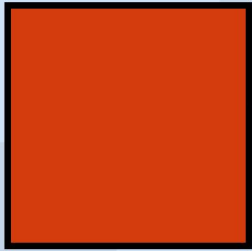
- Basic Idea: The user will be creating a bar chart based on different colored Legos.
- After the game the user will:
  - Be familiar enough with the data to answer percentage/fraction questions about it.
  - Actively use the bar chart to answer those questions.





## Game 2 (continued)

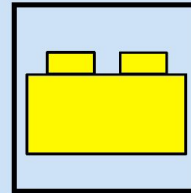
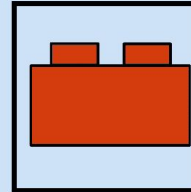
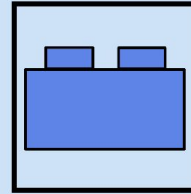
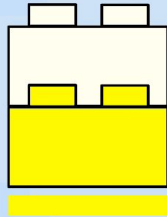
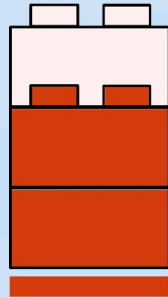
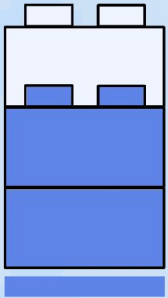
Choose a Lego piece.



- Players will pick each piece which binds it to the mouse.
- Will then sort the pieces into the correct colored bins.

## Game 2 (continued)

Click on another piece.



- After they have sorted the pieces, they will then make the bar chart themselves.
- The bar chart will be used to answer simple questions.

## Game 2 (continued)

Use your Lego towers to answer the following questions.

What is the fraction of red Lego pieces compared to the total?

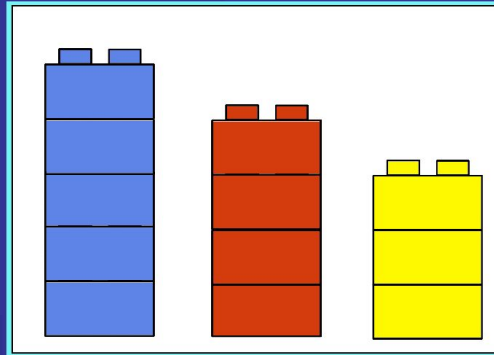
$4/12$

$5/12$

$6/12$

$3/12$

Click on a fraction to continue.

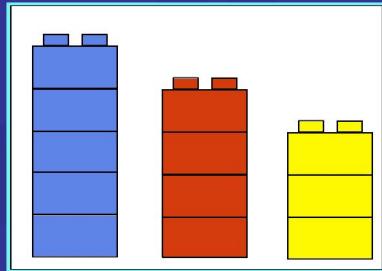


- Basic fraction questions for 1st and 2nd graders.
- Goal is for players to already be familiar with the data set, and be able to evaluate it.

## Game 2 (continued)

# Great Job!

You correctly answered each question  
and made some Lego towers!



Number of incorrect answers: 0



## Game 3 - Math Game

- Basic Idea: The user will be solving simple math problems. It will keep track of data such as correct and incorrect answers and number of questions.
- After the game the user will:
  - Produce a dataset from playing the game.
  - Be able to visualize the data collected from the game in different ways.
  - Be able to understand concepts such as bar charts.
  - Demonstrate their knowledge through simple addition and subtraction problems.



## Game 3 (continued)

Fill in the blank with the correct number.

6 questions left.

$$\underline{\quad ? \quad} - 5 = 4$$

Submit

Fill in the blank with the correct number.

10 questions left.

$$\underline{\quad ? \quad} - 2 = 3$$

Submit



## Game 4 - Math Game Hard

- Basic Idea: The user will be solving simple math problems. It will keep track of data such as correct and incorrect answers and number of questions.
- Harder Version of the Math Game for Higher Grades
- Includes Multiplication and Operators, Addition and Subtraction
- Correct and Incorrect Answers
- Data Visualization



## Game 4 (continued)

Fill in the blank with the correct number or  
operator.  
13 questions left.

$$5 \text{ \underline{?} } 4 = 1$$

Submit

Fill in the blank with the correct number or  
operator.  
11 questions left.

$$8 * \text{ \underline{?} } = 72$$

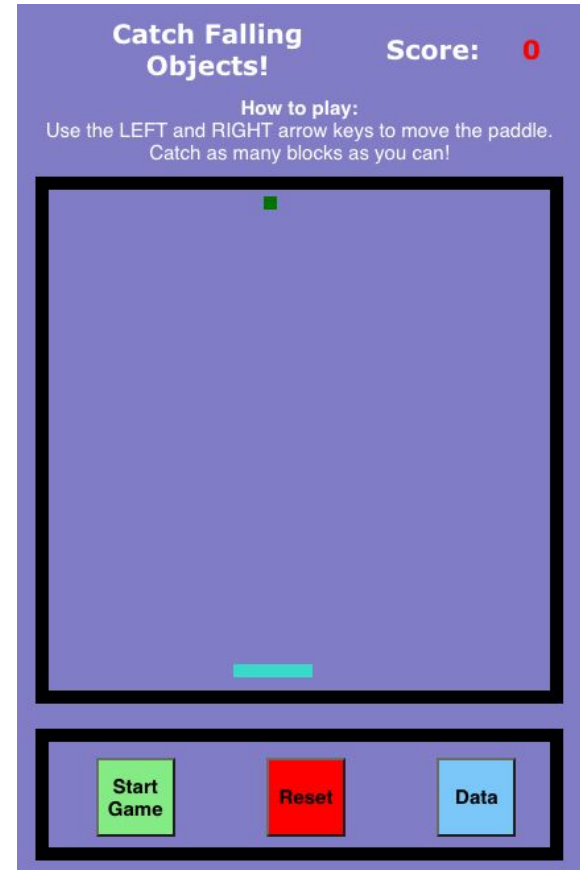
Submit





# Game 5 - Catch Game

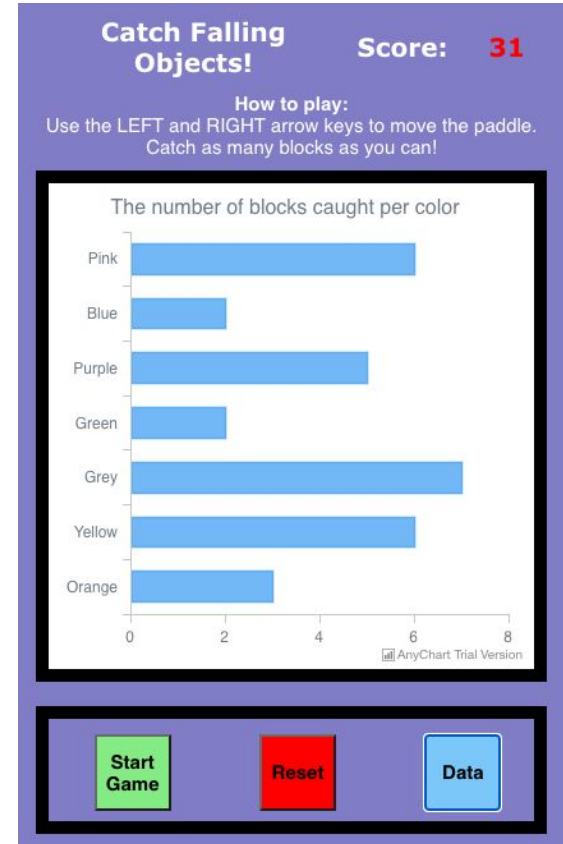
- Basic Idea: The user will control a paddle using arrow keys to catch the falling colors. The user will be able to visually see the number of each color block caught in a bar chart.
- After the game the user will:
  - Be familiar with bar charts
  - Be familiar with randomization





## Game 5 (continued)

- Added functionality for data visualization
- Utilized AnyChart Javascript library to visualize data





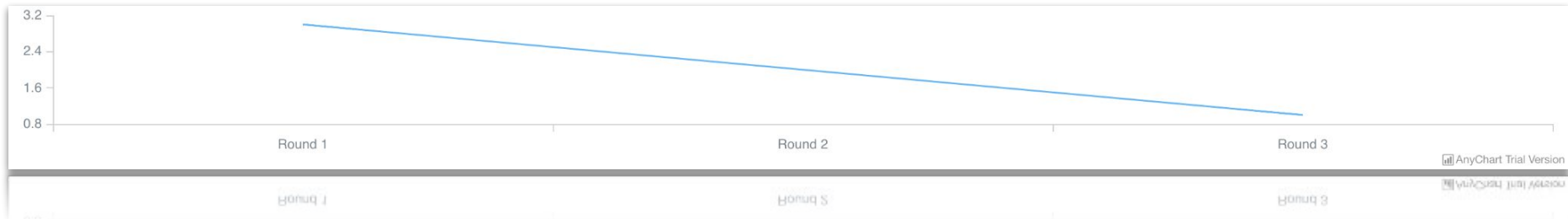
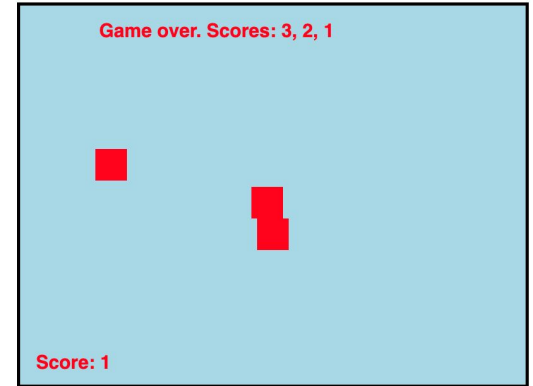
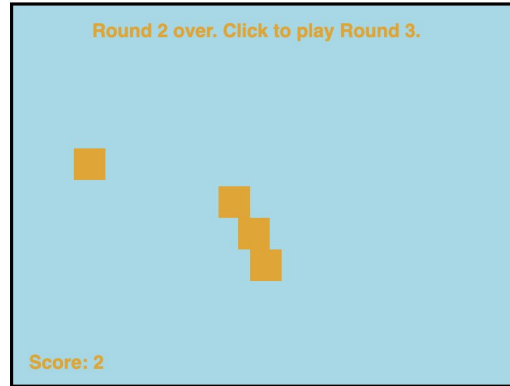
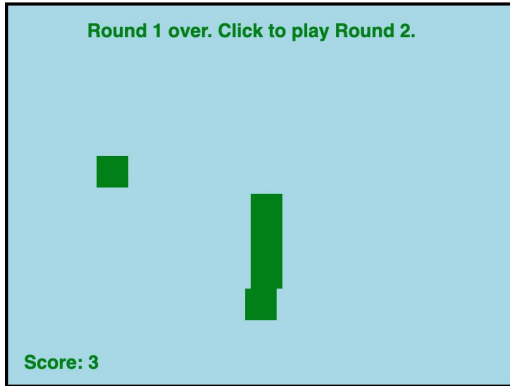
## Game 6 - Tower Game

- Basic Idea: The user will click to drop the moving block to create a tower. There will be three rounds with increasing difficulty.
- After the game the user will:
  - Learn about line charts and how to interpret them.
  - Understand change over time graphs.





# Game 6 (continued)



- Utilized AnyChart Javascript library to visualize data



# Lessons Learned

<b>Problems</b>	<b>Solutions</b>
User Interface	React
Game Development	Learn Unity, Build in JS
Game Integration with Website	WebGL
Coordination	Communicate When Working
Timeline	Plan Extra Week



## Future Work

- Addition of more games
- Data visualization and analytics lessons
- Backend and database integration



# Acknowledgements

Client:

- Professor Sally Hamouda, Department of Computer Science

Professor:

- Dr. Edward Fox, Ph.D, Department of Computer Science



# References

- <https://www.anychart.com/products/anychart/docs/>
- <https://reactjs.org/docs/getting-started.html>
- <https://docs.unity3d.com/Manual/UnityManual.html>
- <https://docs.unity3d.com/Manual/webgl-gettingstarted.html>