Canvas Color Mixer Test Plan

# **Team Darkest Error**

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| **Version** | **Date** | **Changes** | **Revised By** |
| --- | --- | --- | --- |
| 1.0 | 11/17/2023 | Initial Draft | Mindy Zheng |
| 2.0 | 12/9/2023 | Testing rounds | Mindy Zheng |
| 3.0 | 12/13/2023 | Simple Test | Dakota Stephens |
| 4.0 | 12/16/2023 | Testing rounds & Additions | Mindy Zheng |

## Introduction

Our project is an immersive interactive website designed to engage middle-school girls in the diverse fields of STEM. Our objective is to provide an enjoyable, educational, and hands-on way to explore fundamental concepts like randomness, statistics, and coding through a simulated, random paint-dropping process on a virtual canvas.

The user will answer multiple prompts, specifying the experiment’s input parameters such as: the dimensions of the canvas(X and Y), their color choices, and the stopping criterion for the experiment. The website will provide clear instructions for the user, as well as limits for each input to smoothly guide the user through the simulation.

Once the user sets the parameters, the simulation will begin. Users will also be given an option to adjust the speed of the simulation as it progresses. Upon completion, the users will proceed to the next phase of the website - the experimental section.

Here, the user will be prompted again to select an independent variable from three options: D (representing a single number for square canvases), X (with Y held constant), or R (the number of experiment repetitions), along with its respective input values and other fixed variables. Error handling will be implemented at every input prompt to ensure appropriate values are being selected.

During this simulation, several values will be calculated: A (the total number of paint drops of each color - A1, A2, A3), B (the maximum number of paint drops on any square), and C (the average number of paint drops over all squares). After running the experiments, a comprehensive table of all the calculated values will be displayed, giving the user a detailed overview of the simulation and experiment results.

This website aims to inspire and spark an interest within young girls as they begin to explore the different fields of STEM. By integrating a unique blend of art and mathematics, we hope to foster a deeper understanding and curiosity of randomness, computational thinking, and statistical skills.

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## Testing Plan

| **Item No.** | **Feature Tested** | **Test Plan** | **Comments** | **Test Date** | **Result (P/F)** | **Tested By** |
| --- | --- | --- | --- | --- | --- | --- |
| 2.1 | User input functionality | Test the user’s ability to input the parameters for the painting simulation - dimensions, color choices, stopping criterion; it should accept valid inputs and display appropriate error messages | Does not display appropriate and detailed error messages. No errors were displayed when wrong inputs were given. Dimension 1 - 40. Repetitions 1 - 99. | 11/16/23 | F | Dakota Stephens |
| 2.1.1 | Enter for X: run “3, 5, 6”  Expected Behavior: error message - too few items. | | | 12/16/23 | T | Mindy Zheng |
| 2.1.2 | Enter for X: run “4, 10, 5”  Expected Behavior: error message - integers must be in incr. order | | | 12/16/23 | T | Mindy Zheng |
| 2.1.3 | Enter for X: run “-4”  Expected Behavior: error message - “Min of 0” | | | 12/16/23 | T | Mindy Zheng |
| 2.1.4 | Enter for X: run “0”  Expected behavior: error message - “Integers only” | | | 12/16/23 | F | Mindy Zheng |
| 2.1.5 | Enter for X: run “100”  Expected behavior: error message - “max of 99” | | | 12/16/23 | T | Mindy Zheng |
| 2.1.6 | Enter for X: run “10”  Expected behavior: successful entry | | | 12/16/23 | T | Mindy Zheng |
| 2.1.7 | Enter for Y: run “3, 5, 6”  Expected behavior: “error message - too few items | | | 12/16/23 | T | Mindy Zheng |
| 2.1.8 | Enter for Y: run “4, 1, 5”  Expected behavior: error message - integers must be in incr. order | | | 12/16/23 | T | Mindy Zheng |
| 2.1.9 | Enter for Y: “4, 6, 8, 10”  Expected behavior: successful entry | | | 12/16/23 | T | Mindy Zheng |
| 2.1.10 | Enter for Y: “-1”  Expected behavior: error message - “min of 0” | | | 12/16/23 | T | Mindy Zheng |
| 2.2 | Animation functionality | Test the animation’s ability to explain the purpose of the website. The animation should provide the user with a visualization and inform the user. | Absent as of now | 11/17/23 | F | Mindy Zheng |
| 2.3 | Simulation Functionality | Test the painting simulation with various parameters. The simulation should run correctly and reflect the chosen parameters | Created grid works/visual canvas works, reflects the chosen parameters of single dimension independent [1,2,3,4], repetition value of 2, colors (blue, black, green), and term setting of first time any square painted twice. | 11/17/23 | T | Mindy Zheng |
| 2.4 | Experiment functionality | Test the experiments portion of the website, including choosing an independent variable and running the experiment. | Not completed as of yet | 11/17/23 | F | Mindy Zheng |
| 2.5 | Detailed data functionality | Test the ability to generate a table and graph that accurately represents the experiment’s data | Not completed as of yet | 11/17/23 | F | Mindy Zheng |
| 2.6 | Random Fill Experiment | Test the ability to randomly fill values on open fields and run experiment | Random values fill successfully but was not able to run the experiment when clicking the run experiment button. The values were filled as follows: Independent was single dimension [3,6,9,12], repetition value of 34, colors (yellow, black, blue), and term setting of first time any square painted for the third time. | 12/6/23 | F | Mindy Zheng |
| 2.7 | Random Fill Experiment | Test the ability to randomly fill values on input fields and run | When pressing the “Fill Random Experiment” button it filled all values within range and worked thereafter when I clicked run experiment. Functioning correctly. The values were filled as follows: Independent was the number of repetitions [2,4,6,8], Square Dimension value of 21, colors (black, blue, purple), and term setting of the first time any square painted for the third time. | 12/9/23 | T | Mindy Zheng |
| 2.8 | User input Functionality | Test the user’s ability to input the parameters for the painting simulation - dimensions, color choices, stopping criterion; it should accept valid inputs and display appropriate error messages. | Correctly displays errors and accepts inputs. Attempted to put values greater than 99 and less than 1 (which is not allowed) in both independent field and fixed input fields. Also attempted the same with dimension for both fixed and independent. Note, this value range is from 1 to 40.  I determined that no error was being displayed when entering the value 0. | 12/9/23 | F | Mindy Zheng |
| 2.8.1 | Selected 2 color choices and attempt to run experiment  Expected behavior: error message - “Please select item from list” | | | 12/16/23 | T | Mindy Zheng |
| 2.8.2 | Did not select a stopping criterion at all  Expected behavior: error message - “Please select one of these options” | | | 12/16/23 | T | Mindy Zheng |
| 2.9 | Speed Functionality | Test user’s choice to adjust speed when running simulation | Speed adjustment works change value from 1 to 10. Then from 10 to 0.25 | 12/9/23 | T | Mindy Zheng |
| 2.9.1 | Speed functionality | Buttons work as expected, with addition of a functional “extreme speed” (40) | | 12/16/23 | T | Mindy Zheng |
| 3.1 | Animation functionality | Test the animation’s ability to explain the purpose of the website. The animation should provide the user with a visualization and inform the user. | After navigating to the website. Change pages by clicking the usage tab. Once there I watched the animation for web page playout. It was informative and worked correctly. No further information needed. | 12/13/23 | T | Dakota Stephens |
| 3.2 | Graphical Display | The graph should be able to display one or two lines for the one of two different variables chosen for comparison from the run data of the experiment. The graph along with the lines should then be displayed with their corresponding values on the y axis in correlation to their | After running an experiment. Selected the option for “total drops on canvas”. This resulted in a graph with the number of points corresponding to the number of independents and correctly positioned on the graph X and Y axis. Then I clicked the Make a new graph button. This brought me back to the selection screen. I then added the option “Average number of drops” with the total. Clicking the continue button again resulted in another graph. This graph displayed both lines with legends this time. Both correctly corresponded to their X and Y axis. | 12/13/23 | T | Dakota Stephens |
| 3.3 | Graphical Display | This table should give a graphical display of the calculated values and information selected by the user, included: Independent variables, chosen dependent variables, A, A1, A2, A3, A4, A5. This included the reduced table as well. | This correctly calculates the values and displays it on the screen | 12/16/23 | T | Mindy Zheng |
| 3.4 | Dependent Variable selection | When asked to pick two, at most, dependent variables, this should be passed to graphically display statistics. | This correctly shows up in the graph as well as the table | 12/16/23 | T | Mindy Zheng |
| 3.4.1 | I choose 1 dependent variable and attempted to calculate my table and graph  Expected behavior: successful calculation | | | 12/16/23 | T | Mindy Zheng |
| 3.4.2 | I choose 2 dependent variables and attempted to calculate my table and graph  Expected behavior: successful calculation | | | 12/16/23 | T | Mindy Zheng |
| 3.4.1 | I choose 3 and attempted to calculate my table and graph  Expected behavior: choose 1 or 2 variables to calculate | | | 12/16/23 | T | Mindy Zheng |
| 4.1 | Buttons on experiment calculation | There are 3 buttons: create new table/graph, abandon experiment, or quit | Buttons function as expected. Creating a new table will allow user to go back to the dependent variable selection screen | 12/16/23 | T | Mindy Zheng |

\*Testing will be conducted by Mindy Zheng on Windows 11 and Dakota Stephens on Windows 10, with each feature being evaluated in its respective environment.

## Appendix A. User Manual

When the user first enters the website they should see two buttons at the top. The first button (Run Experiment) should be pressed after filling out the form on the rest of the page. The second button (Fill Random Experiment) can be pressed to fill the form out to run the experiment with random values.

If the user doesn’t want random values, they must fill out the form to run the experiment with their chosen variable values. To fill out the form, first select a variable for the independent variable. Then input at least 4 values into the list in the middle of the form. To fill the list, the user must input a number in the field below the list and press the Add Number button. Then after filling this list with independent variable values, the list for dependent variable values will appear to the right. This field must be filled out also.

After filling those fields, the colors, stopping criteria, and song choice can be filled out below. When all fields are filled out, the user should press the Run Experiment button.

The next screen will be the running experiment. During the run of the experiment the speed can be sped-up or slowed down using the slider control on the left.

After the experiment is finished the variable to be calculated is shown at the bottom. The user should choose one of these variables to calculate and be shown on the graph. After choosing this variable the user should press the Calculate and Display Chosen Value button which will display a graph.