Team 20 - Final Design Document

Team Members:
Adam Auer, Marco Borth, Christian Harris, Jinuk Park, Peng Zhang

Project Name:
Murder Mystery

Project Synopsis:
A Web-Based Adaptation of a murder mystery game designed to teach students about BioTech concepts and use of biotechnology for forensic analysis.

Project Description:
The idea of the Muder Mystery Game was first developed by Dr. Jack Treml, a professor of BioTechnology at KU Edwards. The initial game was used as an educational tool to teach students about Biotechnology concepts and technology. However, the initial product of the game came with limitations to its educational ability, especially with simulating the biotechnology in PowerPoint and by outsourcing other tech to outside services. Dr. Treml and our team saw the potential in the game to be an interactive, educational tool the students can use, and so our team has shown interest in creating the true Murder Mystery Game it can become.

Our Team seeks to improve on where the Murder Mystery Game made progress, by recreating the simulations of the biotechnology used in the game, and to contain all tech simulations and education within the application itself. In addition to recreating the game from its PowerPoint origin, our team seeks to add additional functionality and features, such as implementing more biotech simulations and concepts that weren't initially added, to develop and polish the true point-and-click adventure experience the game first invoked.

Our goal is to release this game as a Web-based application that KU can use to educate potential Biotechnology students.

Project Budget:
- Web Hosting Costs: $25 / month through BlueHost services
    - Planning to allow the website to be hosted through .ku.edu domain.
    - Required by the end of Spring semester 2021
- Pluralsight Training Tools: $30 / month
    - Required by the end of Fall semester 2020
- Graphics and Assets Development: $200
    - Possibly outsourced to a graphics team recruited by Dr. Treml.
    - Required by the end of Spring semester 2021

Project Milestones:

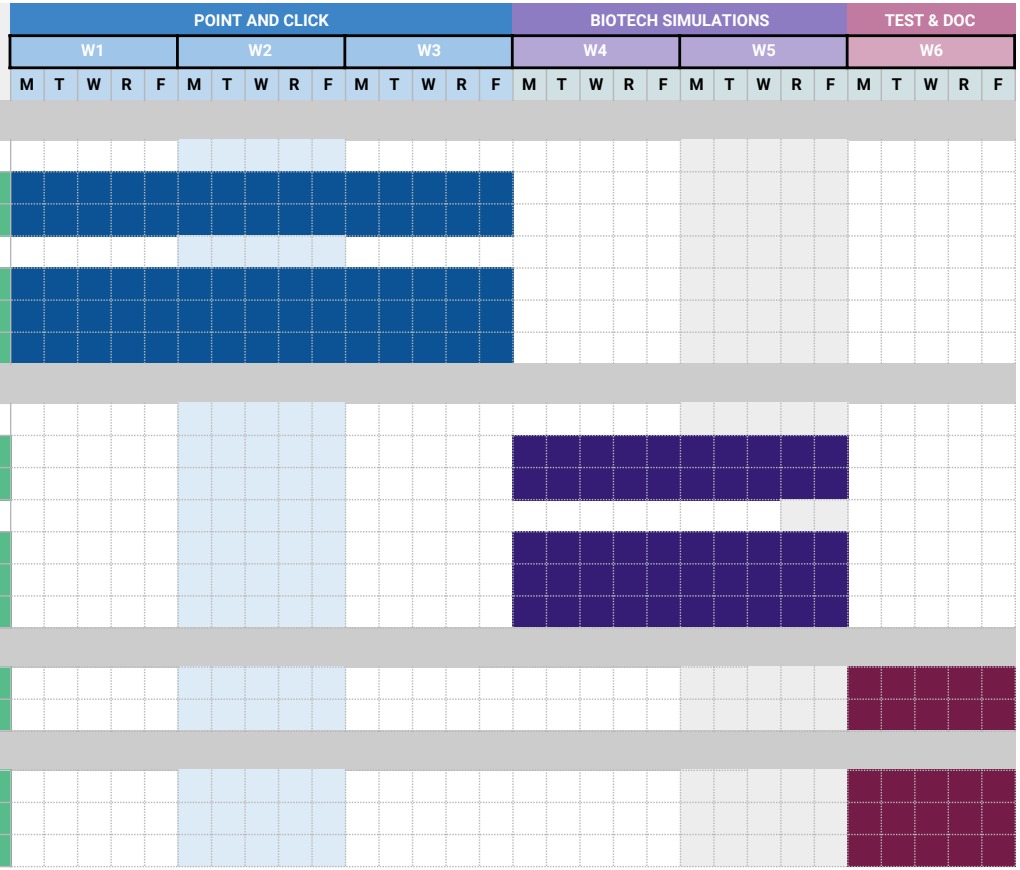
- Fall Semester: (Prototype)
    - Core Features:
        - Point and Click Implementation (11/6/2020)
            - Room traversal
                - Front End (1 week)
                - Back End (1 week)
            - Interactive Elements within the room
                - Front End (2 weeks)
                    - Initial Inspection
                - Back End (2 weeks)
                    - Further Inspection
        - Biotech Simulations (11/6/2020)
            - Thin Layer Chromatography
                - Front End (1 week)
                - Back End (1 week)
            - Fingerprint matching
                - Front End (1 week)
                - Back End (1 week)
        - Unit Testing (11/13/2020)
        - Documentation (11/13/2020)
- Spring Semester: (Final Product)
    - Biotech simulations
        - Virtual DNA Fingerprinting (2/26/2021)
            - Front End (2 weeks)
            - Back End (2 weeks)
        - DNA Sequencing (3/12/2021)
            - Front End (2 weeks)
            - Back End (2 weeks)
        - Will ask Dr. Treml if any additional simulations can be added if able
    - Additional Functionality
        - Interactive Dialog with non-playable characters (3/26/2021)
            - Front End (1 week)
            - Back End (1 week)
        - Inventory System for clues and notes (4/2/2021)
            - Front End (1 week)
            - Back End (1 week)
        - Password game state saving (4/9/2021)
            - Front End (2 weeks)
            - Back End (2 weeks)
    - Unit Testing (4/16/2021)
    - Documentation (4/16/2021)

Team 20 Gantt Chart - Fall '20

Project: Murder Mystery

Members: Adam Auer, Marco Borth, Christian Harris, Jinuk Park, Peng Zhang

MILESTONE	TASK OWNER	START DATE	DUE DATE	PCT OF TASK COMPLETE
Point and Click Implementation				
Front End				
	Adam	10/5/20	10/23/20	0%
	Andy	10/5/20	10/23/20	0%
Back End				
	Marco	10/5/20	10/23/20	0%
	Christian	10/5/20	10/23/20	0%
	Peng	10/5/20	10/23/20	0%
Biotech Simulations				
Front End				
	Christian	10/26/20	11/6/20	0%
	Peng	10/26/20	11/6/20	0%
Back End				
	Marco	10/26/20	11/6/20	0%
	Adam	10/26/20	11/6/20	0%
	Andy	10/26/20	11/6/20	0%
Unit Testing				
	Marco	11/9/20	11/13/20	0%
	Christian	11/9/20	11/13/20	0%
Documentation				
	Peng	11/9/20	11/13/20	0%
	Adam	11/9/20	11/13/20	0%
	Andy	11/9/20	11/13/20	0%



Preliminary Project Design:

The “Mystery Set” and Room Traversal:

A fundamental aspect of our Murder Mystery are the individual mysteries the user has the pleasure of solving. From a general sense, each mystery can be partitioned into a collection of interacting parts and represented graphically or textually. We call these collections Mystery Set’s and each one represents a different user experience. The components of a Mystery Set are the rooms in which the mystery is unfolding, the objects the user has the option to interact with, the descriptions of items and characters which provide clues to the solution, and lastly, a story-board depicted as a graph which defines the connections between all previously mentioned components. By developing a set of Mystery Sets, we are able to quickly swap between mysteries, providing a unique playing experience.

In the design of our game, we wanted to provide smooth and seamless transitions and interactions with each scene. With our graphics style being static image based, we hoped to refrain from a series of links between pages and instead, with the power of the Mystery Set, provide dynamic transitions between rooms. The information for each object in a room is stored within the mystery set. The user is presented with the initial crime scene and then has the option to explore that room for clues or traverse to another. If a transition is desired, a small animation is shown to signal the request is being handled. Behind the scenes, the new room is being populated complete with all interactable objects and clues. Another short animation is displayed as the new room is presented to the user and the mystery solving is ready to continue! These short animations aren’t set in stone yet but could be something as simple as the old scene shrinking to a single point in the center of the screen with the new room expanding back out from that very same point. This method of traversal provides a smooth and linear flow throughout the game and allows for more emphasis to be placed on solving the mystery and less on navigating around.

Object Interaction:

Objects are going to be the main thing the player is going to interact with in order to play our game. Some examples of objects that are being used in the main story are cake, tea, and a book. These objects will be images placed throughout the screen and the player will then be able to move their mouse around the screen to interact with these objects. When the player moves and hovers their mouse over an object, that object will call a CSS function that will enlarge the image of the object. With the object enlarge, buttons will become available that are related to that certain object allowing the player to interact with that object. For example, an object can have a button that allows the player to dust it for fingerprints or have a button that will give more details about that certain object. These buttons when pressed will use JavaScript to change global game variables for the player allowing them to progress through the game. Example of this being if the player presses the dust for prints button the player will gain the prints for that object and then can take those prints to the lab room and test them.

Biotech Simulations:

What will make this game different from other mystery games before it will be the inclusion of simulations of the biotechnology used in forensic science. While these ideas have been first introduced by Dr. Treml in the powerpoint version of Murder Mystery, Our team plans to use the front end and back end services of the app to create a lab room containing all the biotechnology tools the player can use throughout the game. Using more than just the fingerprint scanner to find traces of the culprits prints within the crime science, the player will learn how to use the scientific method to find the incriminating evidence they will need to solve the case. Such technologies will include a Thin Layer Chromatography to isolate the compounds of a substance into their unique components, which can reveal to the player traces of any substance found within the mixture, such as foods, minerals, plants, and potentially poisons. The player will also have access to a DNA Fingerprint analyzer that will separate any DNA found into clusters of fragments that the player will have to decipher any matches of the evidence to the test samples collected from the suspects of the crime scene. Of course these simulations, while accurate to reality, will need to be designed to be entertaining to use while educational to learn how to use. These simulations and others like the fingerprint matcher should have some entertainment to be found, but perhaps the most edutaining feature to be implemented will be the DNA Sequencer used to identify the DNA samples that will serve as a replication of real life sequencers such as BLAST.

BLAST (information outsourcing):

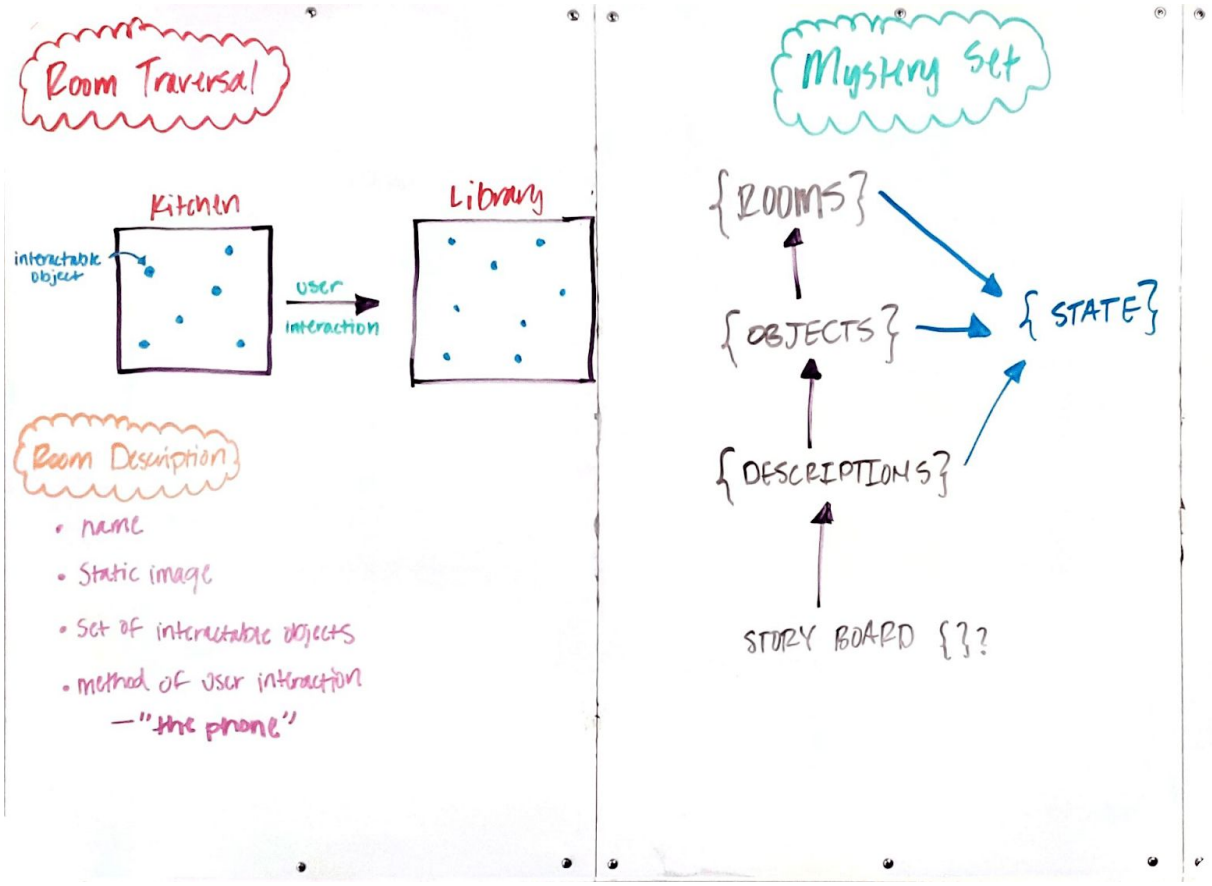
One of the very important parts in this project is letting our players to identify chemicals remains on objects by analyzing DNA sequence. To do so, we will use BLAST as an outsourcing information. BLAST by the U.S. National Library of Medicine is a professional and powerful tool to help users identify chemical composition from DNA sequences we provide. Using Perl to query the U.S. National Library of Medicine databases for identified substances, this outsourced technology is an official resource used by researchers in the Biotechnology Field to analyze and identify a DNA sequence with a matching substance. When players click into each item description, some DNA sequence information will be provided (if available). Then the webpage will lead the player jump to BLAST's official side. Meanwhile, the game will pop-out a simple BLAST tutorial to guide players using the Nucleotide BLAST function. By inputting the correct DNA sequence and choosing a proper searching database, a result list with predicted substance name and percent identity will show up. These searching results could be key clues for players to inference the murderer, and will also push the game process forward. In players' view, by trying out the BLAST tool, students can experience the application of modern biotech, and deepen their impression of the biotech concept.

Crime Scene, Kitchen, Lab (Graphic Design):

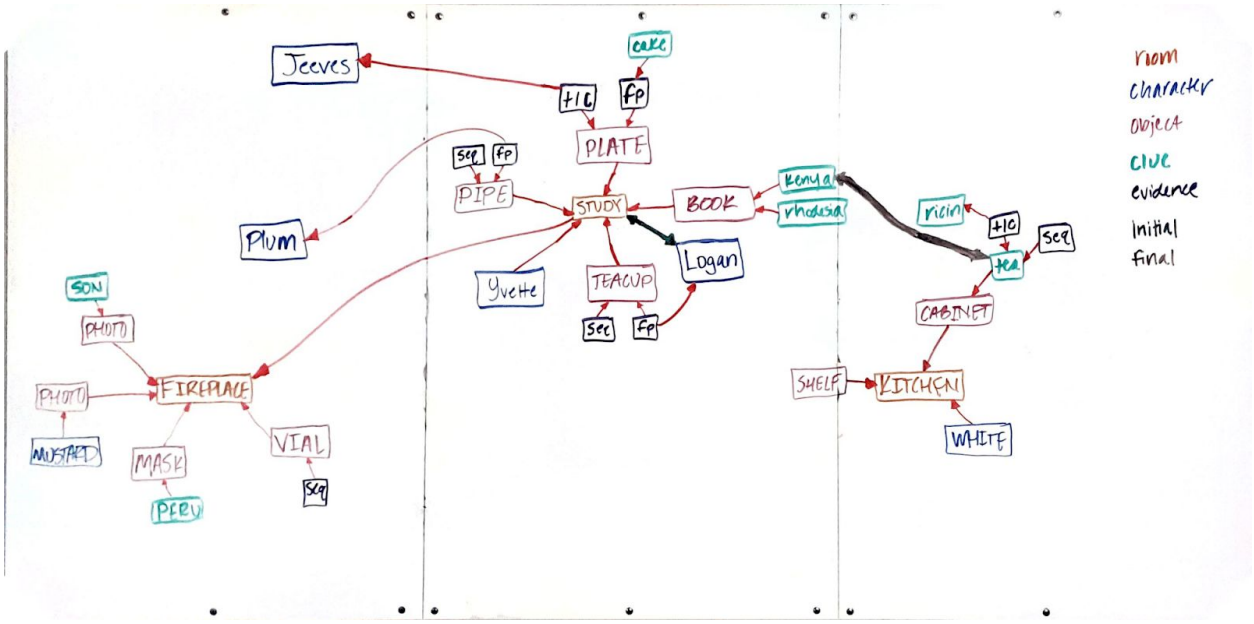
Graphic design is important for the application since the user actually needs to look around the room to collect the evidence and experiment with the evidence collected to catch the criminal. To develop the game with the rooms and objects we will need for the mystery sets and room traversal, many graphics will need to be designed and integrated to fulfill some of the functionality we want to see with the game. When the user looks for an object to interact with that can be used as evidence, the player will need to know that the object is indeed interactable. For the design of the graphics, we have decided to include the room graphics as the background of the web apps body to interact with. Any objects that will be intractable will have their own images stacked on top of the room background, whether those object images are extrapolated from the room image or added into an empty space. When the user hovers the mouse over the interactable object, the object will be highlighted for the player by scaling the size of the object or adding a borderline around the object. With every image converted to .svg files, this will allow the room and object graphics to scale up to the resolutions and sizes necessary without compromising the quality of the images when manipulated by the users interactions. Visual graphics, however, will need to be applied to the lab scene to let the user know that analysis processes are happening when back end services are being processed.

Design Constraints:

For much of the development of the Murder Mystery Web App Game , we have decided to develop the game using HTML, JavaScript and CSS for the front end development of the game. These front end technologies will be used for the users' interaction between objects and rooms, while background processes for data input and analysis with the biotech simulations will be implemented with PhP and SQL. A prototype will be first developed to test the integration of the "mystery set", room traversal, object interactions, and biotech simulations. Once the prototype has been successful implemented, our team plans to further build upon the prototype with by further developing and refining these features, with additional features, such as an inventory system, interactive dialog options, and game state saving, that will utilize additional back end services provided by PhP and SQL.

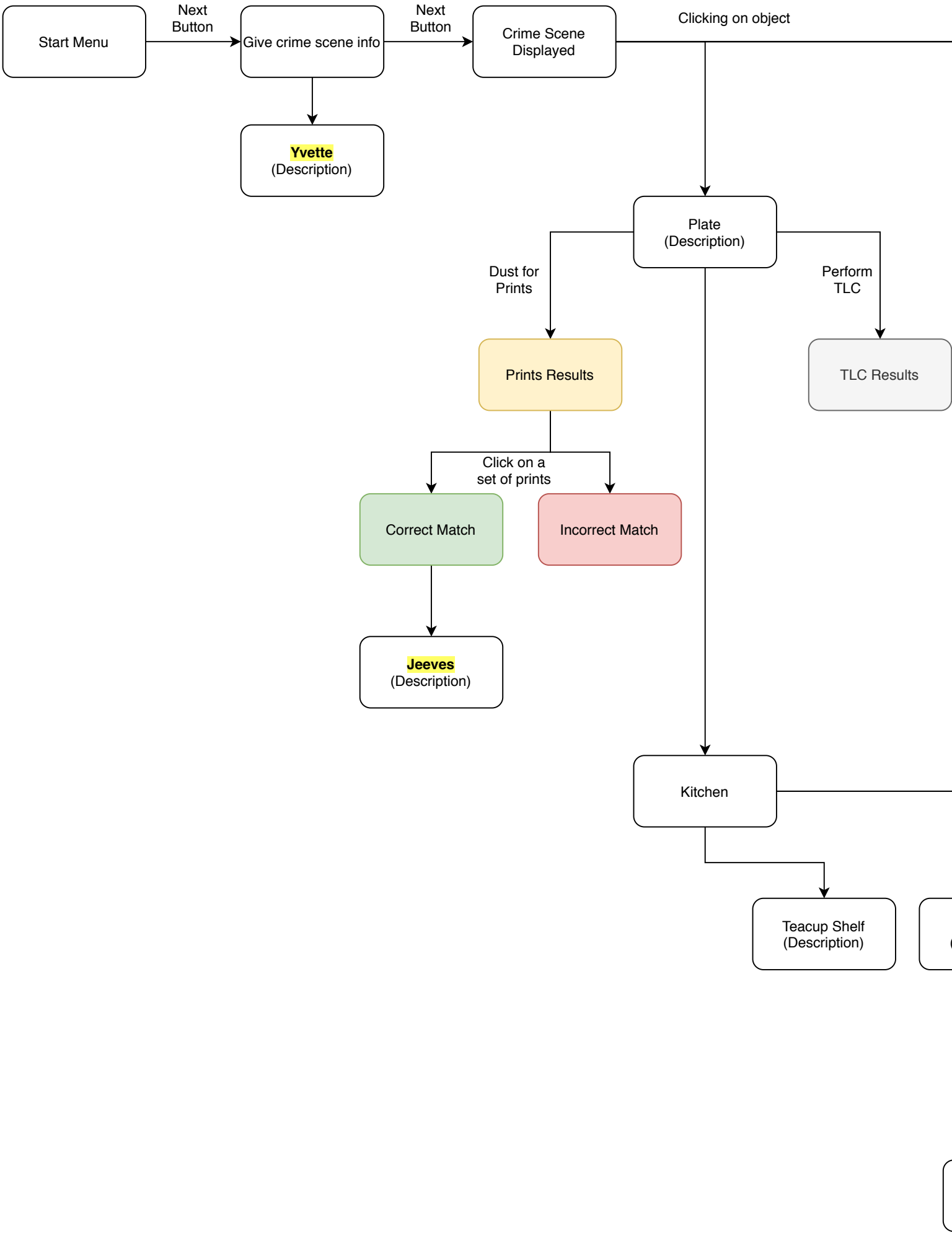


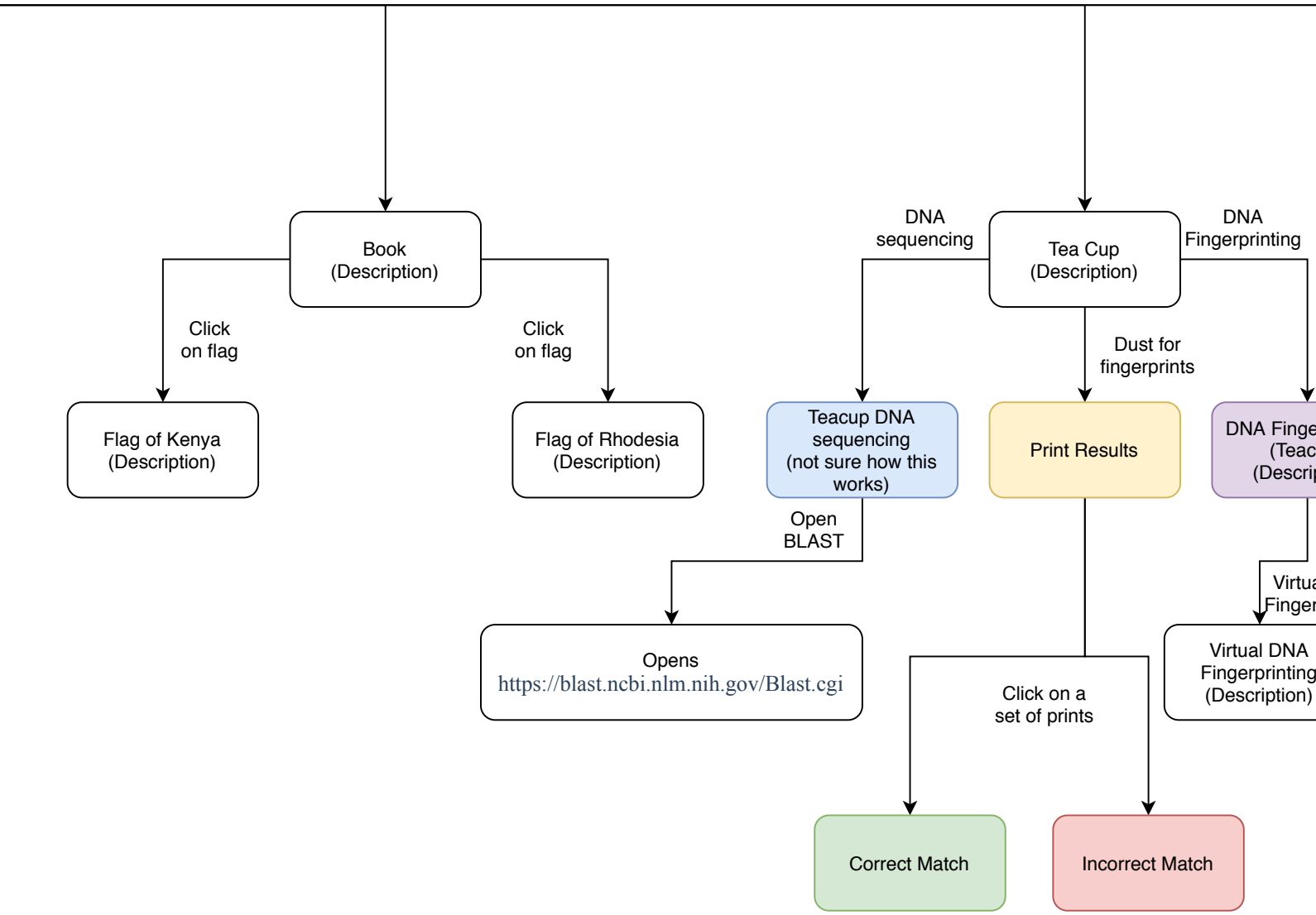
General Traversal and Mystery Set Analysis

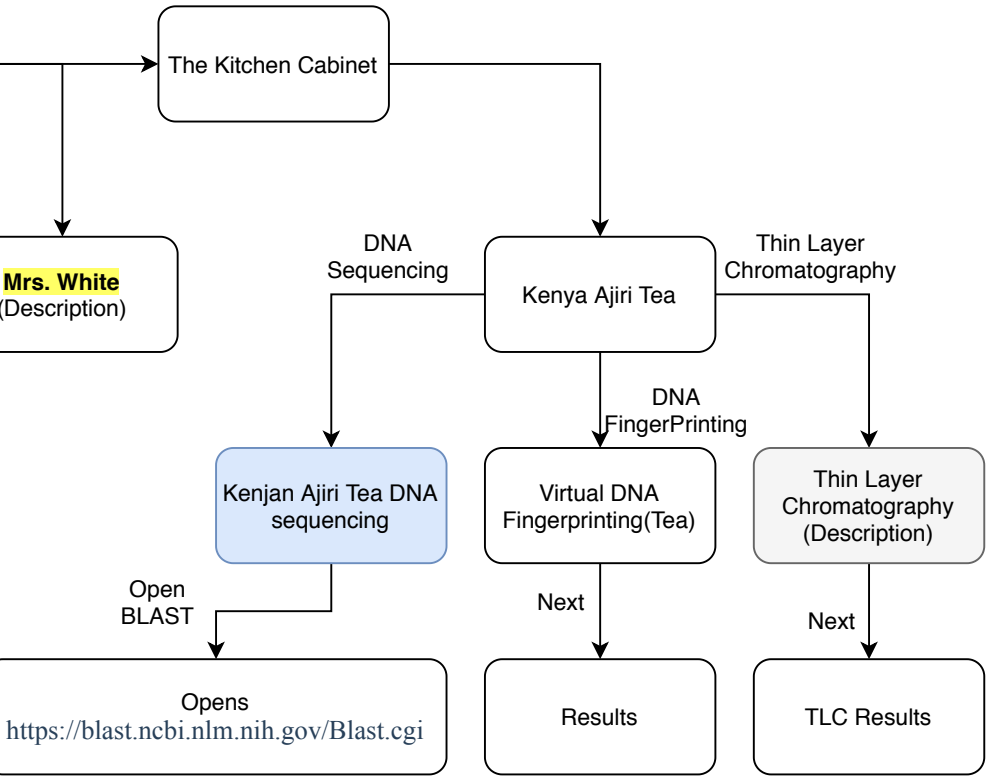


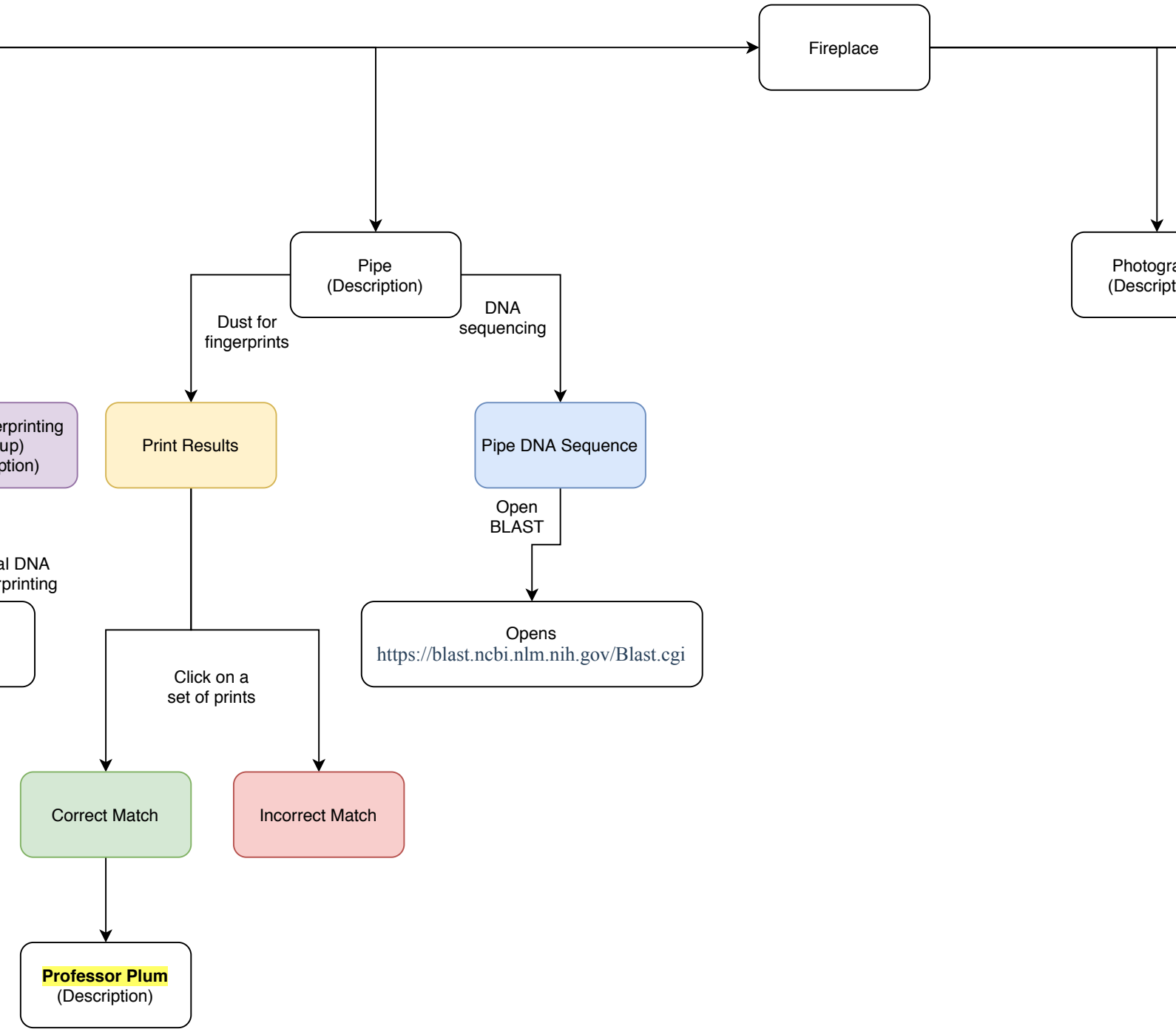
First Mystery Set Storyboard

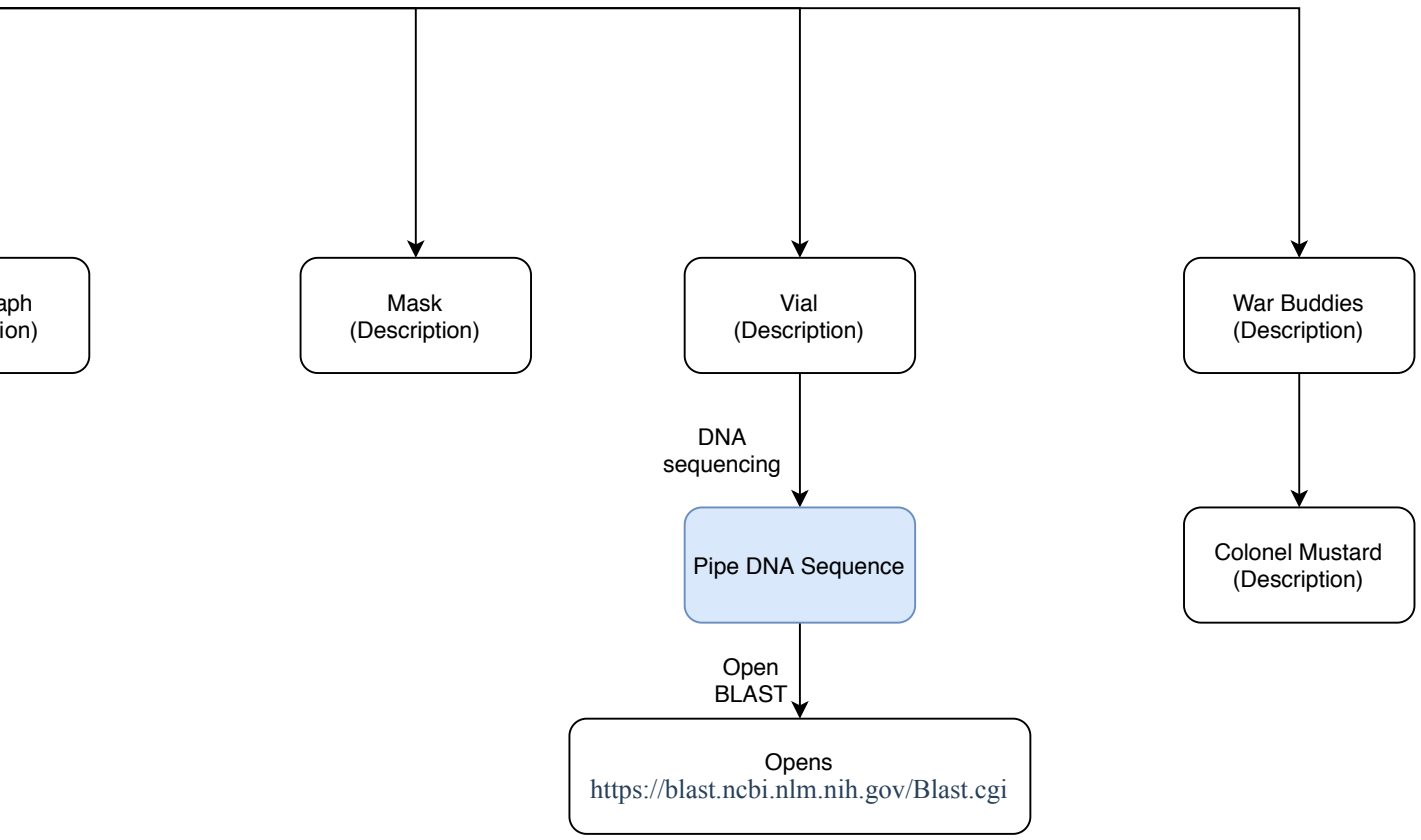
Storyboard Flowchart of Murder Mystery PowerPoint Define across next 4 pages.


Start Menu
Next Button
Give crime scene info
Next Button
Crime Scene Displayed
Clicking on object
Yvette (Description)
Plate (Description)
Dust for Prints
Perform TLC
Prints Results
TLC Results
Click on a set of prints
Correct Match
Incorrect Match
Jeeves (Description)
Kitchen
Teacup Shelf (Description)

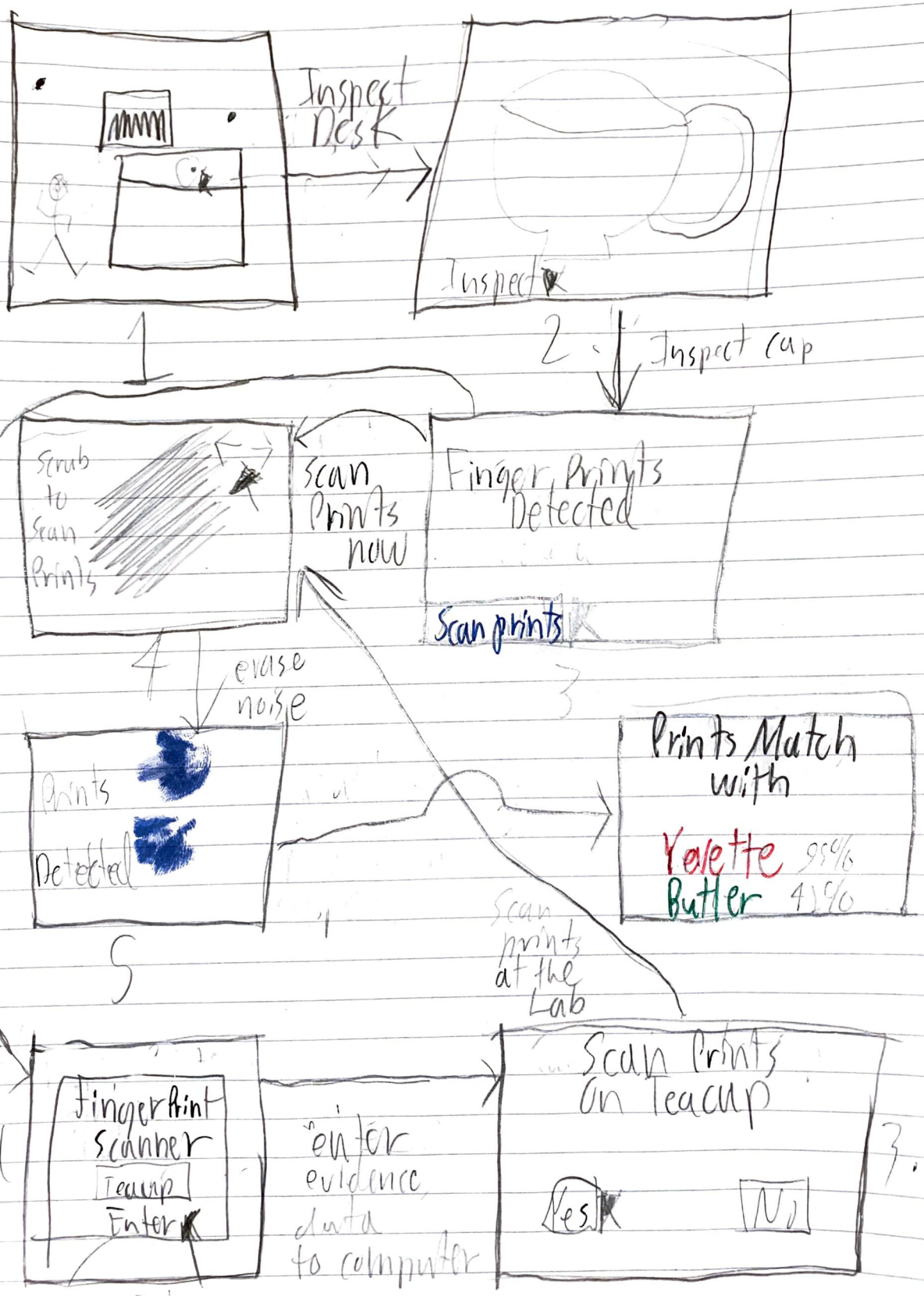

Book
(Description)
Click
on flag
Flag of Kenya
(Description)
Click
on flag
Flag of Rhodesia
(Description)
DNA
sequencing
Tea Cup
(Description)
DNA
Fingerprinting
Dust for
fingerprints
Teacup DNA
sequencing
(not sure how this
works)
Print Results
DNA Finge
(Teac
(Descri
Open
BLAST
Opens
https://blast.ncbi.nlm.nih.gov/Blast.cgi
Virtua
Finger
Virtual DNA
Fingerprinting
(Description)
Click on a
set of prints
Correct Match
Incorrect Match


The Kitchen Cabinet
Mrs. White
(Description)
DNA
Sequencing
Kenya Ajiri Tea
Thin Layer
Chromatography
DNA
FingerPrinting
Kenjan Ajiri Tea DNA
sequencing
Virtual DNA
Fingerprinting(Tea)
Thin Layer
Chromatography
(Description)
Open
BLAST
Next
Next
Opens
https://blast.ncbi.nlm.nih.gov/Blast.cgi
Results
TLC Results

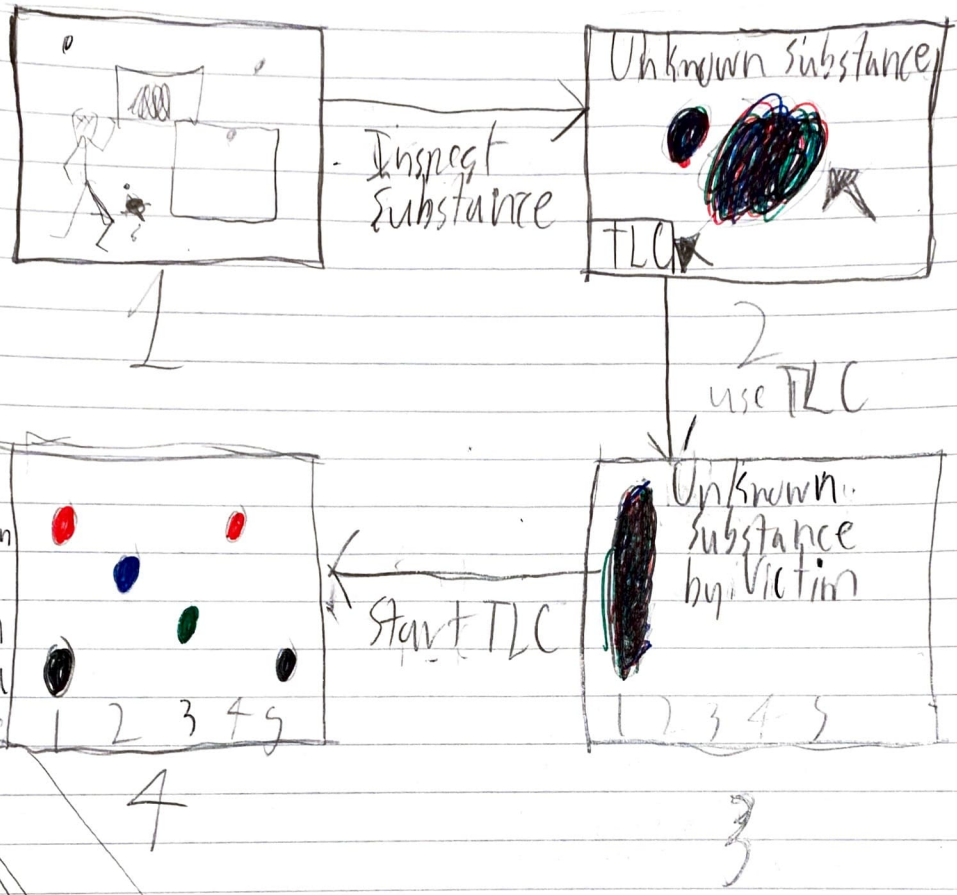

Fireplace
Pipe
(Description)
Dust for
fingerprints
DNA
sequencing
Print Results
Pipe DNA Sequence
Open
BLAST
Opens
https://blast.ncbi.nlm.nih.gov/Blast.cgi
Click on a
set of prints
Correct Match
Incorrect Match
Professor Plum
(Description)


aph
ion)
Mask
(Description)
Vial
(Description)
War Buddies
(Description)
DNA
sequencing
Pipe DNA Sequence
Colonel Mustard
(Description)
Open
BLAST
Opens
https://blast.ncbi.nlm.nih.gov/Blast.cgi

Finger Print Scanner Runtime State Machine



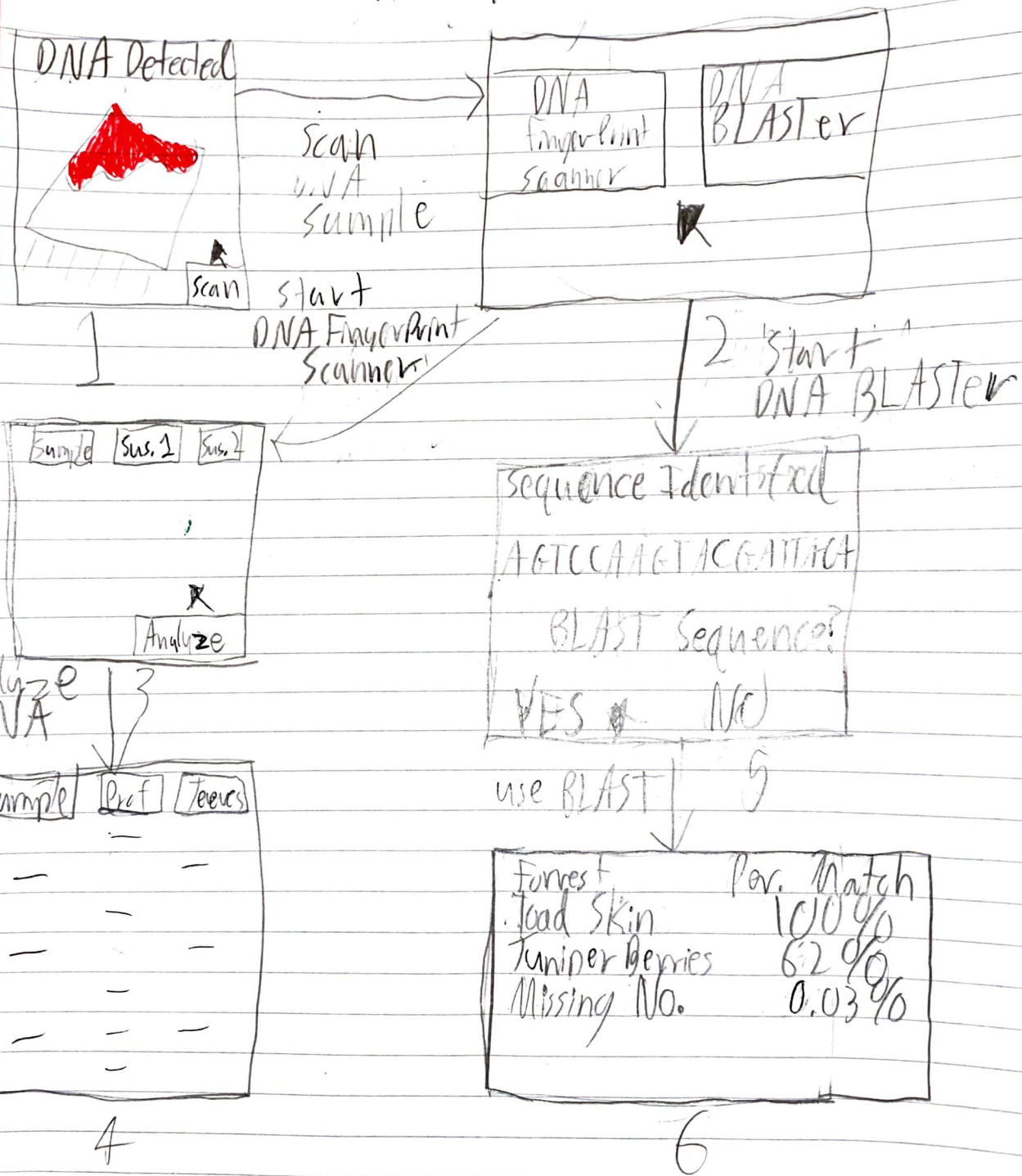
Thin Layer Chromatographer Runtime State Machine



Key
1. Unknown
2. Ricin
3. Poison
4. Vanilla Cake
5. Chocolate Frosting

DNA Finger Print scanner and DNA BLASTer

Runtime state Machine



Ethical Issues:

One potential issue that our team has noted with this project will be the accuracy of the biotech simulations to their real life counterparts. While our team is composed of many skilled programmers, none of the current members have much knowledge in Biotechnology. And while we can think of a way to make the simulations entertaining for the players to use, that doesn't mean that the most entertaining simulation will be the most accurate. To ensure that our simulations are fun to use, while also being accurate to their real life counterparts, we will be sharing our biotechnology simulations with Dr. Treml to review the simulations for their accuracy, especially when our goal is to develop an application that can be educational for the players to use to learn more about biotechnology.

Intellectual Property Issues:

As far as Intellectual Property Issues goes, there will be some potential issues with the images and assets we will utilize as part of our project for backgrounds and objects within the game. In the powerpoint version of Murder Mystery, much of the assets used stem from the 2 images use for the kitchen and study hall rooms, that also contains the objects that the players can interact with. The fireplace image used for the study hall and scene of the crime has been rarely used, and doesn't appear to be copyrighted from the few websites the image was used in. However, The Kitchen image has been used previously by the Spilsbury company in a jigsaw puzzle, but the image itself has not been copyrighted by Spilsbury or by the images author. If these images and others we use do happen to be copyrighted, the best workaround to this issue would be to develop our own original assets. This can also be resolved as well if our team or Dr. Treml happens to recruit a graphics team to design the image assets for the rooms and objects.

Changes Log:

- **Project Milestones:**
    - Addition of DNA Sequencing Tech simulation:
        - After our team developed the Murder Mystery flowchart, we realized we had been confusing the DNA fingerprinting simulations and DNA sequencing simulations for being the same thing.
        - So this task was added to the Spring Semester under BioTech simulations to develop after DNA fingerprinting.
    - Adjustment of Milestone Dates:
        - All milestones past Spring Semester Biotech Simulations had due dates pushed back 2 weeks as a result of the addition of the DNA sequencing milestone.
    - Moved Project Budget Section above Project Milestone Section:
        - Formatting changes and Page breaks were inserted to keep sections and paragraphs together inside single pages.
        - Project Budget was moved up in order to more easily fit with the other sections defined from Initial Project Description.