Biology Learning Games Final Report
CSCE 606 Software Engineering
Team Name: Diamond Hands

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1. Summary

We were tasked with developing additional educational games for biology to stakeholders which would include, but is not limited to the middle schoolers playing the games, the webmaster and the teachers for the class. We decided to create two new games for this purpose: Category game, and Word Search. Our two games provide new, challenging, and engaging content to the students.

Category game challenges the player to separate a bank of words into two different categories based on what property the word has (for example, the two categories might be virus, and animal). Word search allows the player to try and find biology related words. By the end of our development period, we completely implemented the two games and integrated them into the live environment.

2. User Stories

2.1 User stories related to the Sort Game

1. As a player, I want the categories in the game to be selected in a random order. (Points: 2, Status: Complete)
2. As a player, I want the words in the bag of words to be selected in a random order. (Points: 2, Status: Complete)
3. As a player, I want the hint from the Category game to be selected in a random order. (Points: 2, Status: Complete)
4. As a player, I want the words in the Category game to be dragged and dropped in the appropriate locations. (Points: 3, Status: Complete)
5. As a player, I want to see words clearly. (Points: 1, Status: Complete)
6. As a player, I want to check whether I have the correct answer or wrong answer. (Points: 2, Status: Complete)
7. As a player, I want to play the sort game again when I click the “play again” button. (Points: 1, Status: Complete)
8. As a player, I want to see the score that I make in the Sort game. (Points: 1, Status: Complete)
9. As a player, I want to set the number of challenges that I can have in the sort game. (Points: 1, Status: Complete)
10. As a player, I want to play Sort game with words from the cell biology, ecology, infectious disease, and stress module (Points: 2, Status: Complete)

2.2 User stories related to the Word Search Game.

1. As a player, I should see an 11x11, randomly generated letter grid for each game. (Points: 3, Status: Complete)
2. As a player, I should not see the exact same word list for each game. (Points: 1, Status: Complete)
3. As a player, I want to select letters in the letter grid to find words. (Points: 2, Status: Complete)
4. As a player, I want to unselect letters in the letter grid. (Points: 1, Status: Complete)
5. As a player, I want to check whether I have the correct answer or wrong answer. (Points: 1, Status: Complete)
6. As a player, I want to select the difficulty of the game. (Points: 1, Status: Complete)
7. As a player, I want to play the Wordsearch game again when I click the “play again” button. (Points: 2, Status: Complete)
8. As a player, I should not see the word list in “Hard” level. (Points: 1, Status: Complete)
9. As a player, I want to see a message once the game is over to be notified whether I win or lose. (Points: 1, Status: Complete)
10. As a player, I want to play a WordSearch game with words from the cell biology, clinical trials, ecology, infectious disease, and stress module. (Points: 2, Status: Complete)

3. Development and Management

3.1 BDD/TDD

The way that we went about testing our code was through Jasmine as well as running it in multiple browsers. For the Jasmine testing we put one member in charge of writing the test code. The dedicated tester heavily modelled the test code after the previous group’s test code. We also tested both games in Microsoft Edge, Google Chrome, and Mozilla Firefox. We tested the code in mobile environments as well, but did not have enough time to get both games working optimally for mobile devices.

3.2 Configuration Management

For our configuration management we used github in order to keep the code and iterations organized. We had a couple of spiked branches for choosing the score or life feature for Sort Game. We chose to include both instead of choosing between them, so

we killed that branch. Most of our pushes were to the main branch since we were usually working together and coordinating pushes through discord communication in order to mitigate issues. We had no issues with using github.

4. Iterations

4.1 Iteration 0 (Points Completed: 0)

1. Organized our team and layed out meeting schedule
2. We contacted the customer in order to get a better understanding of the requirements
3. We designed some lo-fi UIs and ideas for various games to implement.
4. We acquainted ourselves with the legacy code as well as JavaScript.

4.2 Iteration 1 (Points Completed: 3)

1. We narrowed down our game selection to a Word Search Game and a Word Sorting Game.
2. We confirmed the requirements and decided to focus on the implementation of new games and to not deal with the previously created games
3. We divided our team into 2 groups: 1 group to work on the Sort Game and another for the Word Search Game
4. We created a basic UI for the Sort Game.
5. We implemented a random feature in category selection in the Sort Game.

4.3 Iteration 2 (Points Completed: 20)

1. We implemented the majority of functionality for the Sorting Game:
    a. Drag and drop words to move between word bag and categories
    b. Score and life system to make playing more rewarding
    c. Hint system using definitions and category
    d. Winning state if all words sorted correctly
    e. Losing state if player runs out of lives
    f. “Play Again” functionality
    g. Random Words Selection

    h. Properly checking if all words are sorted
    i. Data for cell biology, ecology, infection disease, and stress
2. We implemented the base code for the Word Search Game:
    a. Randomized matrix of letters
    b. Words embedded horizontally, vertically, and diagonally in letter matrix
    c. Difficulty settings (Word bank doesn't appear on hard)
    d. Word remaining count
    e. Word bank
    f. Game reset feature
3. Began writing test cases in Jasmine
4. Started Looking toward deployment

4.3 Iteration Final (Points Completed: 8)

1. We implemented a random word selection feature for Sort Game. The feature selects about 60% of the words in a category.
2. We finished implementing the rest of the Word Search Game
    a. Word Submission to check answer
    b. Unselecting letters for submission
    c. Lives and word count now working properly
3. We deployed both games to Stepstone
4. We tested both games on and off Stepstone

5. Customer Meetings

- April 8th, 2021, 2:00 P.M.
  This meeting occurred for Iteration 0 and we had a meeting with Dr. Walker who was our primary point of contact from the customer side. In the meeting, we received an overview of the project. The prior task of the project we were given was developing new games that are not part of the legacy project, and that helps in reinforcing the learning of biology concepts of 6th grade students which are relatively simple and easy to understand. Also, the customer wanted us to

develop generic templates for the games, so that it can be reused easily for other subjects and modules. The goal of the project was to deploy our games on the StepStone learning environment in the modules

- April 15th, 2021, 2:00 P.M.
  This meeting occurred for Iteration 1. We received feedback on our game ideas. Due to the short schedule, we were encouraged to select two games from our game ideas. We and Dr. Walker agreed on implementing a categories based game and a word search game in this project. We received advice to have a meeting with the web-master to achieve information about deployment.

- April 21st, 2021, 5:30 P.M.
  This meeting occurred for Iteration 2. We gave a demo for the first iteration of Sort Game and received positive feedback.

- April 28th, 2021, 5:30 P.M.
  We gave a demo for the Sort Game and Word Search Game. We received feedback to improve the usability of the game by making the text more readable in Word Search Game. We also received advice to contact Daniel Shuta to deploy our games in the StepStone Learning environment. Dr. Walker gave us information about the final report and the final demo/presentation video. We received some advice for creating a report of a legacy project.

6. Issues

One of the main issues that we ran into as a team was not having enough time. Due to the shortened project duration as well as some issues getting organized at the beginning of the project, we did not have as much time to develop and test our new games as we would have liked. With this being the main issue some other more specific issues stemmed from it. Since we were short on time we were unable to get a couple of features working.

For the Sort Game we were unable to get the drag and drop feature to work on touch controlled devices, making it unplayable on mobile. For the Word Search Game we were unable to get some features related to the buttons to work. For example, we would have liked to make it so that any confirmed correct word was unable to be altered. We also would have liked to make it so that words could share letters in the letter matrix so that it would be more like a traditional word search. Due to time constraints however, we were not able to implement these features.

7. Legacy

Our project was originally implemented by previous teams who would continuously add more features onto the web platform. Our project was thus a legacy project, and required additional considerations. Most of the code and associated documentation was effective enough to understand what was happening, although there were a few spots which took some time to figure out.

We never actually needed to modify or refactor much in the legacy code, aside from a small bug present in a previous game. All of our additional functionality simply required an additional page to be created, and the javascript to be written from scratch. Our analysis of the legacy code did prove to be fruitful, as we were able to shorten the time needed to develop the new games by referring to design patterns previously used.

8. Logistics

8.1 Team Roles

Product owner: Sun Yul Lee
Scrum master: Jack Shirley
Team member: Brady Testa, Logan Keim, Mounika Kunduru, Varsha Venkataramu, Whittney Ford

8.2 Project Resource Link

StepStone developer: Daniel Shuta, dshuta@cvm.tamu.edu

Pivotal Tracker: https://www.pivotaltracker.com/n/projects/2495416

Legacy GitHub: https://github.com/JainRohitLive/CellBiologyLearningGames

Current GitHub: https://github.com/LoganK64/CSCE_606_BiologyLearningGames

Project Demo Video: https://www.youtube.com/watch?v=3Kkozn36ero

TAMU Vetmed One Health Modules: https://vetmed.tamu.edu/peer/one-health/

9. Tutorials on Deployment on StepStone

Before going into the deployment phase, apps should be tested on StepStone. The details of testing apps in StepStone can be found on Page 15, Tutorial 2 in this report. To test apps, you need to upload your app's folder on FTP server. After modifying the json file in the same way as in the report, you can view your app in the testing environment. The link for the testing environment is https://futuredogter.com/stepstone/playerShell.php?org=CET&sys=public.Latest&pool=TAMU-CET-1&resourceloc=www.futuredogter.com&resourceavatar=NIH-SEPA-1&resource=sample1&ppj=1_1_40

After the games have been uploaded on the FTP server and successfully tested in the StepStone testing environment, you will need to contact Daniel Shuta (dshuta@cvm.tamu.edu) to deploy the games to the production server. Daniel Shuta is a main contact for the purpose of deployment from the StepStone system in this project. You will need to provide 4 fields to Daniel to deploy the apps into the production server.

- Module ID: module ID present in the main StepStone authoring system. For example, module ID for the cell biology module is "SEPACellBio".
- Path ID: ID of the path of your app in the module. For example, path ID for cell biology learning games is "practice".
- Step ID: ID of the step of your app in the path (You will need to contact Daniel to figure out a valid step ID for your apps.)
- Mini-app: Name of your app folder in FTP server