CSE1105 HCI Report

Group 60 on 04/03/2022

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Introduction

With the rise of technology and its complexity, it often becomes a challenge for the average user to navigate and utilize new technological innovations. When UI/UX designers are invested in developing advanced high quality services, human computer interaction is an important subject for the end user experience (*What is human-computer interaction (HCI)?*).

According to Wikipedia, human-computer interaction (or HCI for short), is the interdisciplinary field which focuses on the way humans interact with computer technology and vice versa. This includes observing, optimizing and developing new means of interaction between humans and computers. As an interdisciplinary science field, it ties together several other major fields, which include, but are not limited to: computer science, psychology and engineering (*Human–computer interaction* 2022).

The design and interface requires an evaluation for practical usage. The objective of our evaluation is to assess the usability, user experience and overall design of our application. We will gain insights on how the user will navigate our app and what we can do to guide them throughout the application. Our responsive prototype, available here, is designed using Figma (an online collaborative UI design tool). Appendix A contains screenshots of relevant scenes and the fixes we implemented after the HCI evaluation.

Methods

Experts

In order to catch and fix potential usability issues with our application we recruited a range of experts from different fields (Beale & Howes). Since other student teams were developing the same game for this course in parallel to us, we asked one of those groups to review our work. The team of six students acted as both developers and users. Additionally, we asked some of our friends and family members who have experience as particular types of stakeholders to participate in the review process. Altogether, we had 10 people acting as:

- users (10)
- developers (7)
- designers (2)
- marketing specialists (1)

The stakeholders' experience varied significantly, with some developers being novice, while others having extensive experience. We decided it would be very valuable to also include specialists from game development related fields, so we chose two designers and a marketing specialist to gather more targeted and detailed feedback. These experts presented a very high level of expertise in their respective fields.

Procedure

We designed two evaluation procedures for the two groups of stakeholders - the parallel student team, and friends and family members (Beale & Howes). The first group was interviewed both individually and collectively by our entire team:

1. We split up the experts with one overseer each that would guide them in case of difficulties.
2. We briefly showed the design and explained how each view is connected.
3. We let the experts navigate by themselves in the prototype UI.
4. We collected their oral feedback during their real time experience.
5. We asked them to answer a questionnaire to get quantifiable data.
6. Finally, we asked the entire group to collectively provide general feedback on the areas which they felt needed the most work.

We have instructed the experts on what to do by following Nielsen's usability heuristics (Pribeanu, 2017):

1. Visibility of system status.
2. Match between system and the real world.
3. Consistency of the graphical design.
4. User control and freedom.
5. Error prevention.
6. Recognition rather than recall.
7. Flexibility and efficiency of use.
8. Help users recognize, diagnose and recover from errors.
9. Aesthetics and minimalist design.
10. Help and documentation.

The developer experts were already familiar with the application specifics, therefore their evaluation of user errors and recoveries wouldn't be particularly reliable, as they already knew what to expect from the controls.

Measures (Data collection)

We are measuring how intuitive and friendly the user experience is when the player is using the application for the first time. To do so we're recording the solutions to each heuristic and asking the experts on feedback regarding how our application handles the said points. We are collecting a large amount of data from our experts with the purpose of enriching the user experience of our app. The main aspects that we are measuring are the intuitiveness of our

application and how friendly it is to new users. The data collection tactic that was applied can be split up into two stages.

The first stage is denoted by the oral feedback that was given by each expert while reviewing the app in real-time. This feedback was noted and formalized in order for it to be implemented in the final design of the application.

The second stage is denoted by each expert filling out our review form individually. The form is meant to maximize the amount of information that we can extract from every expert. It's composed of 22 different questions that aim to give a good overview of the experience that the expert had while exploring the app. It also helps pin-point where most of the usability problems arise. We have aggregated these two forms of feedback in order to have a good understanding of what usability problems to prioritize and which are less important.

Results

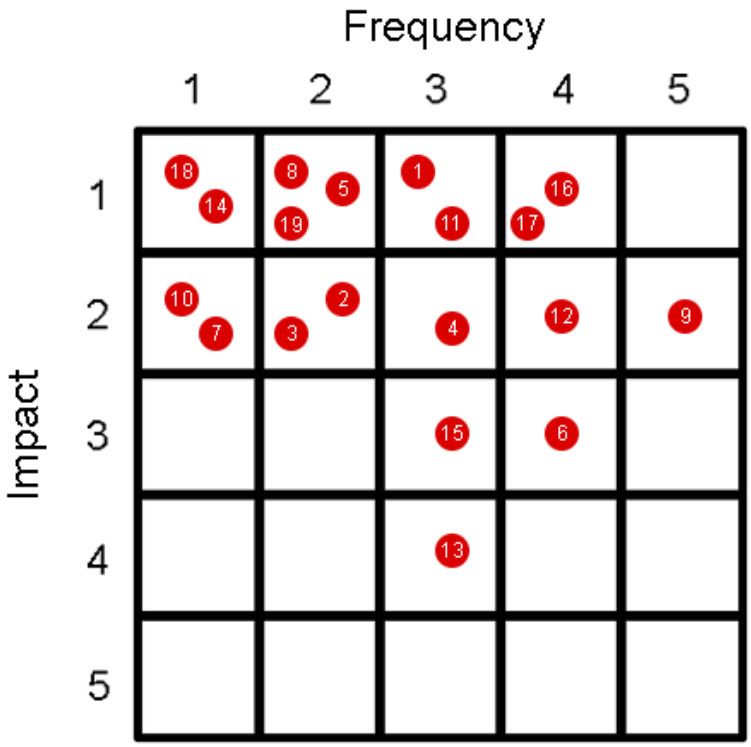
The quantitative data from the questionnaire is available in Appendix B. We applied a statistical analysis procedure on the data using the average of the points and the standard deviation of the data (Lee, D. K., In, J., & Lee, S. 2015). Our average for all the points is 8.54 with lowest scores for design consistency and highest for intuitiveness. Questions 7, 8, 17, and 18 had the highest standard deviation, indicating issues with intuitiveness of power-ups and the design of lobby and game scenes. The lowest score given was a 3 for the consistency (question 18), while almost everyone agreed that the authentication scene was extremely intuitive (question 21). Unfortunately, we did not gather enough data from different types of stakeholders to be able to discern what problems were under/overreported by specific types of stakeholders.

We also received a lot of descriptive feedback when talking to experts. Overall, 19 points have been made with various levels of frequency (as indicated in the brackets at the end of the point):

1. The login screen design and the lobby screen design are completely different in style. (4)
2. The amount of points awarded for answering a question is not visible while the game is being played. (3)
3. There is no back button on most of the screens. (3)
4. The game settings should be less prominent in the lobby screen. (2)
    - suggestion: move them to a sidebar.
5. The design becomes clustered when a lot of players have joined a lobby. (2)
    - suggestion: add a scrollbar.
6. The design becomes clustered when a lot of players are participating in a multiplayer game. (2)
7. In the game page: the round edges are not consistent. (2)

    - suggestion: show an icon with for example “+10” instead of all the user’s pictures.
8. It is not clear how to join a lobby. (2)
    - suggestion: there should be a “join” button, clicking on the lobby’s name should just toggle the settings description.
9. The questions might look better with a picture associated. (2)
    - suggestion: put a picture on the side of the question’s text, it can be from the activities (for estimate and multiple choice questions) or a simple question mark (for questions where an activity picture might give insight in the answer).
10. The rules of the game are never explained. (1)
    - suggestion: add a view accessible from the main screen that shows the rules and explains the pages.
11. The leaderboard shown during the game closes automatically, but it doesn’t show a timer. (1)
12. The “new lobby” button was confused for a “search” button. (1)
    - suggestion: have a search function in the lobby page and move the “new lobby” to a different place.
13. Single player mode implemented in the design making a single player lobby is not intuitive.
    - suggestion: make a separate button for single player games. (1)
14. The powerups are not explained, could do some mouseover text or a button to show how the powerups work. (1)
15. It isn’t clear when power-ups aren’t available (1)
16. Show the ingame leaderboard for a longer amount of time. (1)
17. Show the emoji/powerup selection screen when hovering above the icon (as opposed to it requiring a click). (1)
18. Configuration of the lobby should be displayed in the list of lobbies (at least important information such as gamemode, number of questions, etc.). (1)
19. The ‘H’ in Wh is capitalized, which is wrong. (1)

We classified these points according to their frequency and impact on the usability to create a priority matrix shown below. This matrix highlights that issues 4, 6, 9, 12, 15 are the most problematic.



The priority matrix of the usability problems

Conclusions & Improvements

Human computer interaction is an important subject when designing and developing technological innovation. The evaluation by experts indicates the experience and usability of the design (*Why is human computer interaction important?*). After providing experts with our design, we in return got feedback. Received feedback data shows a clear skew (Bouganim, 2009). In the first stage, the overall feedback is heavily skewed towards the negative feedback - meaning that the *vast majority* of the data points represent negative feedback (opportunities for improvement). In the second stage, however, the collected quantitative data is skewed towards the positive numbers - the average "agreement rate" is always above 6.5.

From the quantitative data, we can deduce the deviation and trend of usability. The data indicates that the experts were mostly aligned in their feedback and had similar experiences with the design. For example, all experts were aligned in views when asked if they found it easy to leave the game. However, for a few specific interactions with the UI, opinions differed. There were different views on the consistency and pleasantness of the design and theme of the UI. The quantitative data provides vital feedback of the experience of different experts using the same application as we aim to provide a uniform and high satisfaction experience.

After receiving feedback, the following points came forward to reflect and change:

Some parts of the interface are inconsistent. The clarity of the lobby scenes needs to be improved, as the font size isn't big enough, and some buttons aren't visible enough. Although it's difficult to implement transitions in Figma, we've also got indications that some of the elements (i.e. active power ups, leaderboard leaders) should be given special effects and transitions to increase visibility. In order to fix these problems we will:

- standardize the color scheme, and change the yellow color to be a bit darker
- by default hide additional, more specific information (like game settings), and allow users to access it when needed by unfolding a menu
- make sure all rectangular forms have uniform border radius
- utilize 3rd party JavaFX libraries that add special effects

Combined, these improvements should make the application more consistent and legible. Users will be able to access data and functionalities seamlessly, and be able to focus on the gameplay rather than the UI. It will also make our bonus features easily discoverable. We will also have implemented thorough warning systems for invalid/unsupported operations and server errors, e.g. when API endpoints return 4xx/5xx codes. This is reinforced by improvements in:

- visibility of the systems status, as more data is apparent and legible without cluttering the interface
- consistency in the graphical design, as used controls and the chosen color theme will be more coherent
- user control and freedom, with players easily utilizing more advanced features
- diagnosing and recovering from network errors, having more specific, human-readable feedback on the source of the problem

These improvements were made to the UI design and the changes can be viewed in Appendix A. These show the initial design and the improved design side by side. Through this process, we are able to have a higher quality, user friendly and a more successful application. The importance of human computer interaction is shown through the methodology, analysis of results and implementation based on analysis.

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Lee, D. K., In, J., & Lee, S. (2015). Standard deviation and standard error of the mean. *Korean journal of anesthesiology*, *68*(3), 220–223. https://doi.org/10.4097/kjae.2015.68.3.220

Pribeanu, C. (2017). A Revised Set of Usability Heuristics for the Evaluation of Interactive Systems. *Informatica Economica*, *21*(3/2017), 31-38. doi: 10.12948/issn14531305/21.3.2017.03

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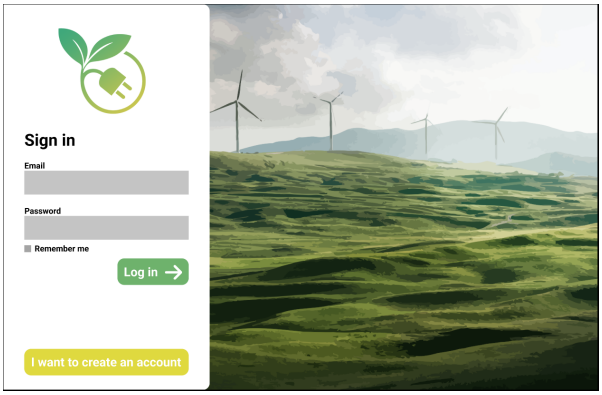
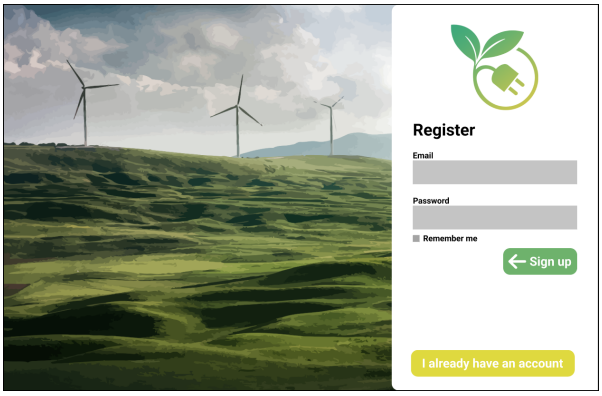
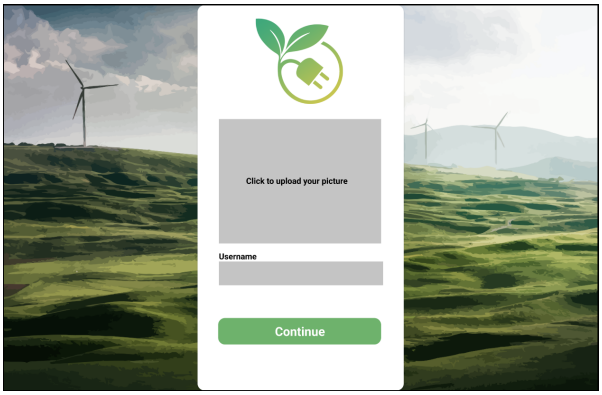
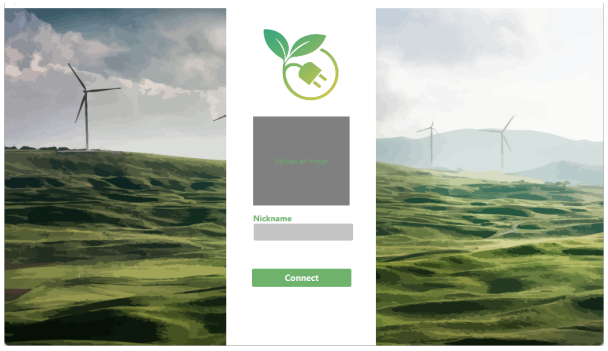
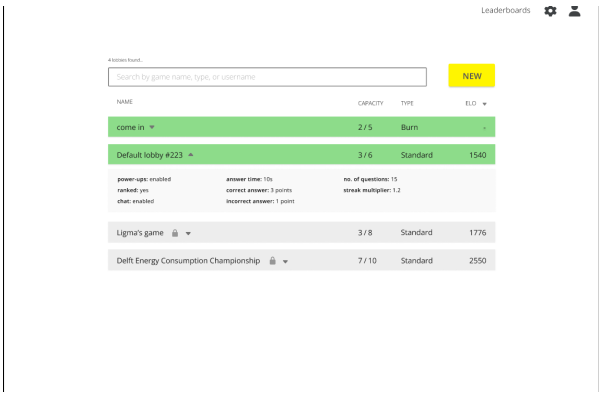
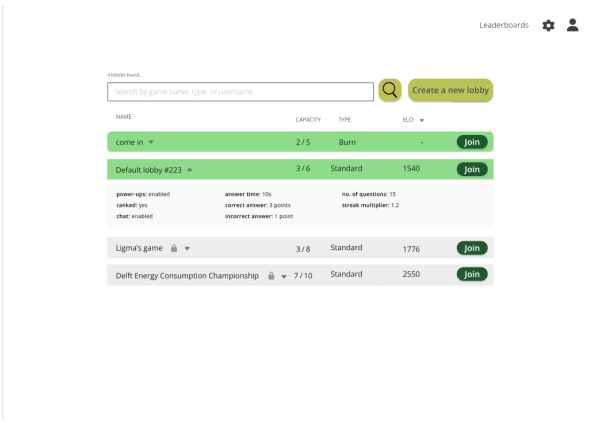
Wikimedia Foundation. (2022, February 22). *Human–computer interaction*. Wikipedia. Retrieved March 4, 2022, from https://en.wikipedia.org/wiki/Human%E2%80%93computer_interaction

Appendix A - UI Design

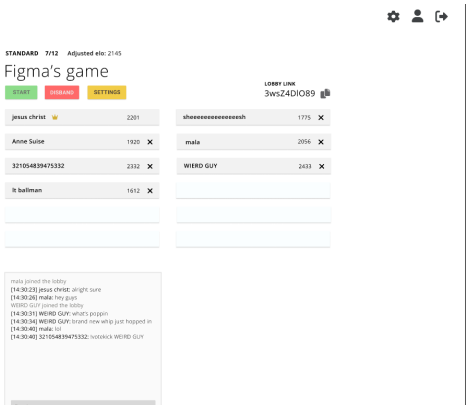
UI Design	UI Implementation/Plan
 Login Page	 Login Page
 Registration page I	 Registration Page I
 Registration Page II	 Registration Page II



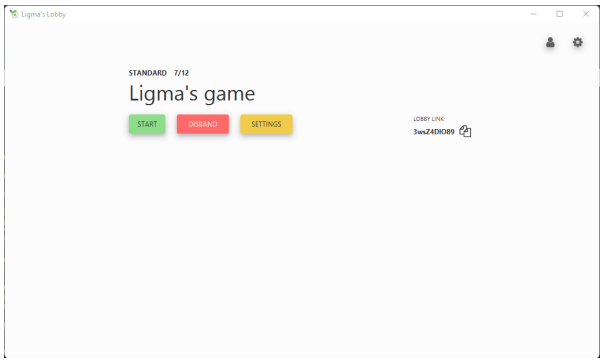
Lobby List Page



Lobby List Page (Planned)

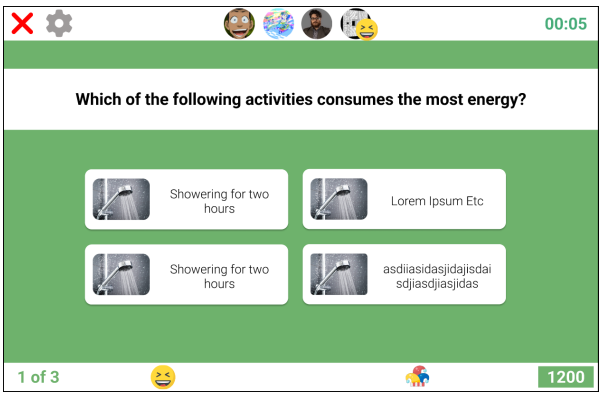


Lobby Page



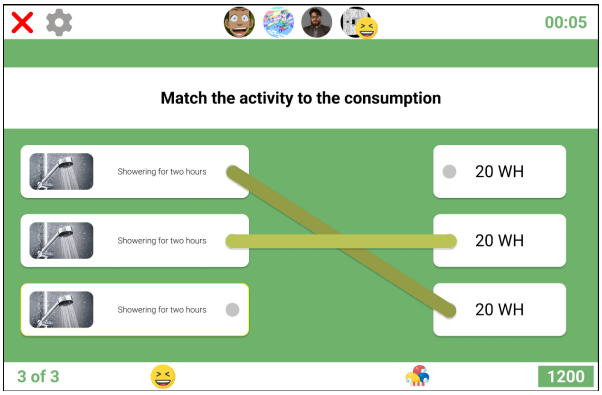
Lobby Page

Config Page

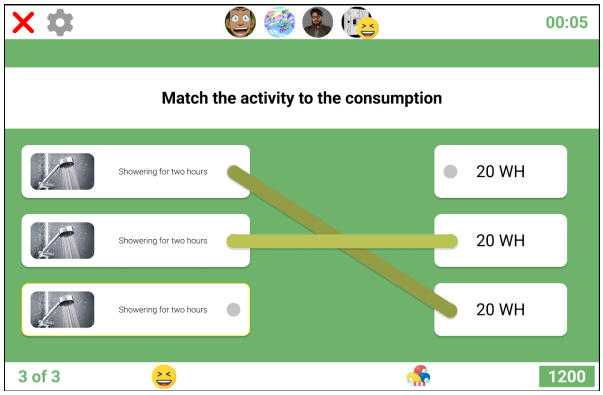


Multiple Choice Question

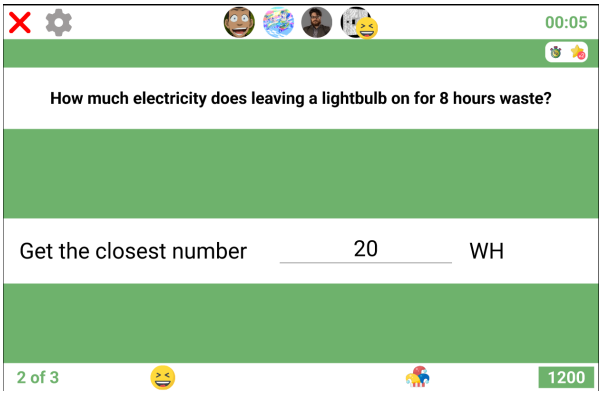
Multiple Choice Question



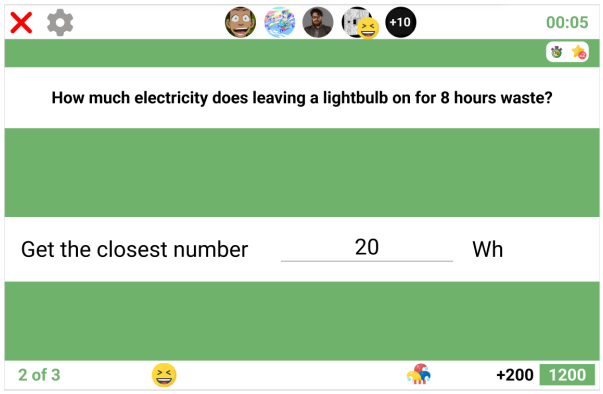
Match Question



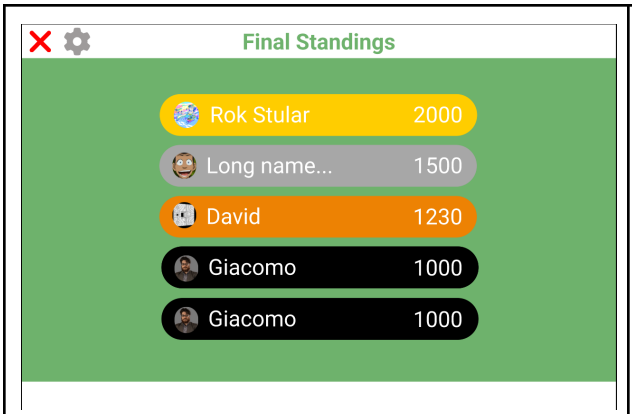
Match Question (Planned)



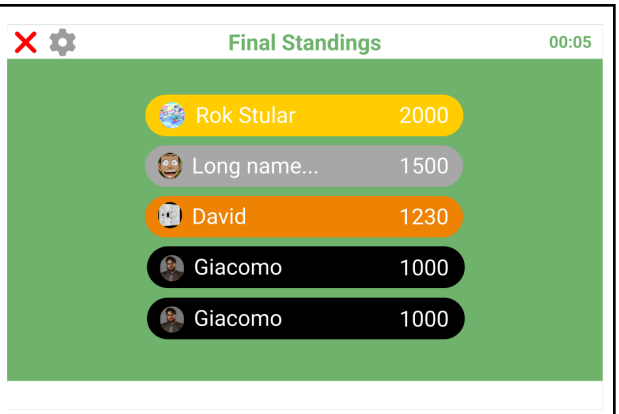
Estimate Question



Estimate Question (Planned)

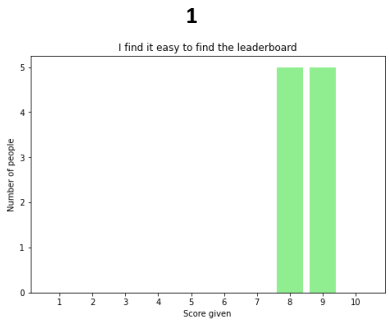


Leaderboard

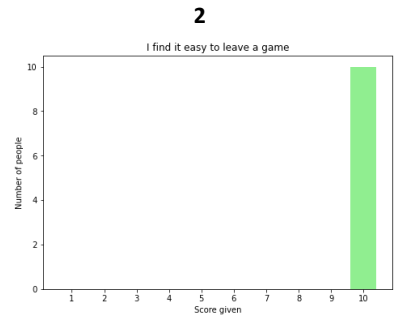


Leaderboard (Planned)

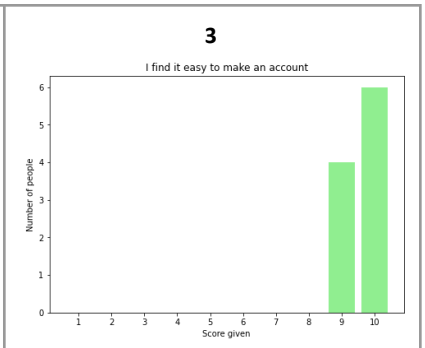
Appendix B - Survey Results



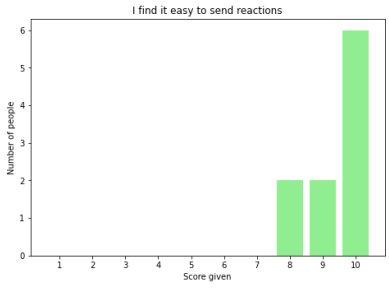
I find it easy to find the leaderboard



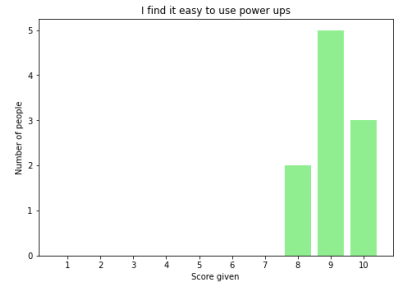
I find it easy to leave a game



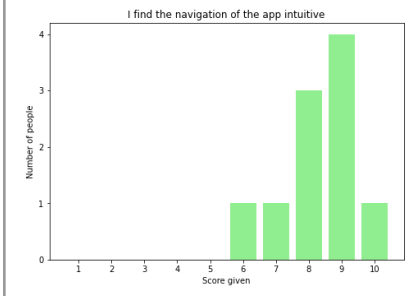
I find it easy to make an account



I find it easy to send reactions

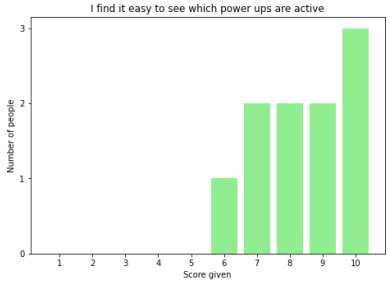


I find it easy to use power ups



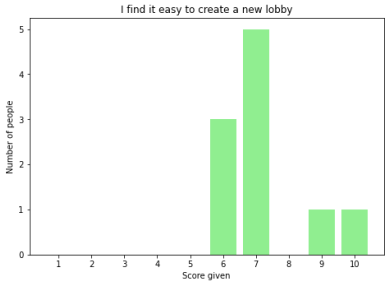
I find the navigation of the app intuitive

7



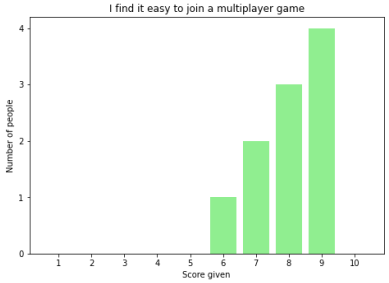
I find it easy to see which power ups are active

8



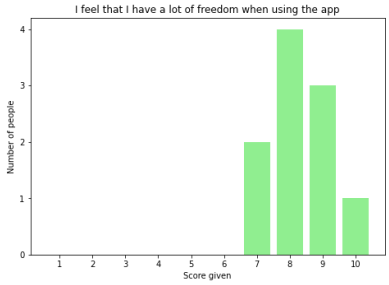
I find it easy to create a new lobby

9



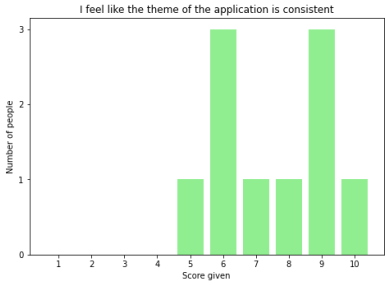
I find it easy to join a multiplayer game

10



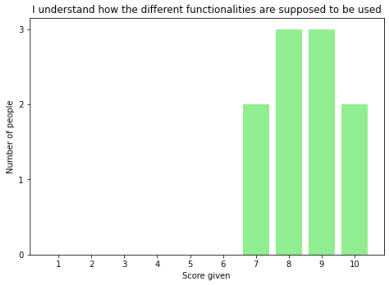
I feel that I have a lot of freedom when using the app

11



I feel the of the application is consistent

12

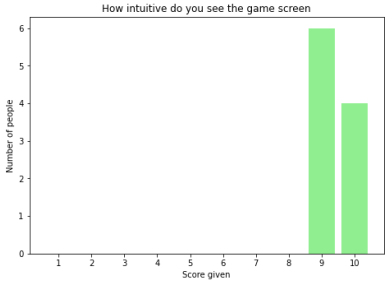


I understand how the different functionalities are supposed to be used

13

I feel like the interface is consistent

14

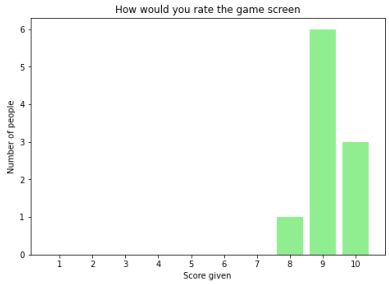


How intuitive do you see the game screen

15

How pleasant do you find the design of the game screen

16

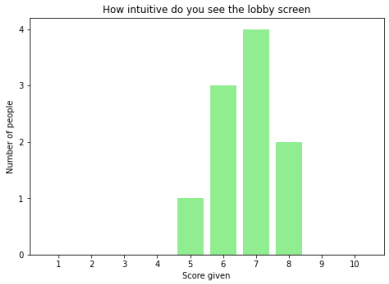


How would you rate the game screen

17

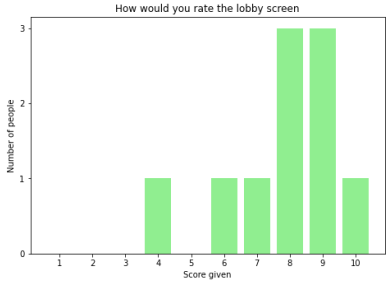
How pleasant do you find the design of the lobby screen

18



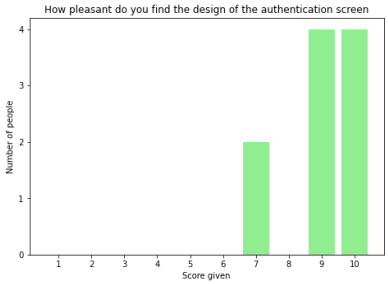
How intuitive do you see the lobby screen

19



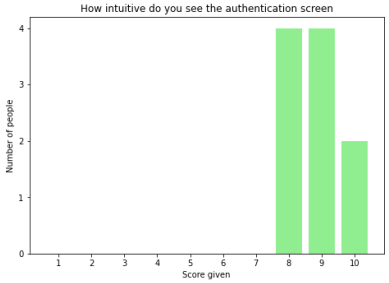
How would you rate the lobby screen

20



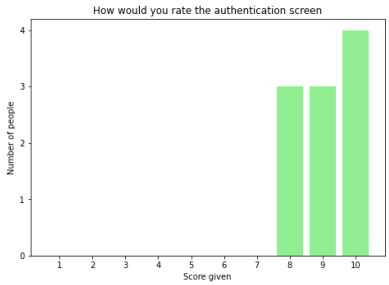
How pleasant do you find the design of the authentication screen

21



How intuitive do you see authentication screen

22



How would you rate the authentication screen