HCI Assignment

Introduction:

This paper presents a heuristic evaluation based on the basic principles of human-computer interaction[1] on a quiz-type application prototype[2]. The main objective of the paper is to describe the problems of the system and design while also including an overview of the feedback, evaluation of the system, and possible improvements made to ensure a great quality of the application.

The prototype presents only the graphical user interface as the project is still in a preliminary phase, however, interactions are modeled using an online prototyping tool.[3] The final quiz should be a multiplayer one (however you as a player could be able to play it alone). It should consist of 20 questions about comparing - using quantifiers - the energy consumption of everyday activities. The game should be interactive and fun to play for a group through the use of Jokers, emojis, and an overall leaderboard.

Methods:

Experts

The paper is based on a heuristic evaluation conducted by group 22 of the OOPP project of 2021/2022. Even though they are not experts in the field, the evaluators are all CSE students currently enrolled in the OOPP course who have prior knowledge regarding heuristic design. Group 22 consists of 6 students who have attended the Human-Computer Interaction lecture[4], completed a mock evaluation during that lecture, and thus are aware of the main principles as well as the process of the evaluation.

Procedure

The experts have been given a document with a step-by-step guide towards properly conducting the evaluation. They need to start by individually analyzing the GUI overview in the PDF file provided, as well as accessing the link for the interactive prototype that maps the actions and transitions between the scenes.

The GUI includes 19 scenes that present different stages of the game. First, we have the splash screen that shows the user the starting point of the game where we have two choices for playing (single player or multiplayer) and, also a choice for the user to see the single-player leaderboard. For the multiplayer and single-player, the game scene is composed of three different sections. The first includes the current score, the time remaining and the question number – on the top part of the scene. In the middle section, the user can see the actual question with the three choices for answering. For each of the possible answers, a suggestive picture and description are also added. The third section has buttons to send emojis on the left, and jokers are displayed on the right for the player to activate them during a round. Moreover, we included the prototype scenes for the waiting room, intermediary/final multiplayer leaderboards, and the results at the end of the game.

Each member is expected to evaluate the interface and find problems regarding the system, usability, design, and features of the project. We advised them to first look over the PDF to concentrate on design details and the overall look of the application. Next, they should try to access the provided link and play around with the mockups to understand how the application is supposed to work, the connections between scenes, the effect of the buttons, as well as other features. In the PDF we provided all these steps were clearly stated with the mention that we believe this whole process should be repeated at least three times for them to be able to give a precise and full review of the prototype. When finished, the whole team compares results, aggregates everything in a final document (the actual evaluation), and sends it to the developers.

Note that the evaluation should be given according to Nielsen's usability heuristics rules[5]

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

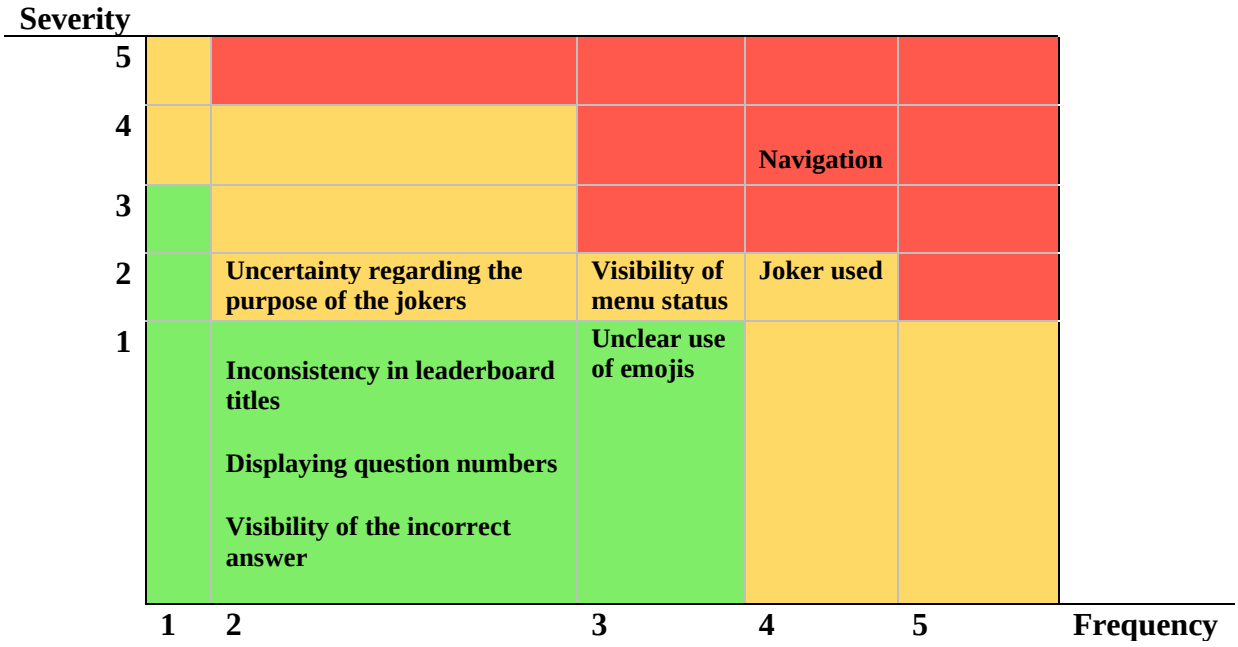
Measures

The experts need to report every user inconvenience that they are finding through the process of testing the prototype according to Nielsen's usability heuristics.[6] During the procedure, each expert will act as a heuristic evaluator: they will derive usability issues[7] based on each heuristic and will report the problems using the following format (Brinkman, 2021)[8]

1. Problem description: a brief description of the problem.
2. Likely/actual difficulties: the anticipated difficulties that the user will encounter as a consequence of the problem.
3. Specific contexts: the specific context in which the problem may occur.
4. Assumed causes: description of the cause(s) of the problem.

Moreover, the experts are required to determine what severity and frequency of these issues, on a scale of one to five, with five being 'always occurring' in the case of frequency and 'unusable' in case of severity.

The developers record their findings in a Prioritizing Severity matrix that underlines the aspects of the interface which require more attention from their part. The following matrix presents the results as provided by the evaluators.



Results

The following are all the points as given by the experts. To make these clearer to the reader these points have been:

- Grouped, in case of similarity

- Changed, to make use of the same terms

- Changed, to fit a fixed schema

- Filled with context, where this was missing

Navigation(User Control and Freedom):

Most navigational problems can be summed up with the following issue:

Problem: There is no undo/back action after selecting something.

Difficulties: If the player makes a wrong choice, they cannot go back (so they will have to quit the game).

Context: All points where a choice needs to be made (except questions).

Causes: Lack of ‘go back’ button.

Visibility of menu status (Recognition Rather Than Recall):

Problem: After continuing from the main screen to the single-/multi-player game starting (the screen requesting the user to provide the name), there is no information about what screen the user is on. The only way to distinguish them is based on whether the field Server IP is shown, but this may not be obvious for the user.

Difficulties: A user who forgot the choice they made, could be unsure what will be the actual result of pressing the Start/Join button.

Context: After selecting a game mode on the main screen.

Cause: Not title telling the player what screen they are on.

Uncertainty regarding the purpose of the jokers (Help & Documentation):

Problem: In the game screen, there are icons in the bottom right corner (Jokers), but it is not immediately clear what the purposes of these Jokers are. It will probably be clear that they are Jokers after using them, but a user seeing it for the first time may be confused.

Difficulties: The user seeing the icons for the first time may not know what the icons are and whether they are clickable (buttons) or only indicators. This may cause some confusion and may result in the user not using them initially.

Context: In the game screen.

Cause: Lack of explanation, lack of explicitly marking the icons as clickable buttons.

Inconsistency in leaderboard titles (Consistency & Standards):

Problem: Some of the leaderboard screen titles use only uppercase letters and some only lowercase letters.

Difficulties: No significant difficulties.

Context: Leaderboard screens.

Cause: Inconsistent formatting scheme

Unclear use of emojis (Help & Documentation):

Problem: The panel of emojis at the bottom left corner of the game screen has no clear indication of whether it can be pressed and what effect pressing it will have. It is also unclear how the panel functions in single player

Difficulties: Players may not realize that this is an interactive functionality, they may also be confused if an emoji reaction from a different player shows up.

Context: Multiplayer mode.

Cause: Lack of indication that the emoji are buttons

Displaying question numbers (Aesthetic & Minimalistic Design):

Problem: The numbers at the top right of the question screens appear to denote the question that is currently being played - however, this is not immediately clear, especially to a player who is in a fast-paced game and does not recognize this immediately.

Difficulties: The player may not know what question they are on.

Context: In the game screen.

Cause: Lack of indication of what the number represents.

Joker used (Recognition Rather Than Recall):

Problem: After clicking on a Joker there is no visible indication that the joker has been used.

Difficulties: A player may not know if they used a joker (this round).

Context: In the game screen.

Cause: No visible change to jokers after they have been used.

Visibility of the incorrect answer (Aesthetic & Minimalistic Design):

Problem: The red text messaging the user during the game that their answer was incorrect has a similar colour to the background

Difficulties: The letters in the incorrect answer become hard to read.

Context: In the game screen.

Cause: Background and ‘incorrect answer’ have roughly the same colour.

Conclusions and Improvements

Navigation
The main navigation issue, the lack of a “return-to-previous-page” button, would have made the application difficult to navigate and unpleasant to use, as the experts duly noted.

To address this, the developers will create a button that will be assigned to this action. When this is done, the user will be able to navigate the application in two directions - forwards and backwards - meaning that mistakenly entering a wrong section will no longer require a restart.

The button will be added in a non-interfering visible spot, for pages where this is needed.

Visibility of menu status

The evaluators noticed that the “write your name” screens for single- and multiplayer modes aren’t labeled, which may confuse users. The only way to tell them apart is to look for the “server-id” field, which is inconvenient and not necessarily intuitive.

To solve this issue, the “the final game” subheading under the game’s name will be changed into “single-player” and “multiplayer” for the respective pages. This way, the user will be informed of the current game mode, while the screen will not become more cluttered.

Uncertainty regarding the purpose of jokers

When a user is mid-round, they have the option to select one of three active jokers. It was noted by the evaluators that it is unclear what each joker does, and whether they are available during a round or not. From this, we conclude that there might be a better design choice to make regarding the way that jokers are presented to the users. In this stage of the design process, we have not decided on a final way to combat this issue, and are considering two approaches.

The first approach is to not explain what each joker does and let players discover the jokers’ functions for themselves.

The second approach would be including a subtle text box above the jokers’ section, explaining what each joker does. This would only appear the first time a user opens the application, but the user would also have the option to view these instructions afterwards.

Inconsistency in leaderboard titles

The column headings in the leaderboards are sometimes written in all-upper-case, and at other times differently. To solve this simple problem, the developers will change all column headings to all-uppercase, which should also improve readability.

Unclear use of emojis

The experts pointed out that the use of emojis is not explained in the application, so a user can be confused as to what purpose they serve. Furthermore, they do not have an apparent use in single-player mode.

The developers agree that the emoji section should be hidden in single-player. Moreover, the box containing the emojis will be slightly enlarged upwards, where a small piece of text declaring “Select one to react!” will be written. This will ensure that the user understands their function.

Displaying question numbers

The developers acknowledge that the way questions are numbered might be unclear to a new user. However, we believe that after playing a few rounds, the numbering system will become clear.

Jokers used

As the user progresses through a game, they might forget which jokers they have already used. This is an issue, because in the prototype design already used jokers are not visually different from used ones. To resolve this, the developers will introduce a feature that will "grey out" used jokers.

Visibility of the incorrect answer

The developers recognize that the similar coloring of background and text may be an issue. Thus, a semi-transparent box will be added behind the text messages informing the user of both correct and incorrect answers. This text box will be similar in appearance to the one containing the questions. With this feature, the developers hope to improve the visual experience of users and make the game more accessible.

Summary:

To summarize, most issues the experts found were aesthetic and might not apply to all users. The only truly navigational issue that was found by the experts was the lack of a "return-to-previous-page" button. (While the final version of the application would certainly be incomplete without such a feature, at this stage we did not deem it essential) The changes made by the developers are thus mostly minor cosmetic fixes, which will, however, greatly improve the user experience. The developers believe that with these improvements, they are ready to start working on the application.

References:

[1] G. Chao, "Human-Computer Interaction: Process and Principles of Human-Computer Interface Design," 2009 International Conference on Computer and Automation Engineering, 2009, pp. 230-233, doi: 10.1109/ICCAE.2009.23.

[2] *Gustavo F. Tondello, Dennis L. Kappen, Elisa D. Mekler, Marim Ganaba, and Lennart E. Nacke. 2016. Heuristic Evaluation for Gameful Design. In Proceedings of the 2016 Annual Symposium on Computer-Human Interaction in Play Companion Extended Abstracts (CHI PLAY Companion '16). Association for Computing Machinery, New York, NY, USA, 315–323. DOI:https://doi.org/10.1145/2968120.2987729*

[3]https://app.moqups.com/3tUl79QwuXbHw6m9t1FlHSKhXSunzW2q/view/page/ad64222d5

[4] TU Delft CSE1105 Lecture 3 [Nielsen, J. (1994). Heuristic Evaluation. In J. Nielsen, J., & R.L. Mack (Eds). Usability Inspection Methods (pp. 25-62). Wiley & Sons.]

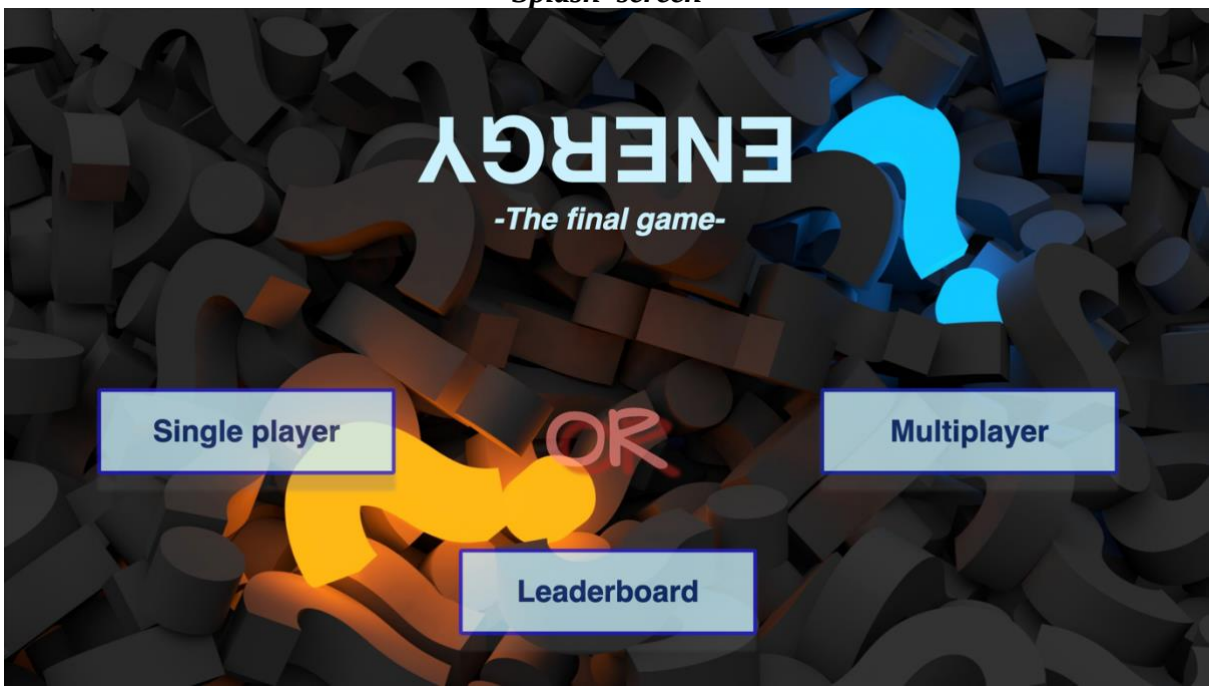
[5] Nielsen, J. (1994a). Enhancing the explanatory power of usability heuristics. Proc. ACM CHI'94 Conf. (Boston, MA, April 24-28), 152-158
https://nngroup.com/articles/ten-usability-heuristics

[6] Nielsen, J., and Molich, R. (1990). Heuristic evaluation of user interfaces, Proc. ACM CHI'90 Conf. (Seattle, WA, 1-5 April), 249-256.

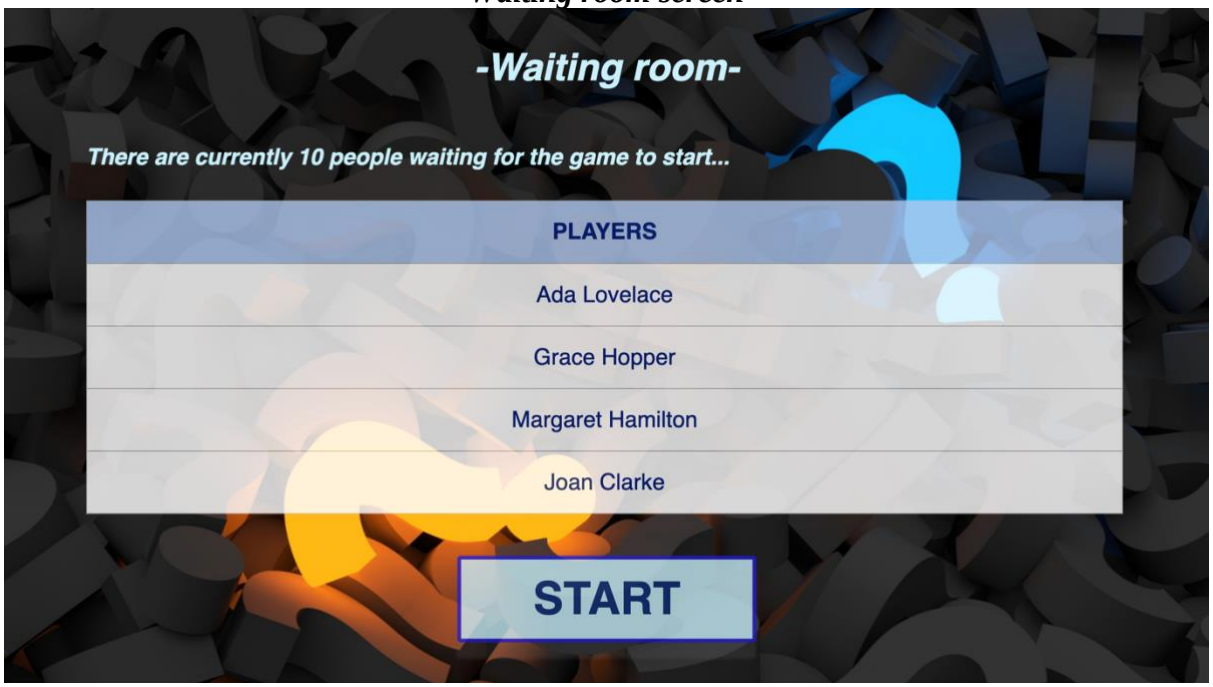
[7] Nielsen, J. 1992. Finding usability problems through heuristic evaluation. *Proceedings ACM CHI'92 Conference* (Monterey, CA, May 3-7), 373-380.

[8] Brinkman, W.-P., & Tielman, M. (2021, February 13). Heuristic Evaluation [Slides]. Brightspace.
https://brightspace.tudelft.nl/d2l/le/content/399695/viewContent/2337143/View

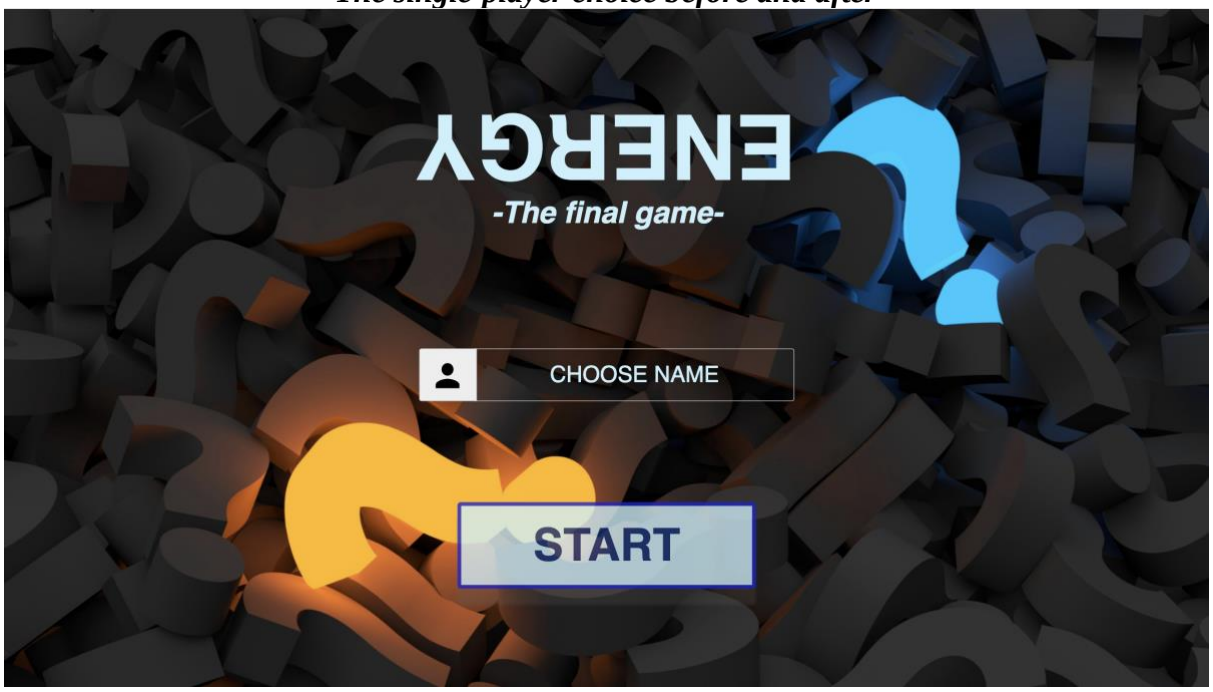
Splash screen



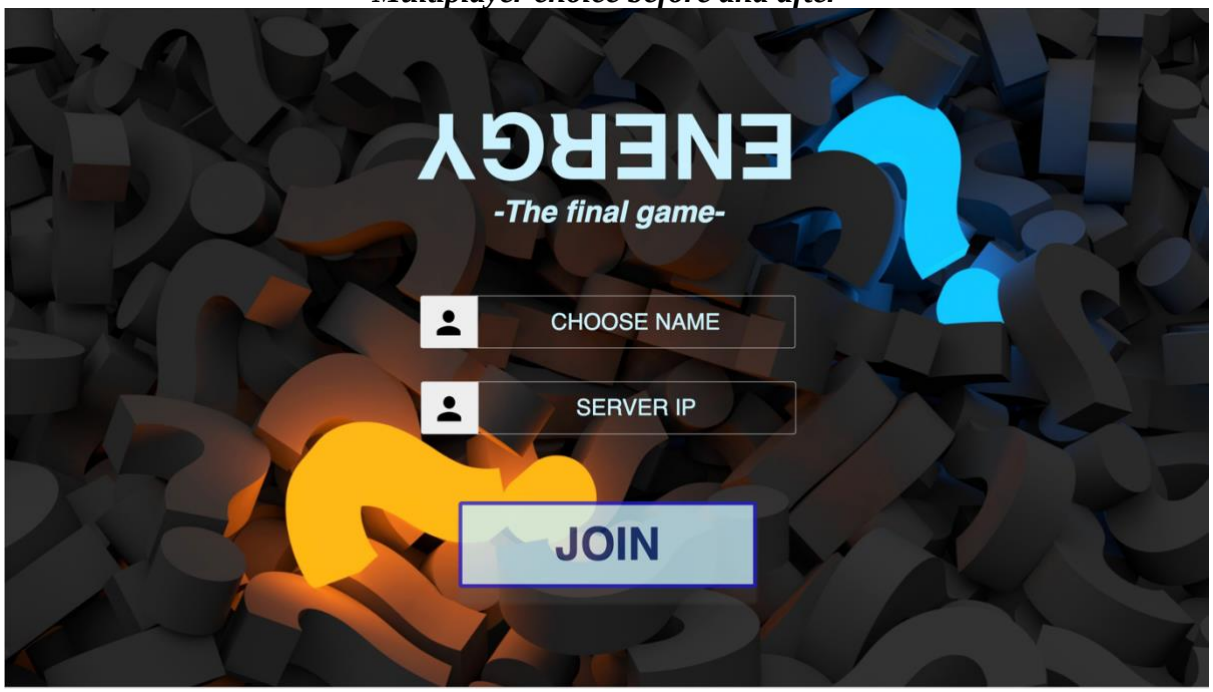
Waiting room screen

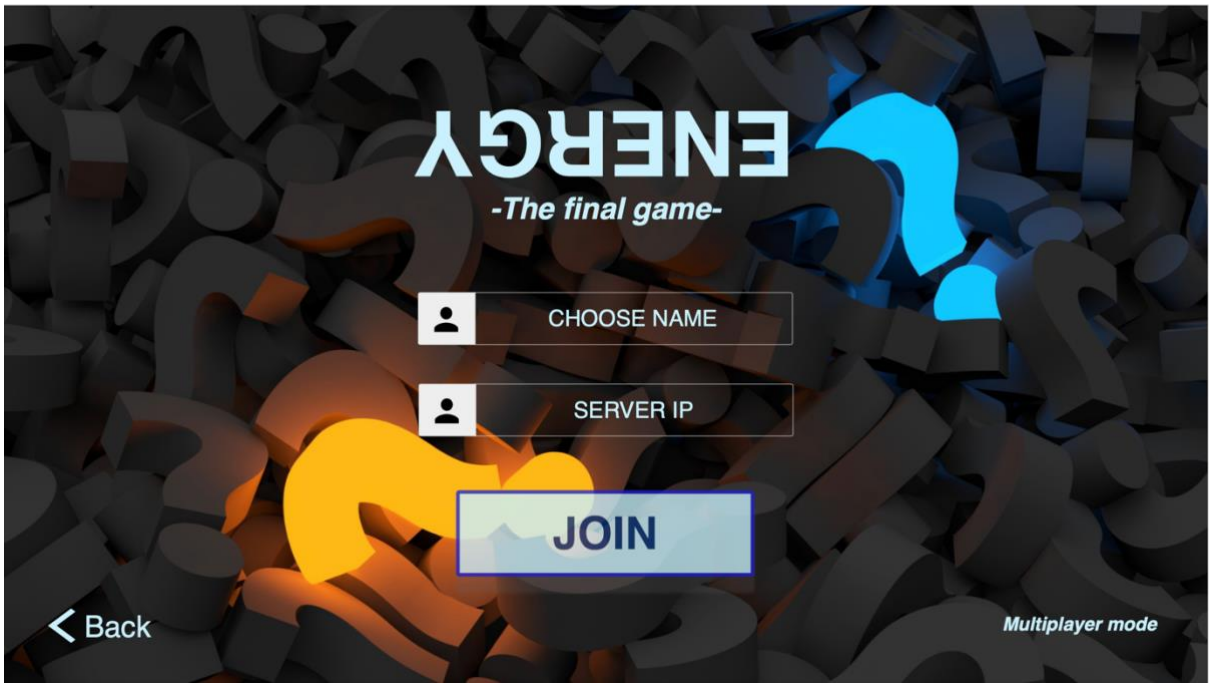


The single-player choice before and after

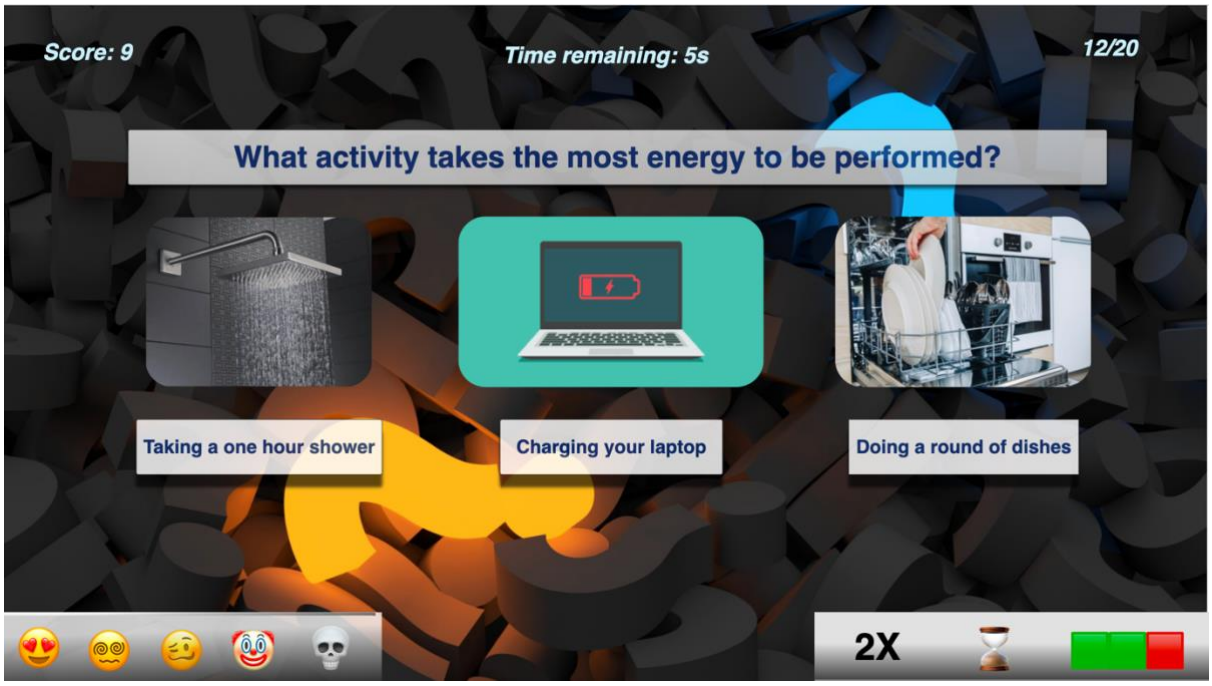


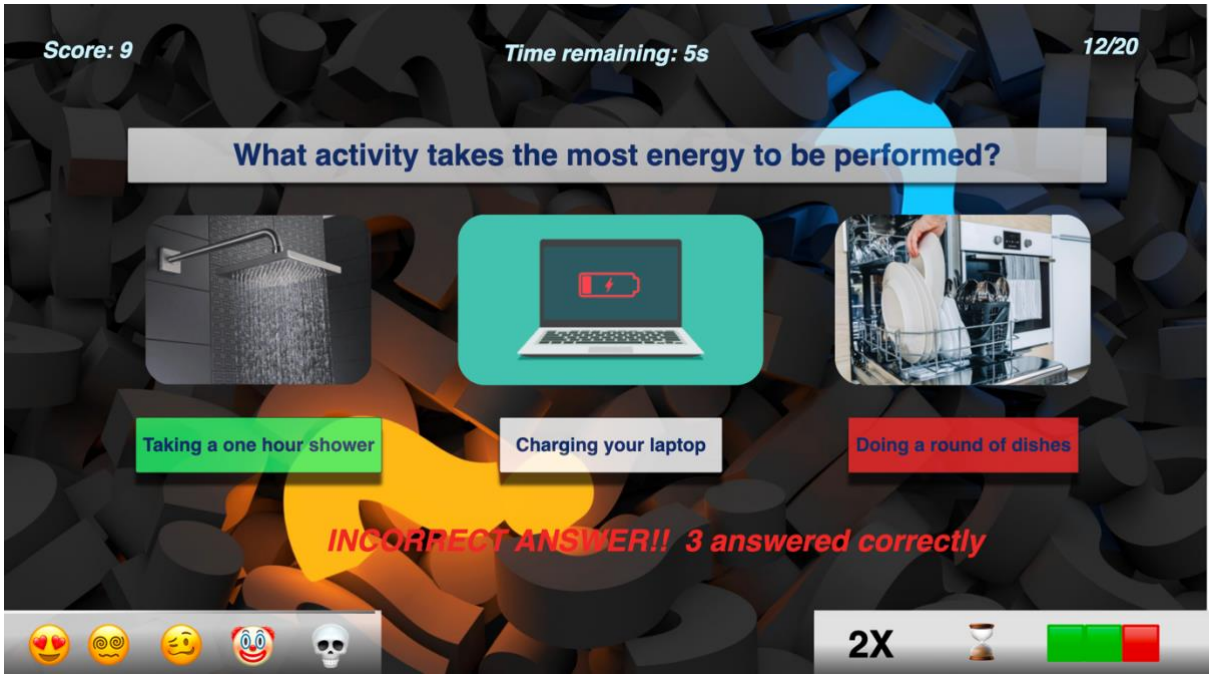
Multiplayer choice before and after

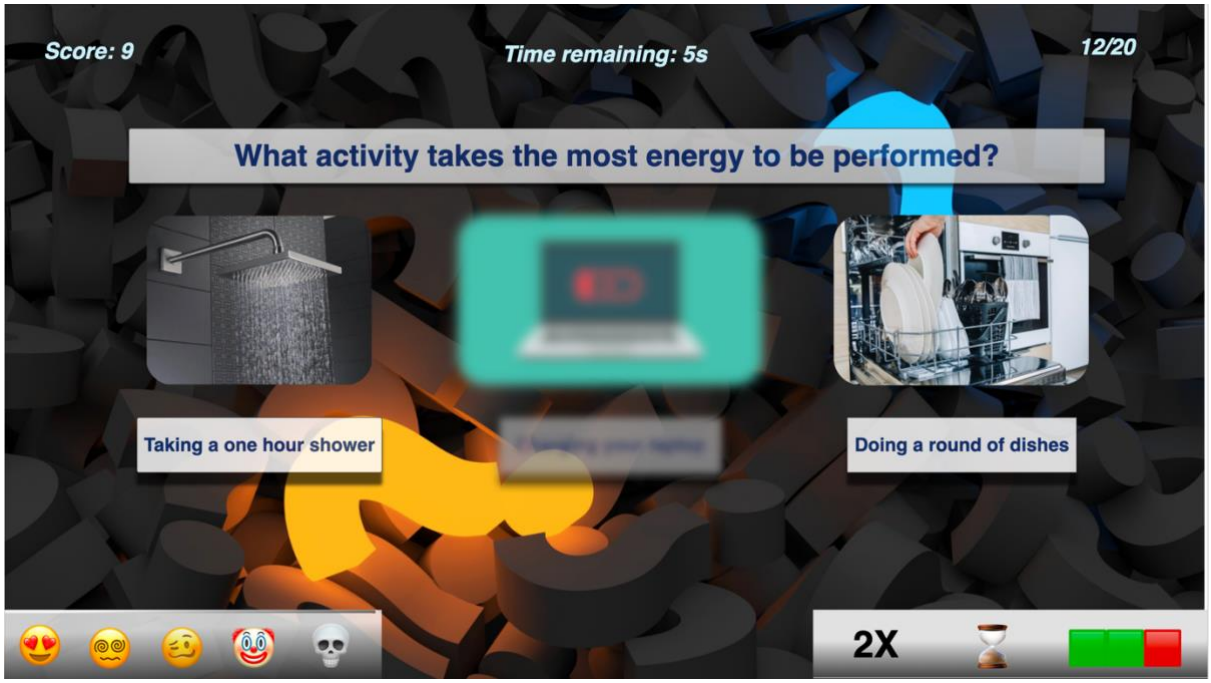


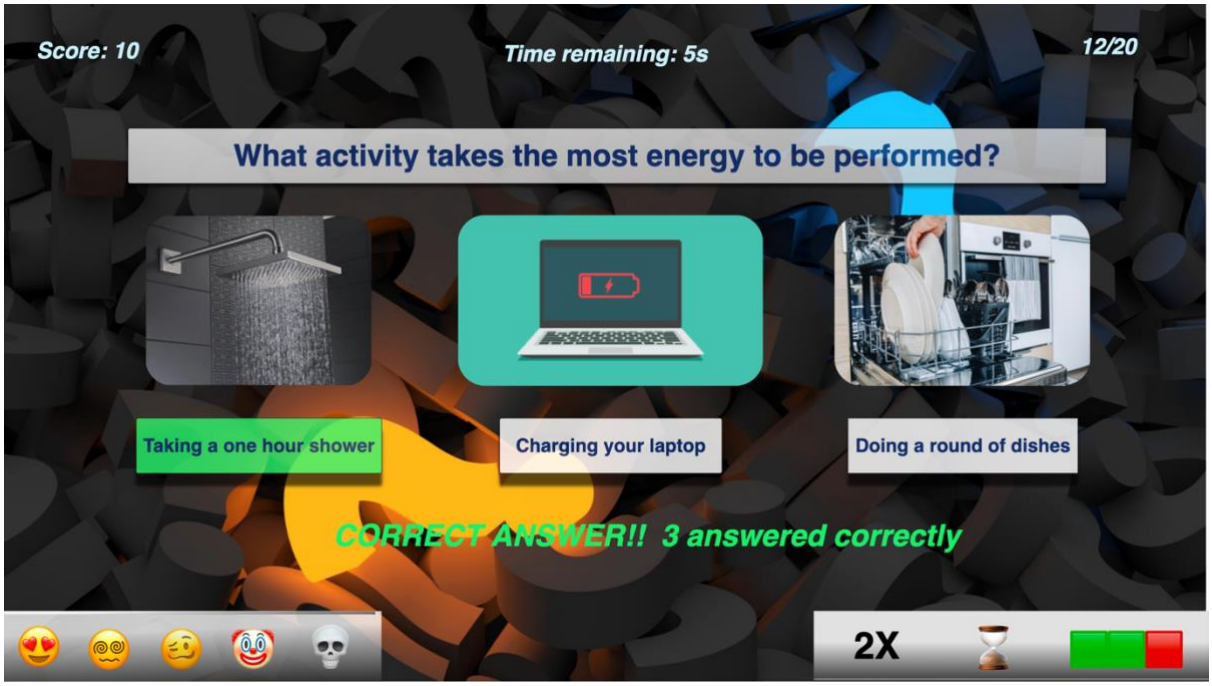


Game round scenes



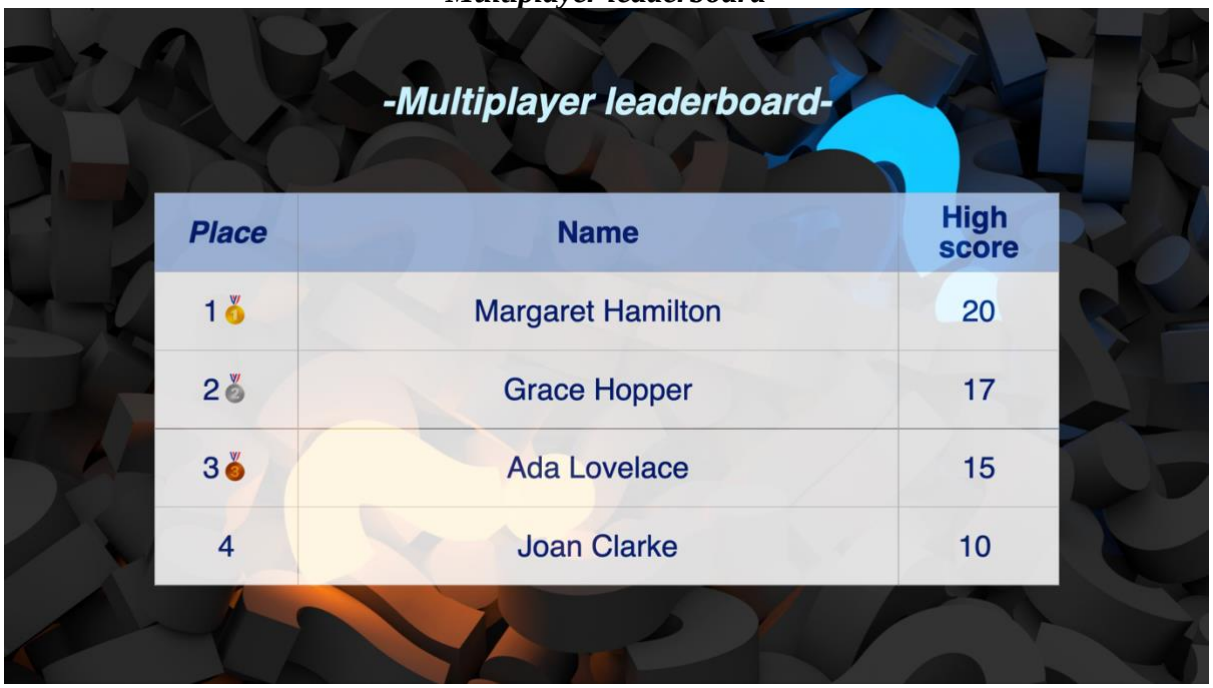

Score: 9
Time remaining: 5s
12/20
What activity takes the most energy to be performed?
Taking a one hour shower
Charging your laptop
Doing a round of dishes
INCORRECT ANSWER!! 3 answered correctly
2X


Score: 9
Time remaining: 5s
12/20
What activity takes the most energy to be performed?
Taking a one hour shower
Doing a round of dishes
2X

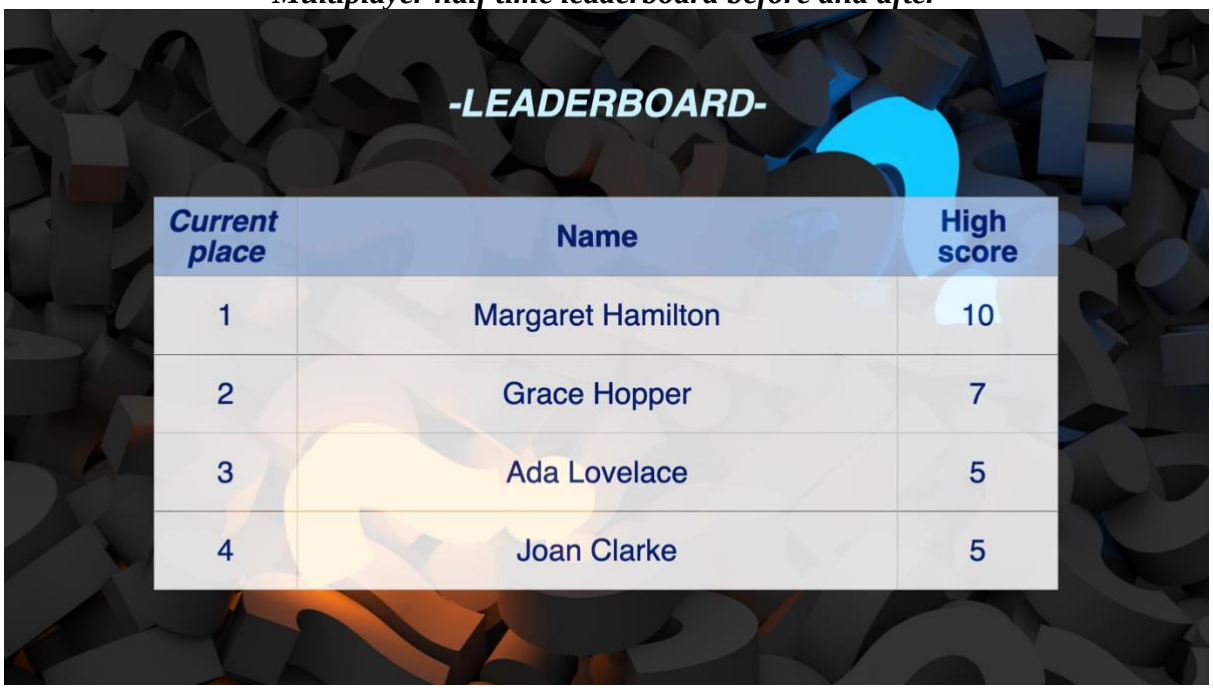


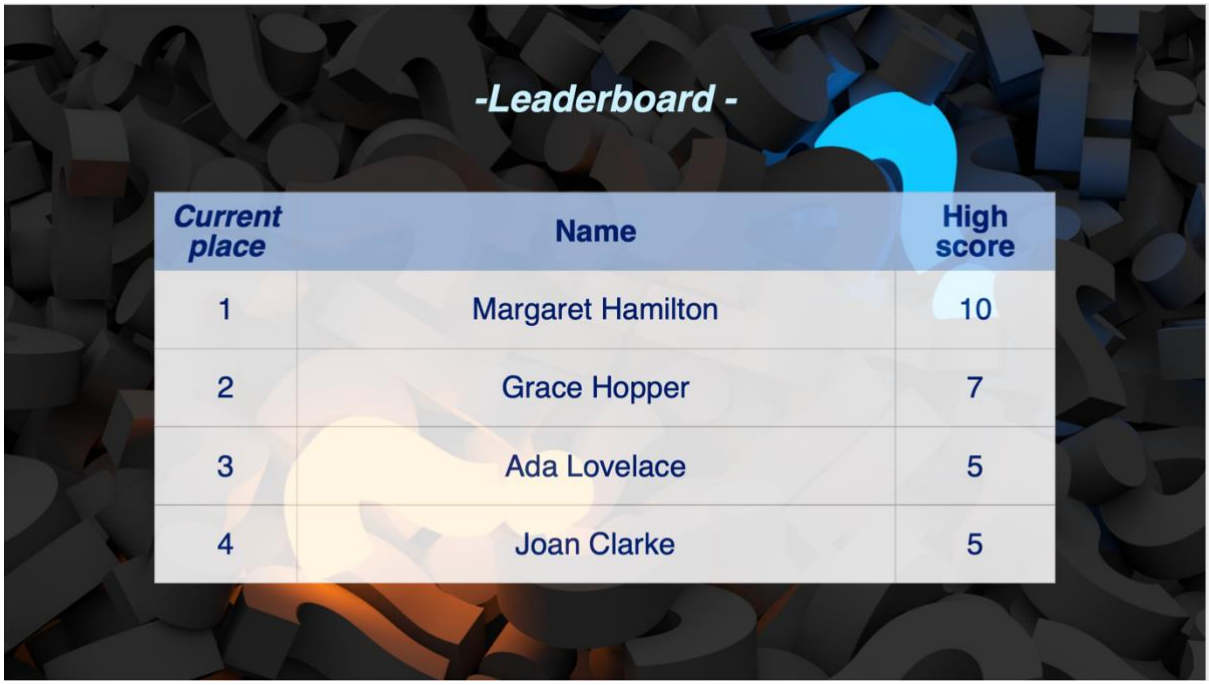
Single-player leaderboard before and after

Multiplayer leaderboard



Multiplayer half time leaderboard before and after





Ending scenes