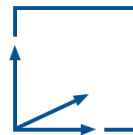


Developing a serious game for an Open-Air Museum with emphasis on interactive elements

Simon Winter

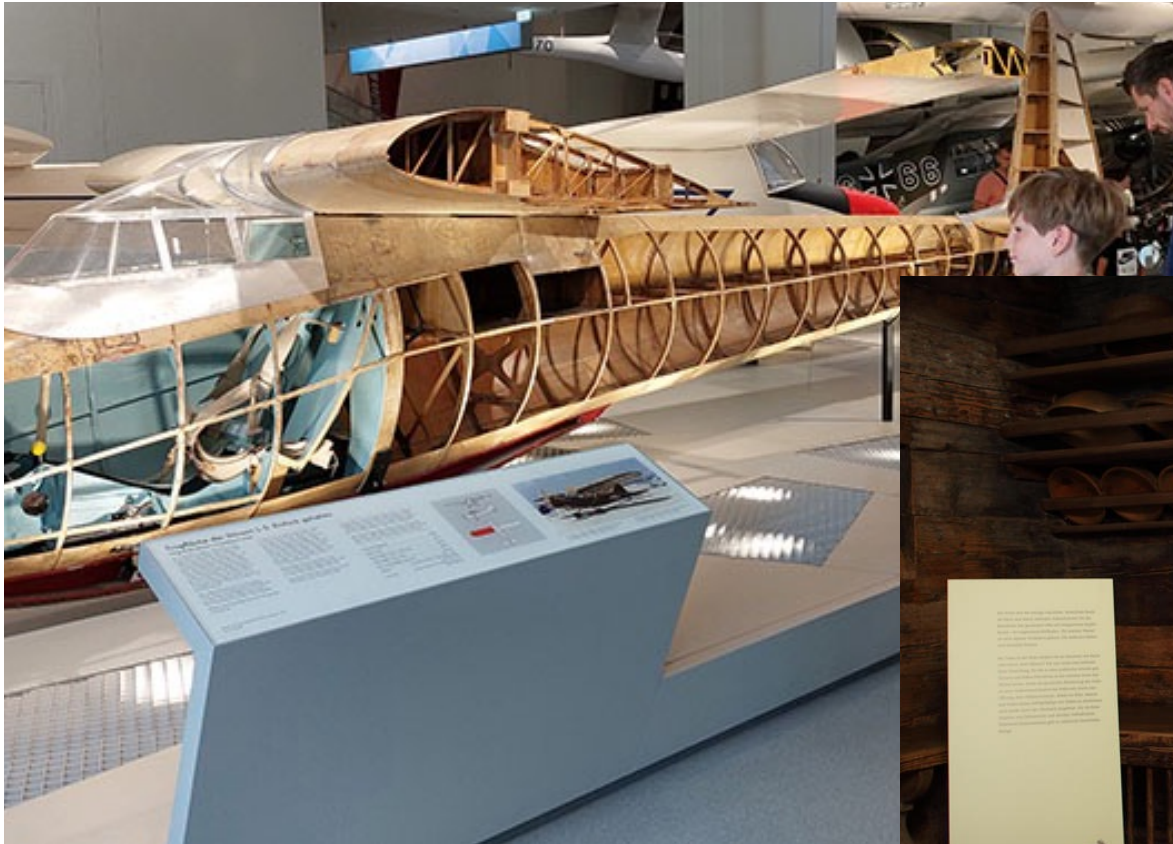
22.02.2024



Final: Bachelor Informatics: Games Engineering

Supervisor: Prof. Gudrun Klinker, Ph.D.

Introduction



Problem Description

“Freilichtmuseum Glentleiten“

- Cultural heritage museum
- Exhibits relocated and meticulously reconstructed farms from various eras
- Connecting gameplay to exhibition
- Choice of content
- Entertaining and educational gameplay elements
- Visual design



Related Work – Anderson's and Kratwohl's taxonomy

A student/participant should exhibit the capability to recall and comprehend the principles and societal frameworks of living in past centuries. This acquired knowledge should then be applied to solve riddles and engage in mini-games.

The Cognitive Process Dimensions of "Escape the Centuries"						
The Knowledge Dimension	1. Remember	2. Understand	3. Apply	4. Analyze	5. Evaluate	6. Create
A. Factual Knowledge		X				
B. Conceptual Knowledge	X	X	X			
C. Procedural Knowledge						
D. Metacognitive Knowledge						

Related Work – Mapping learning and game mechanics

The LM-GM analysis based on "Escape the Centuries"				
Game Mechanic	Cognitive Process	Learning Mechanic	Implementation	Usage
- Rewards/Penalties	5. Evaluating	- Motivation - Reflect/Discuss	- Medals - Redo	- Motivating players - Rewarding learning success
- Feedback	4. Analyzing	- Analyze - Experiment - Feedback - Observation	- Choose results - Text lines - User Interface - Progression	- Reflect on learned material - Use knowledge - Control- and intractability - Progressing through the game
- Progression - Selecting/Collecting - Time Pressure	3. Applying	- Action/Task - Simulation	- Problem solving - QR-Code interaction - Choices/Environmental Items - Changing Environment/Text lines - Reward/Failure	- Rewarding - Interaction with and connection to exhibition - Motivation - Highlight urgency - Create emotional investment - Motivate/Pressure
- Questions/Answers - Cascading Information - Tutorial	2. Understanding	- Participation - Question and answer - Tutorial	- Completing tasks - Scanning QR-Codes - NPC-Interactions - Level - Tutorial	- Story progression - Convey knowledge - Explain gameplay mechanics - Guidance to complete objectives
- Cut Scenes/Story - Goods/Information	1. Remembering	- Discover - Explore - Guidance - Instruction - Repetition	- Levels - NPC-Text lines - Story - Setting/Real world	- Conveying knowledge on historical farms

Related Work – Serious Games



"Gift for Athena" Application



"Tate Trumps"

Goals of this Thesis

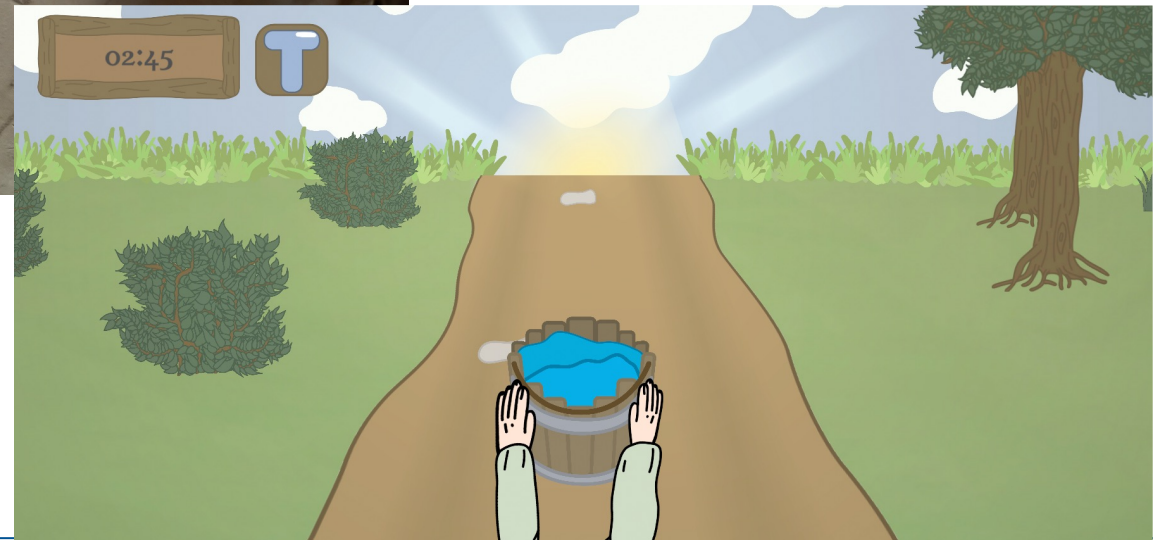
- Combat challenges of museums through the use of modern day technology
 - passive learning experience
 - text-heavy information
 - static displays
 - Concealed Exhibits

Approach – Features



Entertaining mini-games

QR-Codes attached to exhibition



Approach – QR-Codes



Trophy system:

- Rewarding players
- Dependent on time passed during the QR-Code search



Approach – QR-Codes

Total score system:

- Motivate players
- Evaluate and compare user performance
- Competitive aspect



Approach – Content

The game features multiple centuries, connected to the museum's exhibition

- 1700 – “Zehentmaier”
 - Rudimentary living conditions



Approach – Content

Categorizing centuries into topics

- Food Topic
- Living Topic
- Work Practices Topic

Advantages

- Division of the large amount of information
- Allows players to choose topic they are interested in
- Opportunity to take breaks

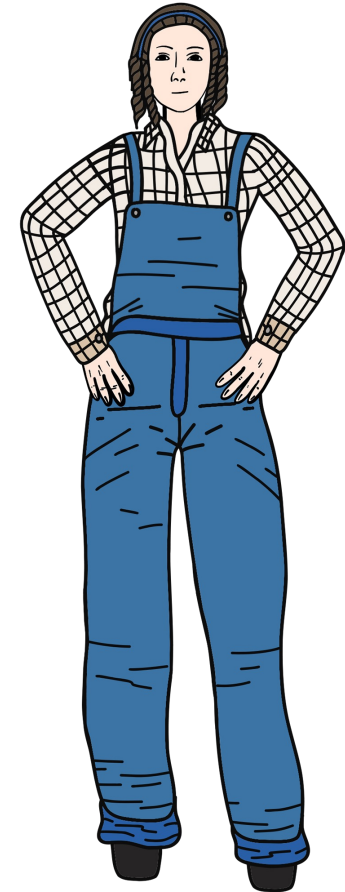
Approach – Visual Design



Maria 1700



Maria 1900



Maria 1950

Implementation



Evaluation



Conducted a survey at the open-air museum "Glentleiten" in the "Zehentmaier" building



Uses the NASA Task Load Index (TLX) and is expanded by additional questions

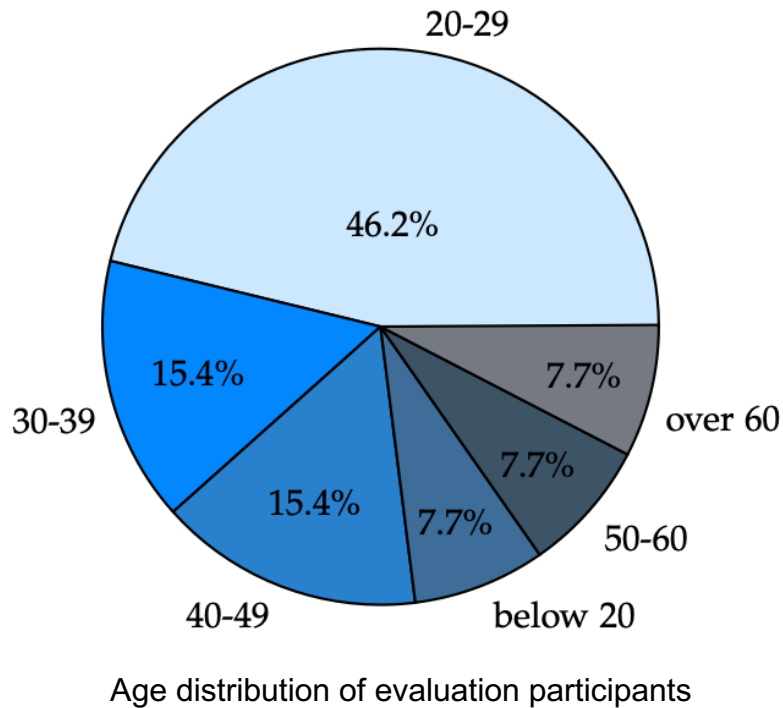


Attended by 13 participants, consisting of ten employees of the museum and three participants unfamiliar with the subject



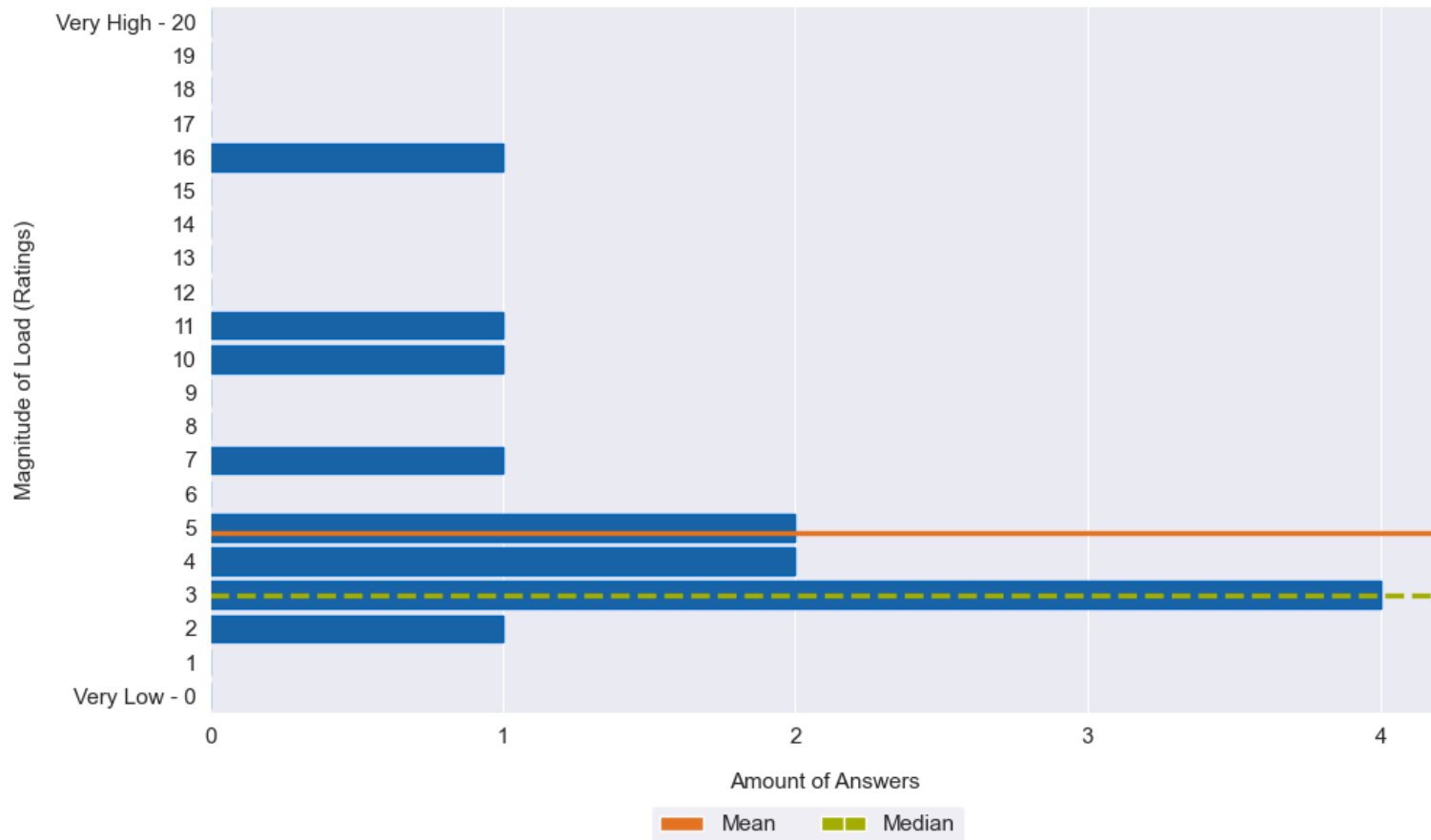
App tracked the time spent on each objective

Evaluation – Participants



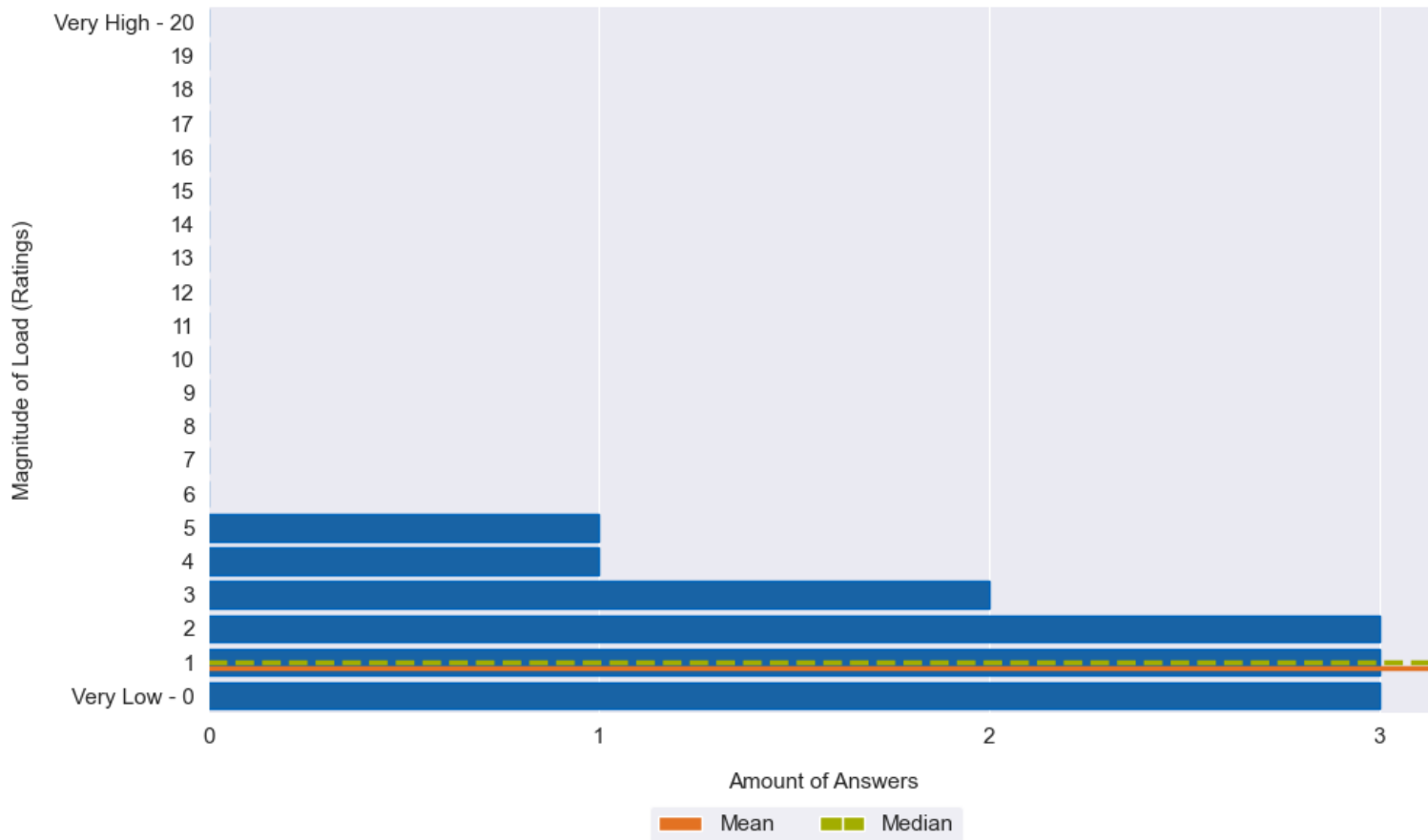
- **53.8%** male and **46.2%** female participants
- **61.5%** of participants play games in their free time
- **53.8%** have previously played a game in a museum or educational context

Evaluation – NASA TLX



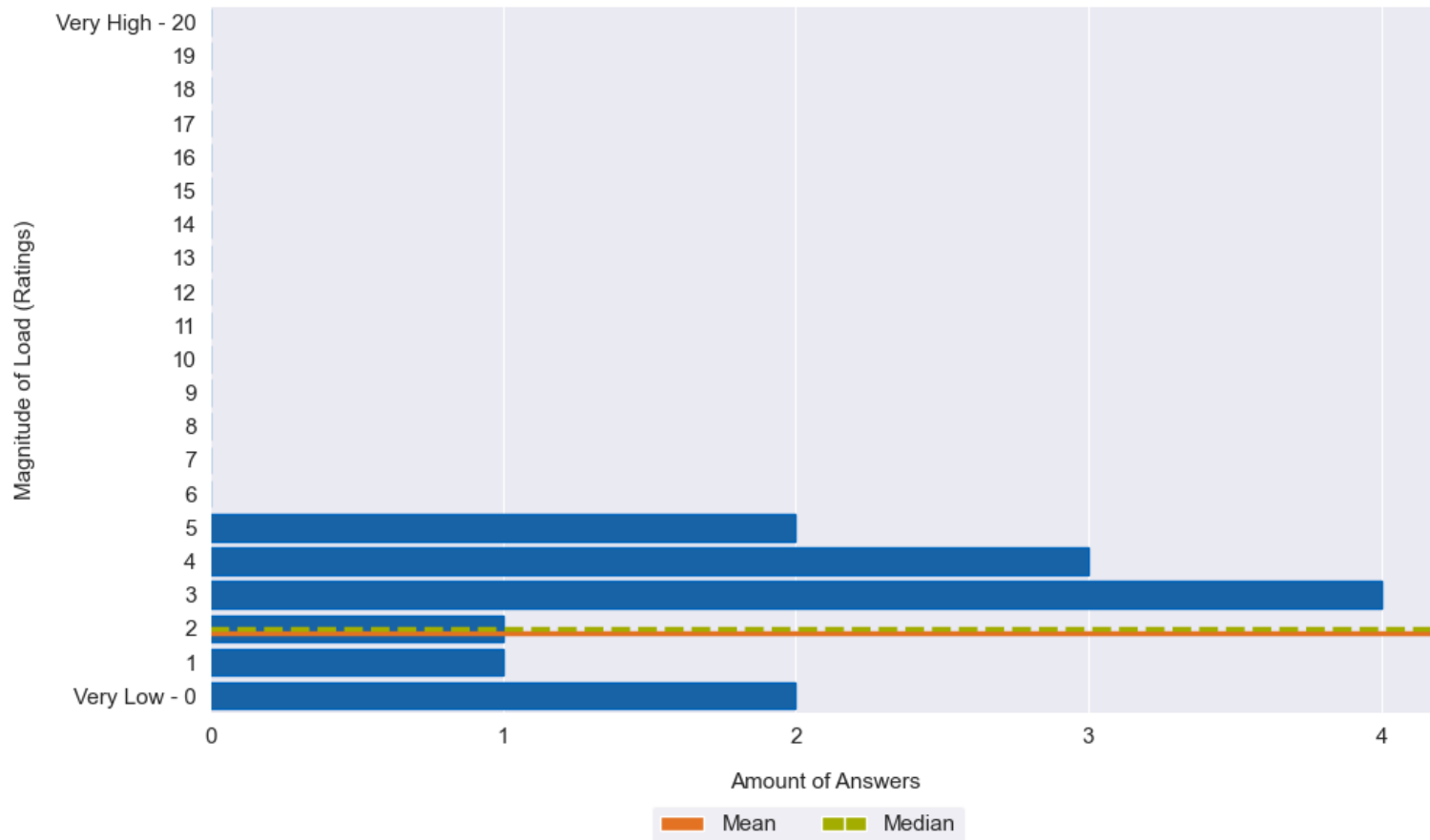
Mental demand sub scale, analyzing the cognitive intensity of the application from very low - 0 to very high - 20

Evaluation – NASA TLX



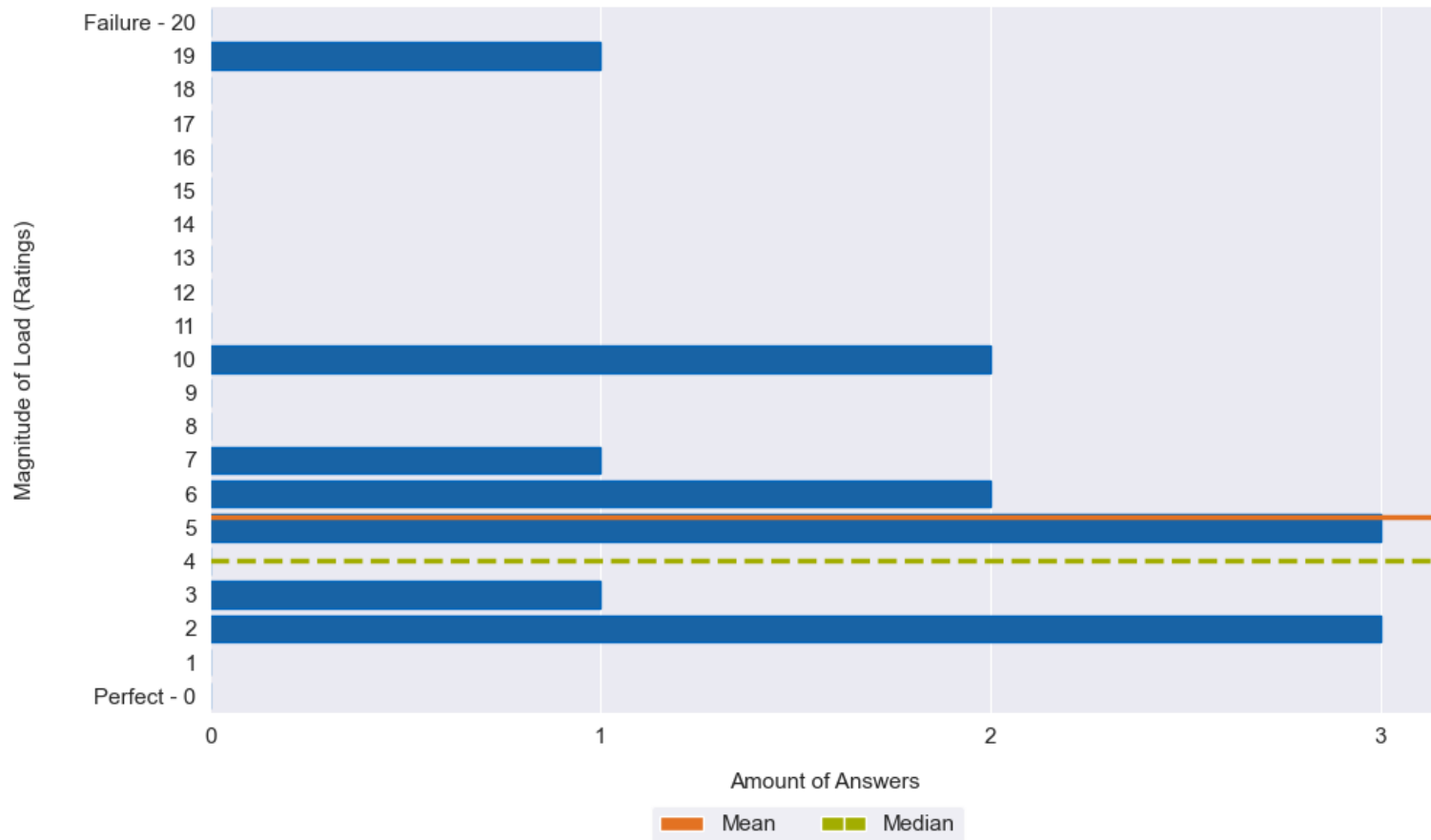
Physical demand sub scale, analyzing the physical activities involved in playing the game from very low - 0 to very high - 20

Evaluation – NASA TLX



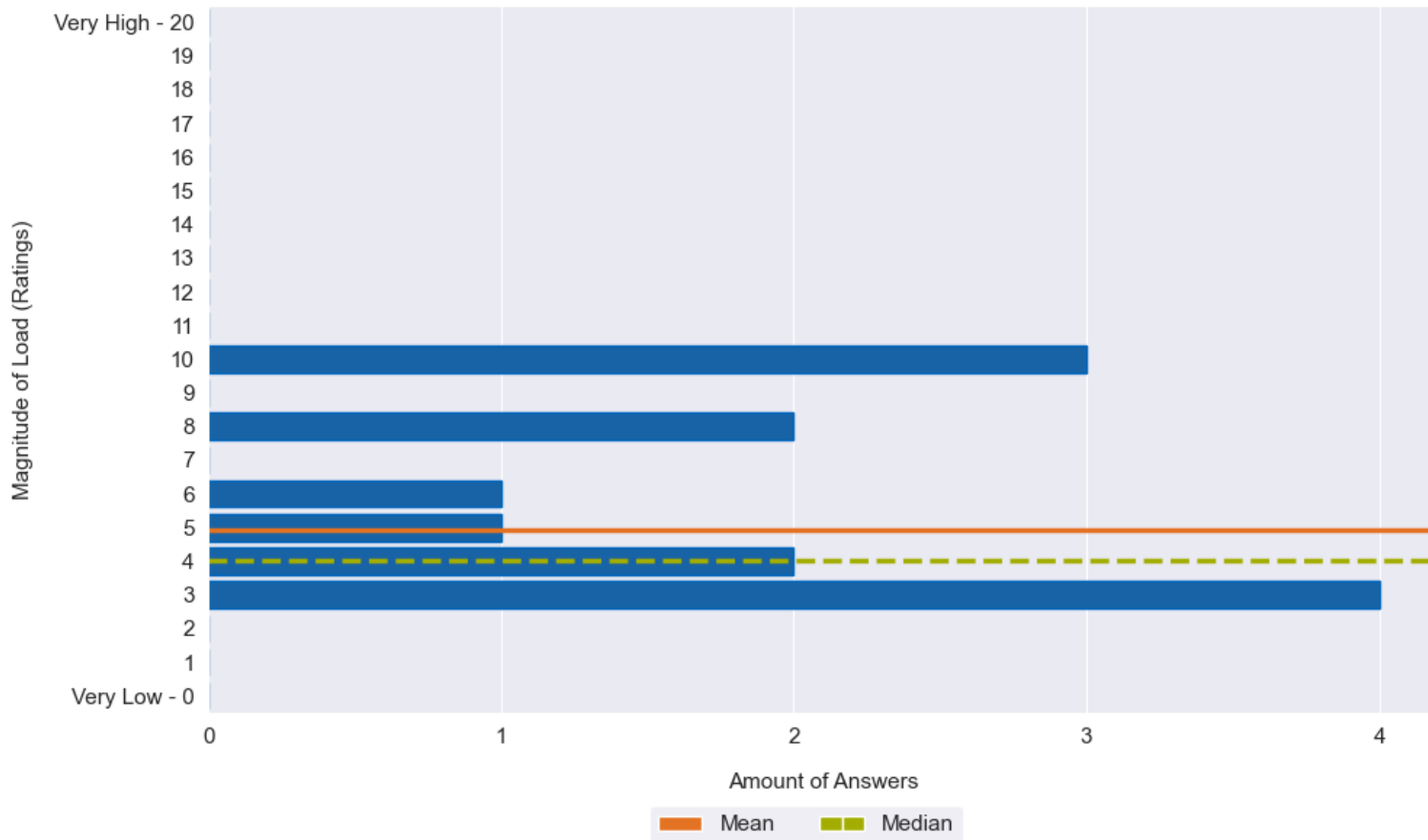
Temporal demand sub scale, analyzing the pace of the application from very low - 0 to very high - 20

Evaluation – NASA TLX



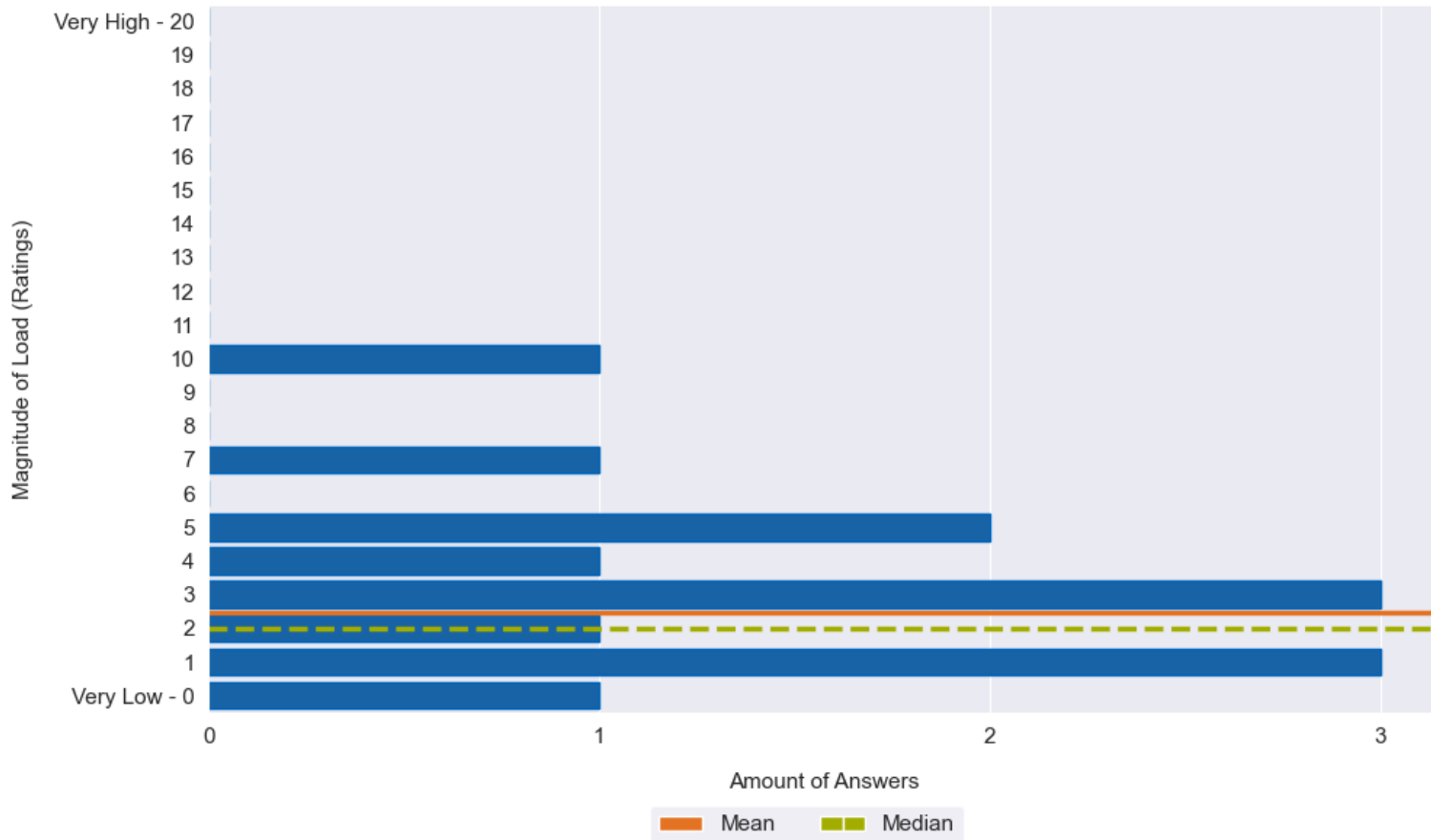
Performance sub scale, analyzing how users assess their success in the game from perfect - 0 to failure - 20

Evaluation – NASA TLX



Effort sub scale, analyzing the user's strain to achieve their performance level in the game from very low - 0 to very high - 20

Evaluation – NASA TLX

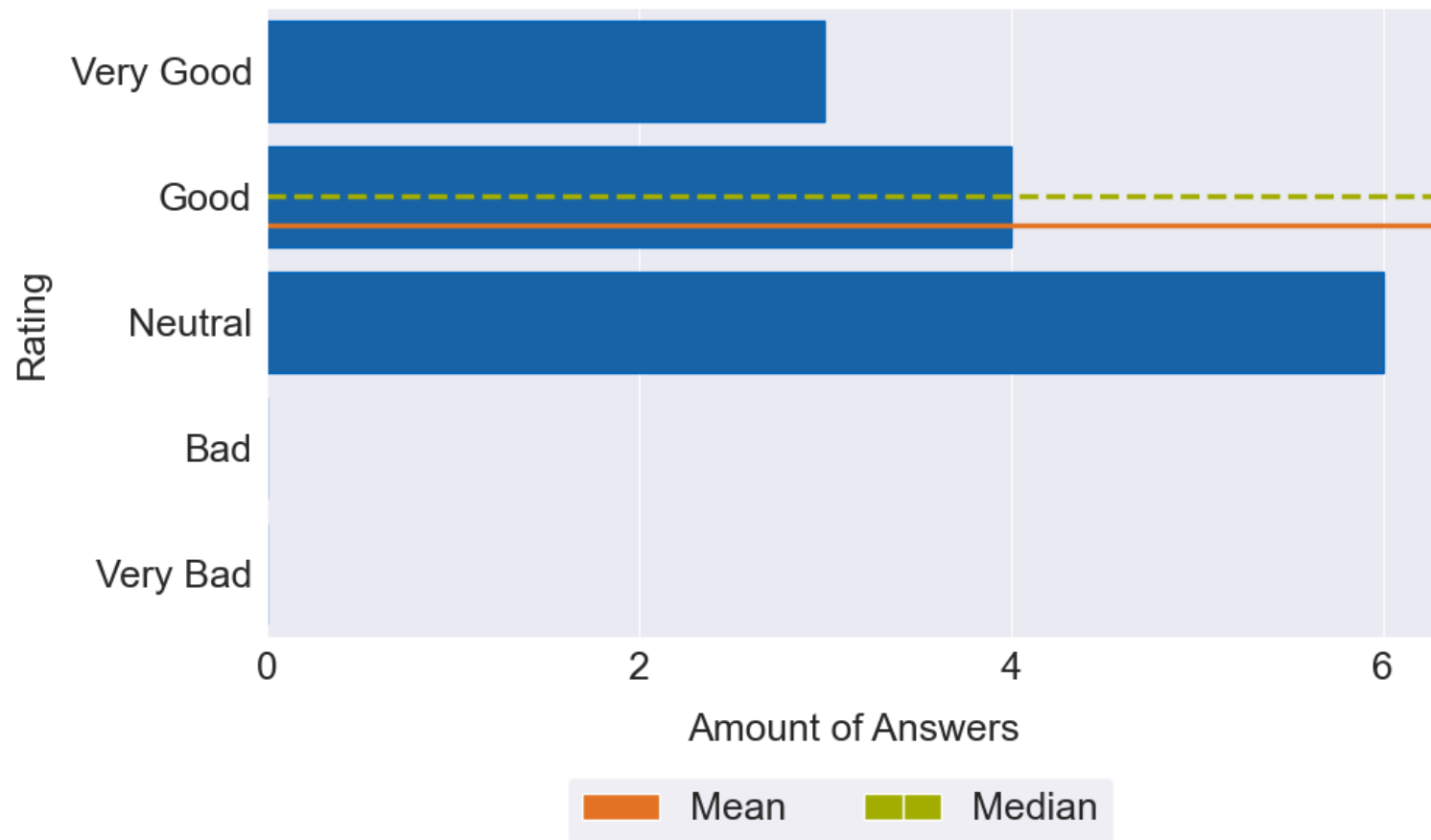


Frustration sub scale, analyzing the users emotional response while playing the game from very low - 0 to very high - 20

Evaluation – Gameplay Experience

- Choice of content
- Accuracy of “Zehentmaier” representation
- Accuracy of “Koch” family representation
- QR-Code placement within the exhibition
- Educational value of mini-games
- Engaging value of mini-games
- Appeal of the game’s art style
- Accuracy of the game’s art style
- Approach enhances the exhibition

Evaluation – Gameplay Experience

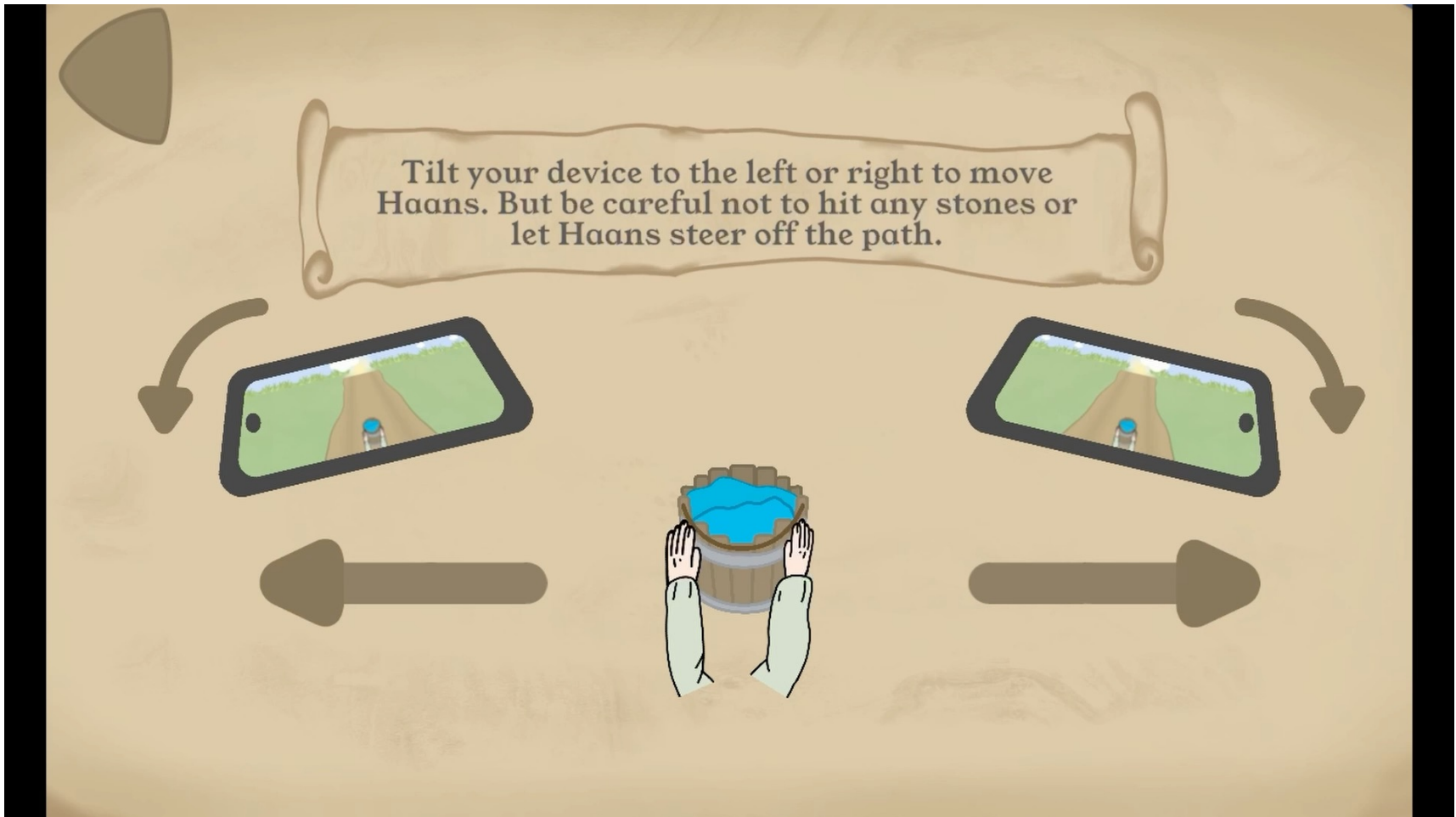


Evaluating the accuracy of the "Koch" family representation

Evaluation – Text Feedback

- General feedback
- Things they liked
- Things they disliked
- Possible content extensions
- Suggestions for improvement
- Other suggestions

Evaluation – Text Feedback



Future Work

User Interface (UI)

- Design the game's tutorial more distinct
- Redesign of the tutorial button
- Design game's UI arrows according to accessibility guidelines



Future Work

User Interface (UI)

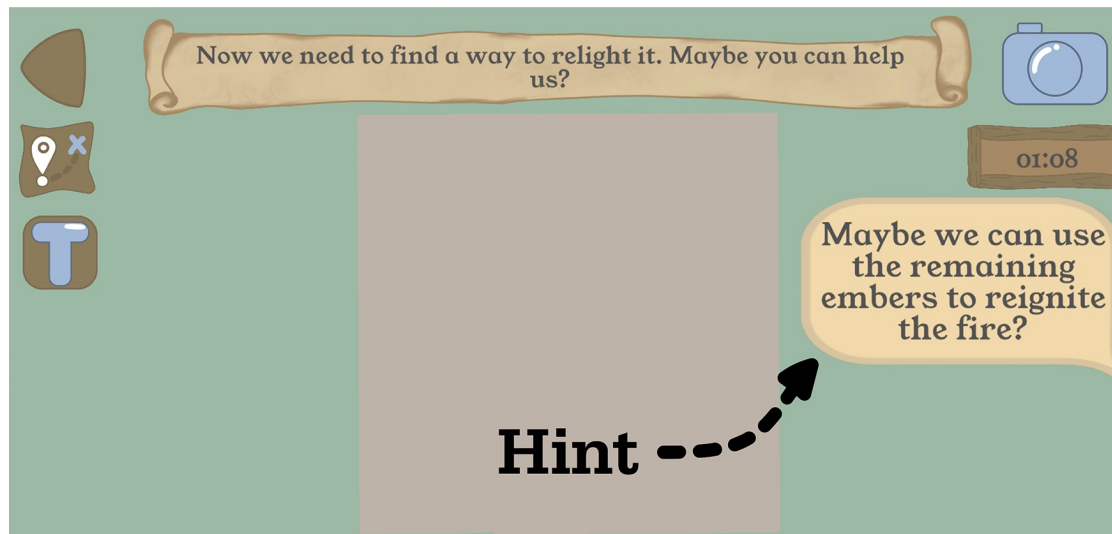
- Change the high score calculation
- Don't display alternative QR-Codes as locked



Future Work

User Interaction

- Device vibrating to signalize to players a tip is available
- Further analyze, if QR-Code timer has to be adjusted
- Change water carry mini-game
- Remove choice in 1700 Food level



Future Work

Content

- Implement missing topics and level
- Button, directing players to the museum
- Change QR-Codes' content from words to links
- Evaluate the effectiveness in conveying information in subsequent study

Questions?



List of References

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