D7.13 ECF4CLIM Learning Game (gamification) v2

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Version	2		

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WHO WE ARE

The ECF consortium consists of ten partners. The project is coordinated by Centro de Investigaciones Energeticas, Medioambientales y Tecnologicas-CIEMAT.

Name	Country	Logo
Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas CIEMAT	ES	
Instituto Superior Técnico. University of Lisbon. IST	PT	
Universidad de Sevilla **USE**	ES	
University of Jyväskylä **JYU**	FI	
Universitat Autònoma de Barcelona UAB	ES	
Meda Research Ltd **MedaResearch**	RO	
Instituto de Soldadura e Qualidade ISQ	PT	
Trebag Szellemi Tulajdon Es Projektmenedzser Korlatolt Felelossegu Tarsasag TREBAG	HU	
ENLITIA Energy Services SA **ENLITIA**	PT	
QUE Technologies Kefalaiouchiki Etaireia QUE	GR	

ACRONYMS

Term	Definition
ECF	European Competence Framework
EQF	European Qualifications Framework
SMEs	Small and Medium Enterprises
STEM	Science, technology, engineering, and mathematics

ABOUT THE PROJECT

Through a multidisciplinary, transdisciplinary and participatory process, ECF4CLIM develops, tests and validates a European Competence Framework (ECF) for transformational change, which will empower the educational community to take action against climate change and towards sustainable development.

Applying a novel hybrid participatory approach, rooted in participatory action research and citizen science, ECF4CLIM co-designs the ECF in selected schools and universities, by: 1) elaborating an initial ECF, supported by crowdsourcing of ideas and analysis of existing ECFs; 2) establishing the baseline of individual and collective competences, as well as environmental performance indicators; 3) implementing practical, replicable and context adapted technical, behavioural, and organisational interventions that foster the acquisition of competences; 4) evaluating the ability of the interventions to strengthen sustainability competences and environmental performance; and 5) validating the ECF. The proposed ECF is unique in that it encompasses the interacting STEM-related, digital and social competencies, and systematically explores individual, organisational and institutional factors that enable or constrain the desired change. The novel hybrid participatory approach provides the broad educational community with: an ECF adaptable to a range of settings; new ways of collaboration between public, private and third-sector bodies; and innovative organisational models of engagement and action for sustainability (Sustainability Competence Teams and Committees).

To encourage learning by doing, several novel tools will be co-designed with and made available to citizens, including a digital platform for crowdsourcing, IoT solutions for real-time monitoring of selected parameters, and a digital learning space. Participation of various SMEs in the consortium maximises the broad adoption and applicability of the ECF for the required transformational change towards sustainability.

LEGAL NOTICE

EXECUTIVE SUMMARY

In the context of the ECF4CLIM project, the development of a Learning Game within Task 7.5, led by ISQ with the crucial participation of TREBAG – the game developer – and, ENLITIA (ENLITIA) – responsible for the Learning Platform where the supporting parts of the ECF4CLIM game are hosted, while the game itself is stored on the server of TREBAG. The serious game is a central component of the Learning Space, aimed at enhancing educational communities' awareness and empowering them to take action against climate change and sustainable development. Here's why serious game development is paramount:

Engaging Learning Resources: The learning game serves as a dynamic and engaging educational resource within the Learning Space. It complements other digital learning content and provides a gamified environment for users.

Targeting Diverse Audiences: By offering a digital game, the project maximizes its reach to a wide range of target groups, reaching EQF (European Qualification Framework) levels 3 to 6. Users can engage with the game repeatedly, enhancing their understanding through trial and error while accessing the theoretical knowledge through interactive knowledge bases – flipbooks.

Interactive Learning Formats: The game incorporates various interactive formats, including quizzes, decision trees, drag & drop, and true or false questions. This diversity caters to different learning styles, ensuring a comprehensive educational experience.

Incorporation of Narratives and Storytelling: Leveraging narratives and storytelling in the serious game enhances user motivation. This approach aligns with gamification principles, making the learning experience not only informative but also enjoyable.

Effective Use of Gamification Elements: TREBAG's role in the technical and graphic design aspects, as well as the gamification of training materials, ensures that the serious game is not just a tool but an effective and immersive learning experience. Some examples of the used gamification elements: are storytelling (see above), missions given as a main goal, and modern graphical features in the 360-degree rotatable panoramic images (varying information are hidden under pin points, this provides a fascinating visual experience to the game) and instant feedback. (More details at the game description.)

Adaptation to Online Learning: Knowledge bases developed by ISQ are interactive and tailored for online delivery, facilitating user engagement and accessibility. This is crucial, especially considering the preferences of younger audiences who are accustomed to obtaining information through new media. These knowledge bases were used as the basis of the learning game.

Expert Collaboration: The involvement of subcontractors, including IT staff, graphic designers, and illustrators underscores the collaborative effort to create a visually appealing serious game, with three different environments targeting different age audiences.

In summary, the EC4CLIM learning game development (Deliverable 7.13 within Task 7.5) is strategically designed to enhance the effectiveness of educational resources, ensuring they are not only informative but also captivating and adaptable to diverse learning preferences. It exemplifies a contemporary and impactful approach to education, particularly vital when engaging younger audiences in the digital age

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1 INTRODUCTION

1.1 Scope and objectives of the Deliverable

- Overview of the project's requirements that the game addresses.
- Main components of the game structure.
- Describe in detail the constitution of the games developed, namely the types of mini games they include.
- Present the results of the pilots carried out in educational institutions.
- Present the next steps related to the subtask.

Within the next pages, the development of the ECF4CLIM Learning Game project, as the testing phase results with various demonstration sites is described. First, the development of the three games and their structures, as well as all the information about the creation process

1.2 Structure of the deliverable

The deliverable is divided into 5 sections:

- The first section describes the scope of the game, the objectives and its structure.
- In the second chapter, the information about the game, the software used, the main components of the game structure, the mini-games that make them up and the importance of these mini-games in learning (which is why they were integrated into the games).
- In the third chapter, we mention the obstacles that were faced in developing the game (especially technical ones) and the actions that were taken to overcome them, and we present the steps taken to carry out the pilots.
- The fourth chapter is related to the pilots developed, presenting not only the results but also the obstacles that were faced, and the actions that were taken in order to troubleshoot those issues.
- Finally, the last section describes the next steps related to the subtask.

1.3 Relation to Other Tasks and Deliverables

The task has direct and indirect links with the tasks of the ECF4CLIM project.

- Task 2.3. The development of an initial EFC
- Task 6.6 Implementation, Test & Validation of the digital platform

2 SCOPE OF THE GAME, OBJECTIVES AND STRUCTURE

2.1 Introduction

The ECF4CLIM Learning Game, which will be described in detail in Chapter 2, makes it possible to maximize the range of target groups reached in the ECF4CLIM project, as well as to support learning. The objectives of ECF4CLIM, centred around promoting environmental awareness and sustainable practices within educational communities, harmonize seamlessly with the implementation of a serious game. Embedding a serious game into the project brings forth several advantages. First and foremost, it enhances engagement across diverse user groups, fostering a more effective and enjoyable learning experience for students, teachers, and citizens – the education community in general. By incorporating interactive mini games, supported by knowledge bases specially tailored from the ECF4CLIM roadmap; the learning game caters to varied learning styles, ensuring a comprehensive educational impact. The game's allowance for repetition promotes reinforced learning, enabling users to internalize crucial concepts related to climate change and sustainability. Adaptability to online learning aligns with contemporary preferences, especially among younger audiences, making the learning game a versatile and accessible educational tool. Furthermore, the inclusion of narratives and storytelling elements not only motivates users but also inspires responsible actions, contributing to a heightened sense of environmental stewardship. Overall, the serious game within ECF4CLIM introduces an innovative and engaging dimension to learning, aligning with modern educational approaches and fostering a deeper understanding of sustainable practices and responsible citizenship.

2.2 Scope and Objectives of the ECF4CLIM Learning Game

The scope of the ECF4CLIM Learning Game is to provide an immersive and interactive experience within the ECF4CLIM Learning Space. This game aims to enhance the understanding of climate change, sustainable development, and responsible citizenship among users, including students, teachers, and managers in educational communities. The Learning Game is designed to encompass diverse educational resources, incorporating digital learning content and a variety of mini games. These mini games contribute to a comprehensive learning experience. The game's scope extends to the interactive knowledge bases, with a strong visual component, that provides the users with the theoretical knowledge to accomplish the different challenges launched by the game. This also motivates users and makes complex concepts more accessible. The different areas of the knowledge bases are the following listed below, where Modules 2-5 are based on the Steps of the Roadmap created by the project, and Module 1 introduces the topic:

1. Sustainability awareness - Introduction to Sustainability
2. Engagement - Why and How to Promote Sustainability
3. Connections - Complexity in Sustainability
4. Visions - Expected, Preferred and Alternative Futures
5. Action - Acting for Sustainability

Overall, the ECF4CLIM Learning Game serves as a dynamic tool to engage users in a digital environment, encouraging repeat interaction and fostering a deeper understanding of sustainability principles.

2.3 ECF4CLIM Learning Game Structure

The Learning Game can be accessed from several points of the online platforms of the project:

- from the website: https://www.ecf4clim.net/games,
- from the Learning Space: https://ecf4clim.ENLITIA.net/learning-space-game/
- or directly through TREBAG subpage, where the game is stored: https://h2020.trebag.hu/

After registration and confirmation when entering the ECF4CLIM game a landing page offers the choice between three different games, specially designed to different age groups:

- 6-9 years (EQF level 1-2): Search for Crocco
- 10-15 years (EQF 2-3&4): Secret of the Forest
- 16-25 years (EQF 3&4-6): Community Mall

The user chooses one of them by clicking on a picture out of three:

The three games have different backgrounds and three “missions”.

- 6-9 years: Search for Crocco: where two friends have to find their third friend (a crocodile) in a family house and garden.
- 10-15 years: Secret of the Forest: an adventure in the woods with a seed bank quest.
- 16-25 years: Community Mall: an abandoned mall turned into a community place by the “green” choices made by the player.

The task is to complete the missions given in the game, but to achieve this the player needs to get informed about the learning content of the Modules placed also in the game and play with the minigames and the decision trees of each module. Through this learning path, players will be introduced to sustainability themes and competences based on GreenComp and the project's Roadmap.

3 ECF4CLIM LEARNING GAME

3.1 Introduction

In order to really understand the process of creating the games, this chapter presents in detail the information about the ECF4CLIM Learning Game.

3.2 Software used to create the game

The software of the Learning Game is a custom-developed software with functionalities and graphical components tailored to meet project and end-user requirements. The software development underwent multiple phases from its start, mostly according to the accepted bid of the subcontractor company. This subcontractor proposal had been approved during the project planning phase arising from the subcontracting situation of the IT development part. (In order to gain approval of the sub-contract and its budget by the Project officer, Trebag Ltd. had to explain and prove the necessity of involving a sub-contractor in the project. Therefore, at project planning period Trebag provided a detailed workplan of the learning space development by the IT subcontractor company with the planned stages and payments. The subcontract and its budget was approved and accepted by the PO at project preparation phase. Various functionalities to be developed were flexibly structured within predetermined subcontractor frameworks, shaped based on the opinions of project partners and involved demonstration site teachers.

The software is a custom-developed website with features and visuals to match the brief, MySQL database, secure new PHP server-side script, and modern coding following w3c recommendations. Client side with jQuery framework.

The website is developed in Net-Snake Bt.'s (the subcontractor) proprietary PHP7 based framework, which is partly procedural and OOP oriented. The Front-End is based on Dynamic Hypertext Markup Language 5 and Cascading Style Sheets 3, the Back end uses the latest dynamic server-side scripting language, Hypertext Preprocessor, which can synchronize a multi-user, multi-threaded, SQL-based relational database manager using server-side object-oriented programming theory.

The programming language syntax is optimized for the fastest front-end rendering, with particular attention to cross-browser theories, and UTF-8 international character encoding with the possibility of internationalization. During the design of the program, the subcontractor proposed a specification (formal and informal) for the software and started to produce a model

of the system using higher-level abstractions, including both object-oriented and procedural programming theories in both Hypertext Preprocessor and JavaScript.

In addition to PHP and MYSQL technologies, the website uses JavaScript object-based scripting language and its best-of-breed GPL-licensed framework, jQuery. Front-end interactions are handled by dynamic forms, JavaScript event handlers and PHP processors. The structure of the site complies with the recommendations of the W3C consortium, which were considered in the design and presentation of the site structure in a responsive manner, taking into account the responsive ATF. The animation is controlled by an object-based jQuery JavaScript framework, displaying in a responsive 60FPS rendering with frame drop handling.

3.3 Involvement of the teachers, co-creation processes

Teachers and students from the Demonstration Sites were engaged at multiple points in the creative process:

Stories selection:

Their input was initially sought in the selection of the three stories: ECF4CLIM Learning Game 3 Stories Vote took place in December 2022. The background stories and missions for the three age groups were chosen based on 18 teachers' opinions that were gathered and processed and, the final venues and stories were decided based on those opinions.

Clickable Items Co-creation:

The ECF4CLIM Learning Game Clickable Items Co-Creation Process occurred in February 2023. As a result, many objects or natural elements clickable within the game's panoramic images were developed by the suggestion of the teachers or students: 17 answers were given from Partner in ECF4CLIM-project (10 people), an Advisory board member (3 people), Demonstration site/ school teacher or staff (3 people), Demonstration site/ school student (1). The teachers collected ideas from their pupils.

Preliminary test of games and knowledge bases:

In May 2023, the preliminary knowledge bases and a few proposed mini games were showcased to teachers to gather their opinions on the planned games and knowledge base. Though relatively few responses were received, the feedback was utilized in the finalization of the games and knowledge bases: 6 answers were given in this Google Form, but the task was complex: the teachers were asked to check 10 knowledge bases and play 15 games either themselves or with their students, and record their feedback in the Google Form.

Testing

Teacher involvement also extended to the testing of the completed game, conducted by demonstration site teachers and their students in November 2023. For further details, please see Chapter 5 of the current document titled "PILOTS DEVELOPED."

3.4 Main components

On the user experience side, the game consists of the following main parts:

- Panorama pictures (29 pictures)
- Mini games (75 pieces, 3x25 pieces)
- Decision trees (15 pieces, 3x5 pieces)
- Knowledge Base Modules (15 pieces, 3x5 pieces) developed by ISQ on sustainability issues based on the Roadmap Steps of the project and GreenComp competences
- User's Manual to explain the game
- Database with minimum information about the player and her/his achievements in the game
- Administrator interface
- Engines that power all of this and the engines and interfaces that tie it all together.
- GDPR: In order to guarantee the data protection, player has to accept the General Date Protection Regulation (GDPR) at the registration. The player can read the GDPR by clicking on the button. It includes in detail the types of managed data and purpose of data control.

Panorama Pictures

The 360-degree rotatable panoramic images serve as the backgrounds of the game; they change along the game as the player progresses through the modules. This means, that the figures and the surroundings of each image changes as the user progress in the game. The change in backgrounds is most striking in the shopping mall scene, where a completely empty, derelict building is transformed into a vibrant complex full of shops and services promoting sustainable living, which also serves as a community space. Along with the changes, the pins also change with each 360-panorama image, with different messages attached to them. Some of the pins lead the player to the module minigames or to the module decision tree.

The garden at the beginning of the play:

The same garden in Module 5:

Upon entering the game, the player arrives at a 360-degree rotatable panoramic image. Here, they can look around and by clicking on white pinpoints, they can gather information about the illustrated environment or the game's progress. These 360-degree panoramic images change with each module's progression, containing an increasing number of pins. The pins in the panoramic images provide information on different themes:

For ages 6-9 (EQF 1-2): "Search for Crocco" - focusing on a family house and garden:

- Demonstrating sustainability-related tools and habits within and around the house: showcasing personal lunch boxes and water bottles, exchanging and donating toys and clothes, water and energy-saving tools, eco-friendly cleaning products, solar panels, heat pumps, insulation, light tubes, wind turbines, electric car charging stations, shading with equipment and trees, plants, pollinators in the garden, composting, home vegetable production, bird feeders, bicycle commuting, rainwater collection.

For ages 10-15 (EQF 2-3&4): "Secret of the Forest" - set in the woods and on a clearing with a small farm:

- Emphasizing the importance of nature conservation, human-made environmental pollution, the role of insects in nature, food production, composting, home gardening, solar panels, importance of bees and pollinators, water retention, and the impact of burning wood and coal.

For ages 16-25 (EQF 3&4-6): "Community Mall" - depicting an abandoned mall transformed into a sustainable community place:

- This environment supports sustainable lifestyle in various aspects, promotes active engagement, and contributes to improved mental well-being through its pins. Part of the pins visually represent components of “Step 4: Action - Acting for Sustainability'' from the ROADMAP. The themes of these pins in this age group encompass: the role of consumption in climate change, services supporting sustainable individual lifestyles: bike repair, clothing repair, small machine repair, book exchange, clothes exchange and vintage second-hand stores, stalls for local producers, combating food waste and advocating for repairable equipment. Mental health-related pins include: engaging in

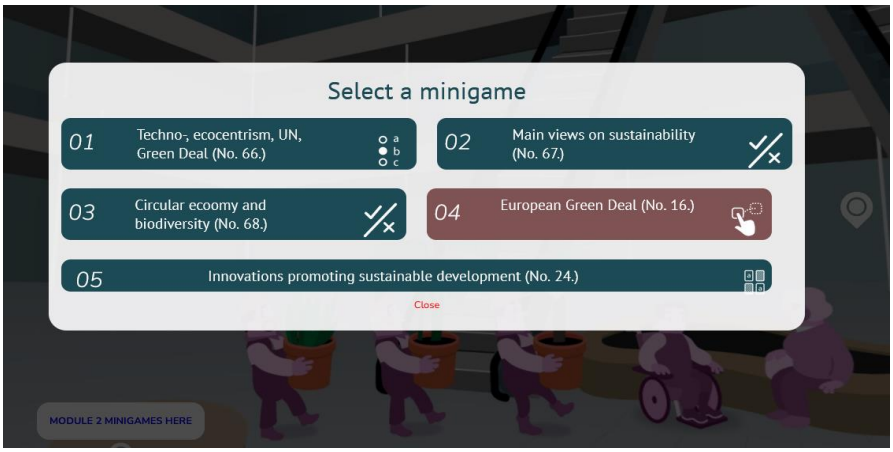
creative activities, the role of plants, and the importance of connections and conversations.

Example of the Community Mall when the player is at Module 5:

3.5 Games included

Each age group has 5 modules with the same topics but discussed at different levels and depth. On the left side of the screen, there are five circles. Here the player can choose the module of which (s)he wants to play with. The first circle shows module 1, the second shows module 2, etc. The coloured circle and the % shows how many of the minigames have been played in the module, 20% - 1 game played, 40% - 2 games played, etc.

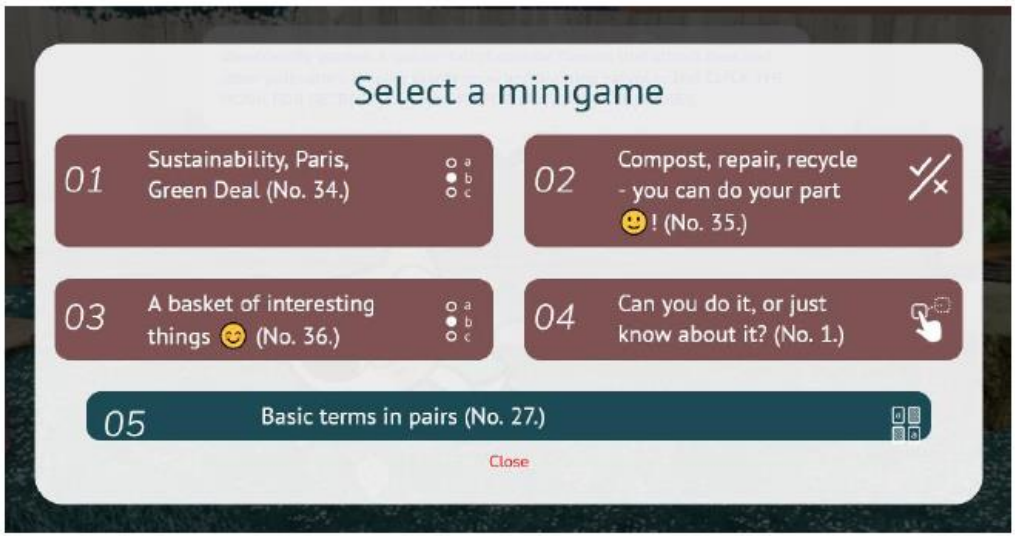
In total the ECF4CLIM Game includes 75 minigames. 5 minigames and 1 decision tree are developed for each module's knowledge base. The player shall find the pin with the module minigames first, then play with the minigames.



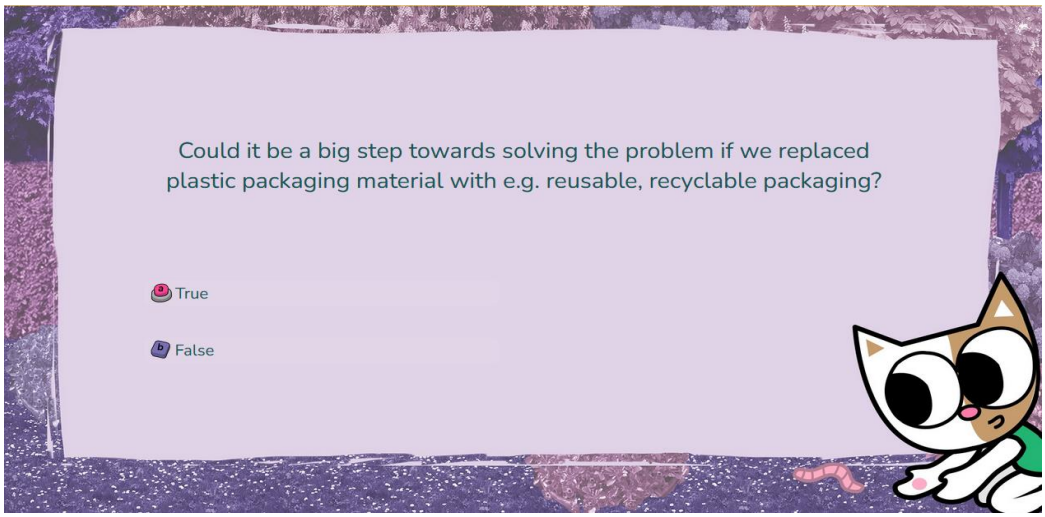
Each 360-panorama picture has a pin with “MODULE X MINIGAMES” or “MODULE X DECISION TREE”.

To play with the minigames, the player shall find this pin and click on it to find the minigames. The minigame selection page contains all the 5 minigames that the player is currently playing with the given module. There are four types of minigames and the decision trees at the end of each module:

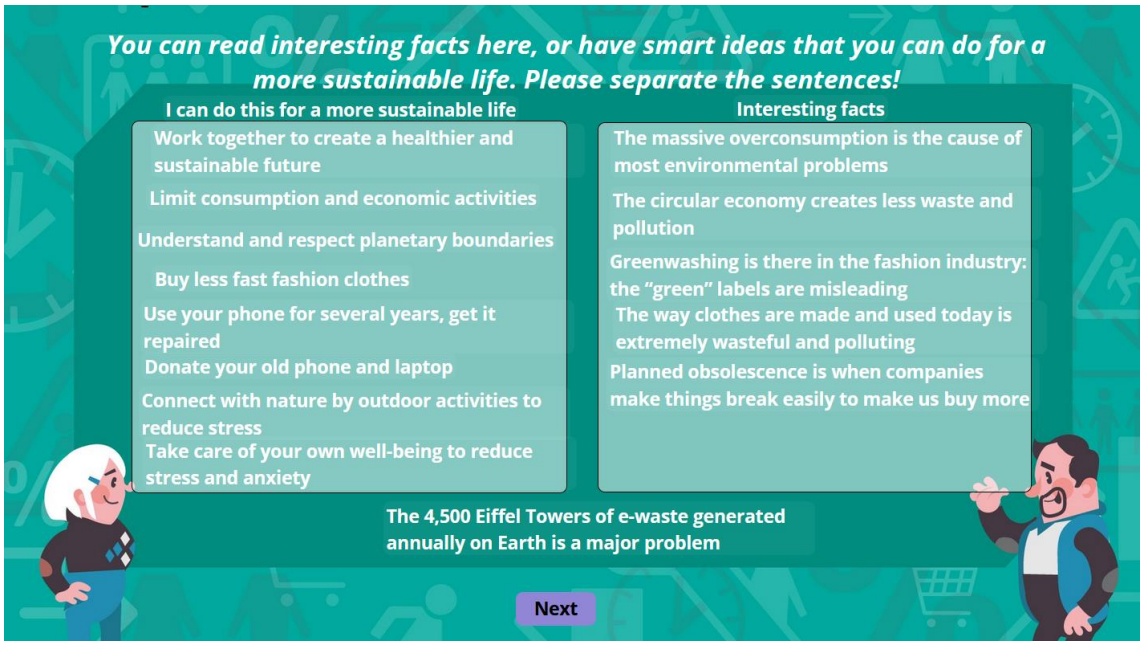
1. Quiz
2. True or false
3. Memory game (matching game)
4. Drag and drop



- True or false games:

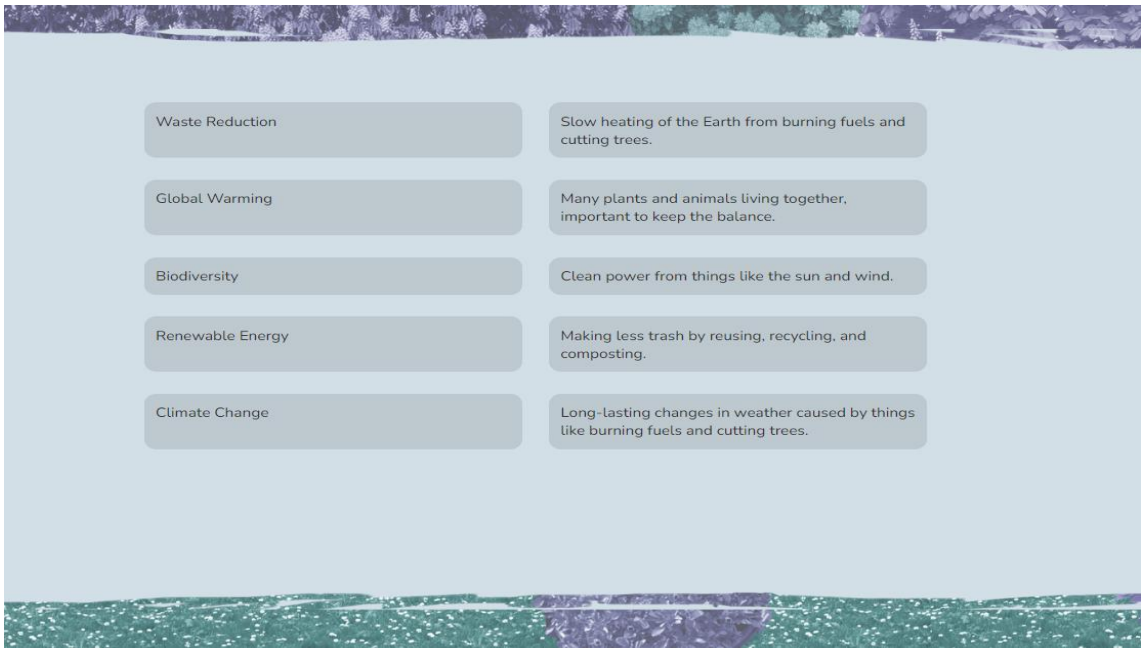


- Drag-drop games:

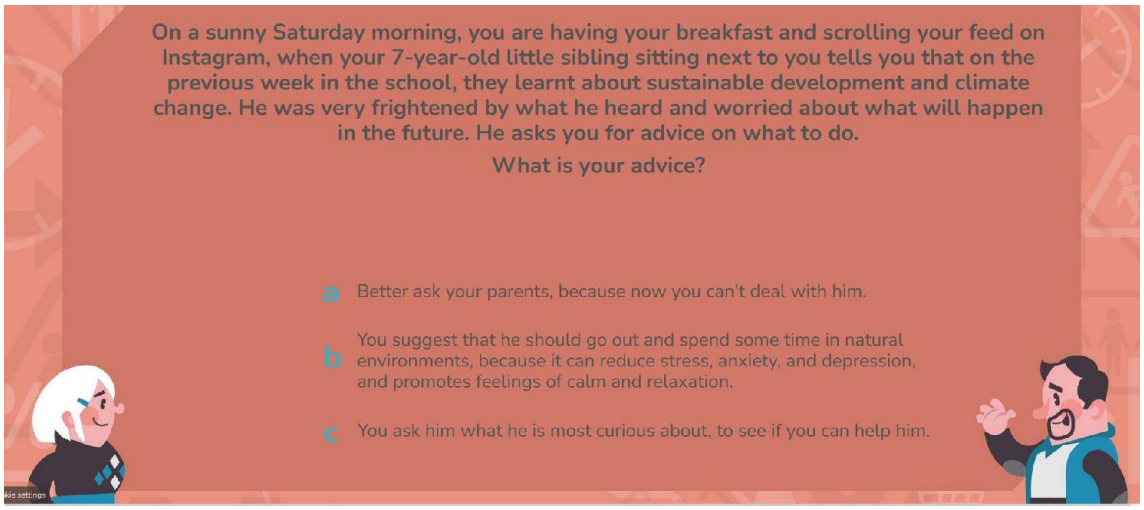


- Quiz games:

- Memory games:



- Decision tree games:

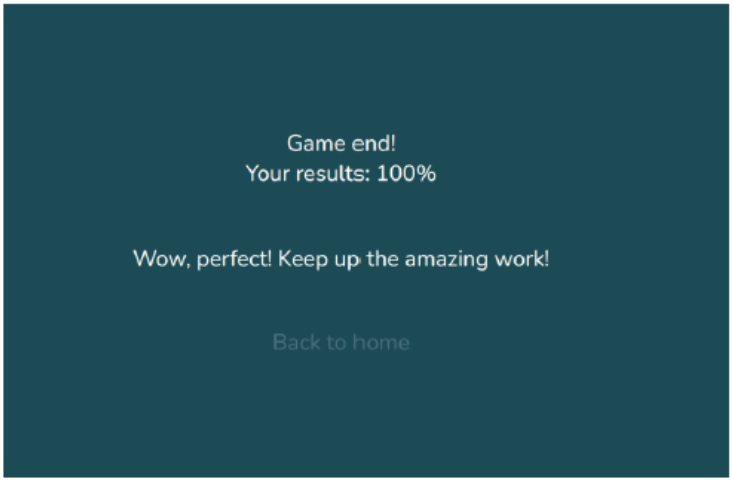


When the player has played all the minigames of a module, the scene moves to a next picture where the player can find a new pin with the decision tree of that module.

Decision trees require players to think carefully about the story (and the decision situations) and choose one of the possible answers. The story then continues depending on the answer chosen. Feedback on their choices is given to the players, helping to reinforce what they have learned in the module. The decision trees allow learners to reflect on what they have learned by selecting from a number of choices at their disposal.

The minigame that was played changes its colour.

Players get feedback after completing a minigame:



4 OBSTACLES THAT WERE FACED IN DEVELOPING THE GAME

4.1 Introduction

As mentioned earlier, this chapter seeks to present the obstacles (mainly technical) faced in the development of the game and the actions taken to overcome them.

4.2 Obstacles faced in developing the game

Throughout the development of the game, we encountered several obstacles, yet managed to overcome each of them, leading to the completion of the game by December 2023.

The challenges we faced were manifold: one major hurdle was defining the target age range, spanning from 6 to 26 years old, which presented a significant challenge in game design. Consequently, multiple storylines and graphical backgrounds emerged, and the final decisions on these were left to the demonstration site teachers via an online vote. However, this voting process slowed down the development of the game's ultimate concept. Another challenge stemmed from teacher requests on creating tasks that could engage students more actively and encourage their decision-making, focusing on engagement rather than merely presenting school-like quiz-based queries. Striking this balance proved difficult, trying to find equilibrium between school-test-like activities and games that demanded active participation and decision-making.

Upon teacher request, the concept of the escape room was incorporated, aligning it with the missions at various locations. Another consistent request was for mobile accessibility of the game, yet due to financial constraints decided early in the preparation phase of the project, the game was optimized for desktop or laptop use, though it is accessible from tablets and mobile phones with a less convenient outlook.

Finding suitable language was another challenge; we aimed to avoid technical jargon, especially for younger players, and strove for inclusivity within the game. Difficulties also arose in creating knowledge bases, since these were mainly impacting the game development, and aligning them with game graphics was also a challenge. The process of developing the panoramic images took longer than anticipated, both in conceptualization and drawing. Formulating missions that fit the theme proved to be another challenge.

Continuous consultations with teachers added to the complexity and took longer than expected. Tailoring the game experience for younger players who might not be proficient in English was difficult. Additionally, the limited time frame for teachers posed challenges during the testing phase.

4.3 Actions that were taken to overcome them

Adapting flexibly to every encountered problem, we successfully found solutions. Due to the slow progress of development and the postponement of testing for autumn 2023, we requested an official postponement for the deliverable allowing us extended time to manage technical tasks and have ample time for teacher consultations. Our aim is to shape the game as closely as possible to meet teachers' expectations and requirements. The feedback received during testing guided adjustments and refinements, significantly aligning the games with teachers' requests and expectations.

As we placed significant emphasis on involving teachers, the development process conducted multiple workshops with them. Their creative ideas, feedback, testing results were asked at 4 occasions in the development process, all of these occasions were prepared at least one online meeting beforehand explaining and presenting the task or the input asked from them, and also giving floor to any doubt or question. (For more details see 3.3 Involvement of the teachers, co-creation processes.) Consequently, we could adequately incorporate their ideas into the game's development. Another issue was the broad age range (from 6- to 26-year-old students!) that was resolved by dividing it into three segments: the youngest age group spanned from 6-9-years, the younger ones were formed to be 10-15-year-old, and the 16 and above category was put into one group, resulting the upper secondary class students to be integrated with university students. The accuracy of this segmentation was validated by the testing process.

In response to encountered issues, we dynamically restructured the progression, ensuring simultaneous advancement in subtasks.

5 PILOTS DEVELOPED

This chapter presents the pilots and the steps taken to carry out the pilots will also be presented. The results that were obtained from the pilots carried out, as well as the obstacles that were faced and the actions that were taken in order to troubleshoot those issues are presented.

5.1 Steps taken to carry out the pilots

The initial testing period was scheduled for early summer 2023. However, due to varying summer break schedules at the Demonstration sites across the involved countries, the test was eventually postponed to autumn 2023. Preparation for the test took place during the summer, involving consultations with project leaders, WP leader and WP partners, and partners connected to demonstration site teachers. The final testing phase occurred in November 2023.

Partners in contact with demonstration site teachers were the first to be approached. They conducted a brief survey among the teachers involved in testing, which resulted in a request to minimize the required testing timeframe. Teachers felt overwhelmed as they had to maintain progress with regular studies, leaving limited time for testing in the preceding months. Responding to this, TREBAG organized a division of the games to be tested, assigning each game or decision tree to two counties. Consequently, half of the testing countries were tasked with testing one portion of the games, while the remaining countries assessed the other half of the minigames. An online presentation was conducted to instruct on playing the game, with representatives from most demonstration sites and partners in contact with them attending this workshop. The session allowed for detailed discussions and addressing any queries related to the game.

5.2 Testing period, participants and questions addressed

During the testing phase from October 30th to November 30th, 2023, responses were collected via a Google Form, an online questionnaire. Testers included teachers and students from demonstration sites and partners spanning Finland, Portugal, Romania, and Spain. In the end, the questionnaire was completed by 30 different teachers or students, but one questionnaire could contain feedback about up to 3 different minigames. The original idea was that each game would be tested by 2 teacher/student groups, but due to teacher overload, all the pre-testing could not be done as planned. The 30 teachers or students who responded gave their opinion on a total of 63 individual games, and Annex II analyses these 63 opinions by age groups. Despite the relatively small number of respondents, the general opinions were clearly discernible in the responses received. (Some of the teachers did not record their feedback on the individual games, but stated a general comment on all minigames of a module, - covering 5 minigames in the same topic or module.). Finally, the majority of games underwent testing by at least one teacher or student.

The following questions were asked about each tested minigame or decision tree:

- All in all, how did you (or your students) like this minigame? (1 = not at all, 5 = very much)
- How was the content of the minigame? (perfect / good enough / a bit bad / pretty bad / other…)
- How was the length of the minigame? (perfect / too long / too short / other…)
- How was the design and the style? (perfect / good enough / a bit bad / pretty bad / other…)
- Other feedback on this minigame / general feedback?

5.3 Results obtained

The major findings of the testing phase highlighted active student involvement, with individual contributions accounting for 37% of the given answers (37% student answers, 47% teacher answers, remaining answers were from mixed teacher-student and partner junior project manager):

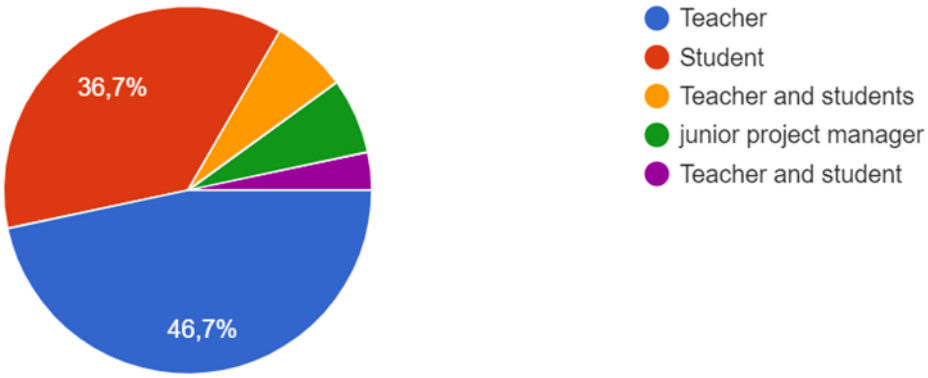


Chart 1. Participant Distribution of the Learning Game Testing (sample size: 30 answers)

Over 66% of all respondents held a positive opinion of the games overall, while the design and style received extensive praise, surpassing an 80% approval rating:

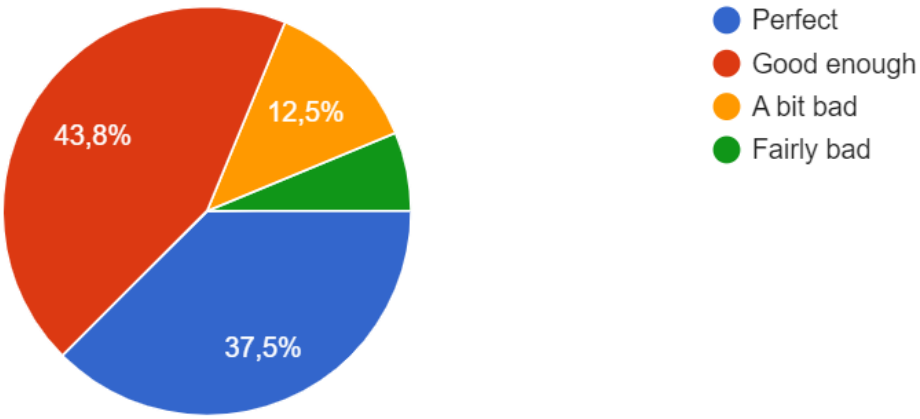


Chart 2. "How was the design and the style?" Answer Distribution of the Learning Game Testing (sample size: 30 answers)

For details of the testing results please look up the Annex (Charts of Testing Results) of this document.

Results for the 6-9-year-old age group:

The findings from this age group, based on 21 responses, indicate several key points:

- Only 33% expressed a general liking for the game, which is notably lower compared to the other two age groups, making this version the least favoured.
- A majority, 52%, found the content to be good or perfect.
- Dislikes were more prominent among this age group, reaching 29%.
- Approximately 53% felt the game's length might be a bit too long.
- The design received high praise, with over 90% expressing appreciation for its quality.

Results for the 10-15-year-old age group:

Based on 24 responses, the major findings are as follows:

- A notable 46% expressed a general liking for the game (liked or very much liked)
- 77% found the content to be good or perfect, indicating a positive outcome,
- Dislikes were minimal,
- While some felt the length might be a bit long, only 9% indicated it was too short, with 48% perceiving it as too long, 43% answered the length to be perfect,
- The design received positive feedback, with over 75% expressing appreciation for its quality.

Results for the 16-25-year-old age group:

Based on 20 responses, the significant findings are as follows:

- 60% expressed a general liking for the game, marking the highest among all three groups,
- Remarkably, 95% found the content to be good or perfect, ranking the highest among all three groups,
- Surprisingly, there were no reported dislikes,
- The length was deemed satisfactory by 80%, with a significant 80% rating it as perfect,
- The design garnered positive feedback, with over 89% expressing appreciation for its quality.

In general, it can be said that games for the youngest age group received the most criticism, while the other two age groups mainly liked the games.

5.4 Obstacles faced

During testing, we faced several issues, mainly stemming from teachers' overwhelming workload. Partner institutions connected to demonstration sites in most countries required multiple prompts to engage with teachers and conduct testing. Eventually, the testing concluded, yet we settled for fewer evaluations than planned due to repeated requests with limited teacher participation, resulting in relatively few outcomes.

Overall, a significant portion of the games underwent testing at least once. We processed numerous observations received during testing and conducted various activities to address identified errors or feedback, some of which will be completed in January 2024. The summarized table below highlights the discovered issues and our response reactions.

Generally, simplification was required for the youngest players as certain parts of the games were too difficult and lengthy for them. Additionally, specific videos and expressions were removed from the games to ensure enjoyment for the youngest players.

There was a general demand for the game to be available in national languages. The technical capability for translation was available since the subcontractor developed the game with translation built into the software. However, translating and integrating these translations into the game interface requires a considerable amount of time. This raises the question of whether the consortium can address this within the scope of the current project application.

Major findings and actions taken to troubleshoot those obstacles:

General Findings	**Changes Done or Planned**
Content too much and too difficult for 6-9 years old	Simplify and shorten the more criticised mini-games for this age group (not all of them)
Wording and videos sometimes too difficult	Remove the most difficult expressions or videos or change them
Minigames sometimes too long	Shortening those minigames
Request to be able to see the good answers	This needs a programming development, we can do it but only in January, 2024
Minor technical corrections requested: too small letters, changes in screen size, missing button, etc.	Finish all these little corrections
Request to see the progress of the minigame	Give numbering to the minigame questions, e.g. 1/10 , (planned, tbc with developers)

Very general comment: national language translations would be essential (for 6-9 years most)	It is beyond the scope of the developer team, but the possibility exists in the software

6 CONCLUSIONS AND NEXT STEPS

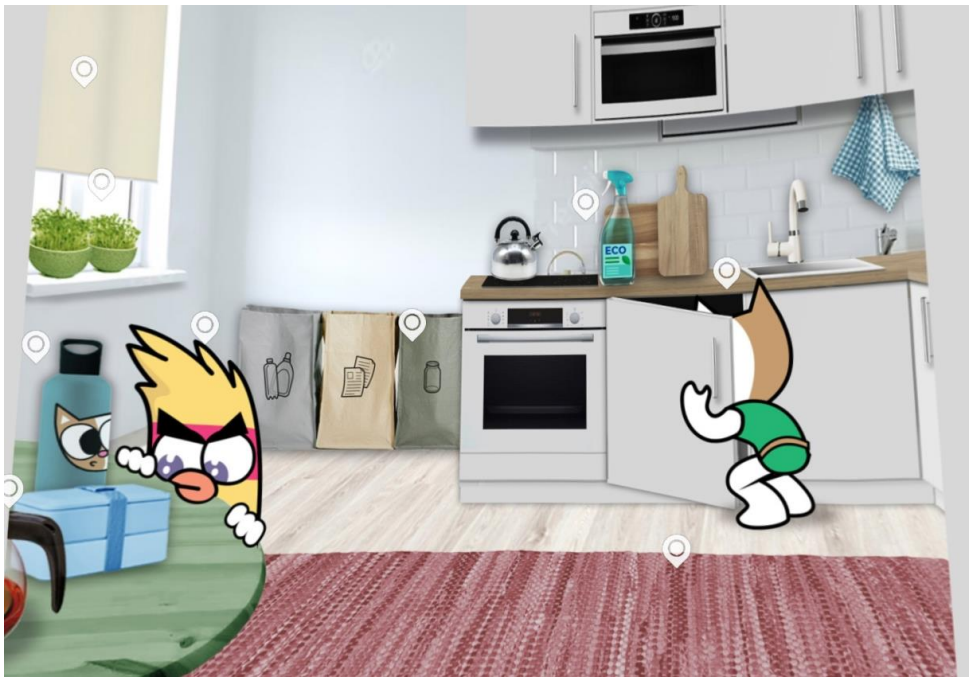
As a conclusion, it can be stated that the testing of the game has been completed, and we've gathered sufficient feedback for necessary improvements. Some of the improvements and error corrections have already been implemented, while the remaining part will be completed in 2024 by the development team due to the task's time requirements and programming needs.

Overall, teachers and students evaluated the games positively, with the absence of translation into national languages being the main drawback. The requested improvements mainly focused on shortening and simplifying the games, primarily affecting the youngest age group (6-9 years old) and partially the 10-15 age group.

As the next steps, the development team will finish the requested improvements and simplifications. The remaining significant question revolves around the issue of language translations, which requires a considered decision at the WP level.

7 ANNEX A: LEARNING GAME SCREENSHOTS

Screenshots for the family house and garden:

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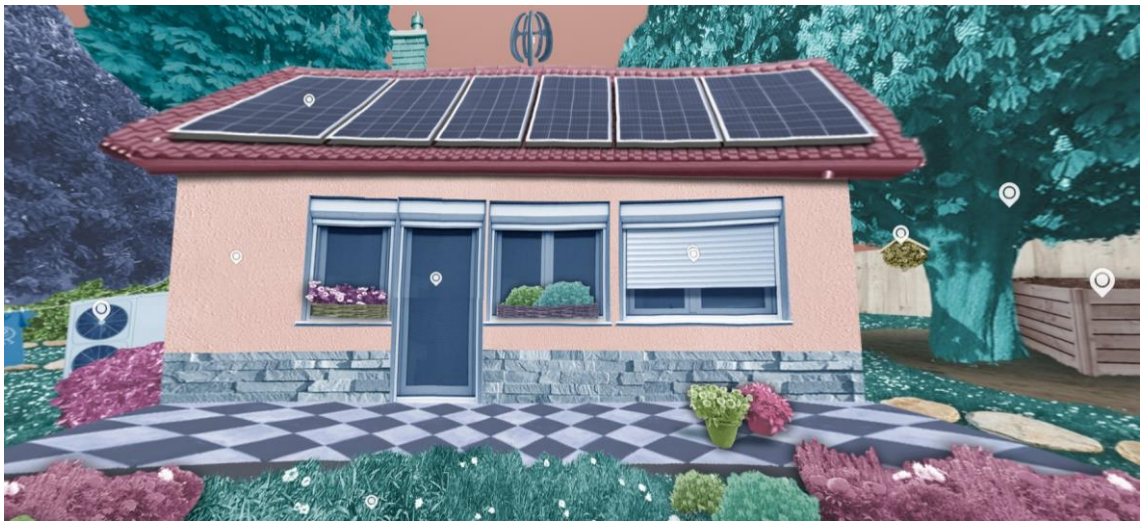
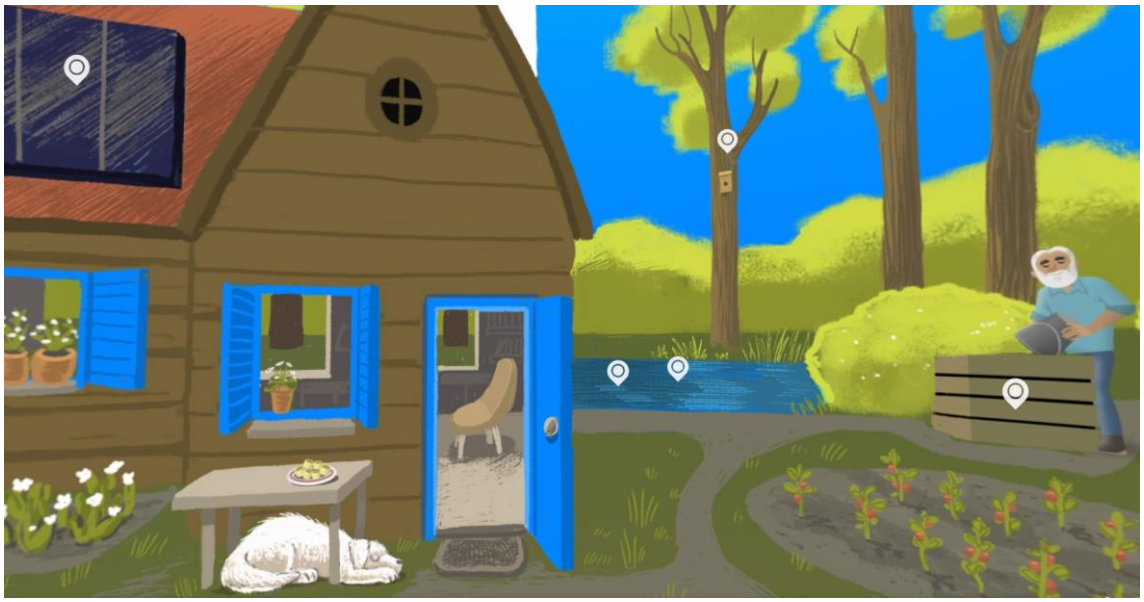


Woods and clearance:

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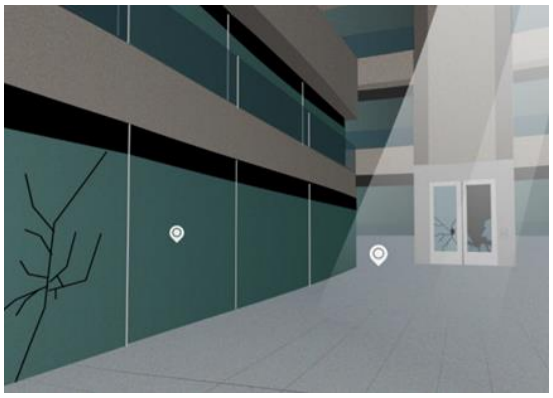
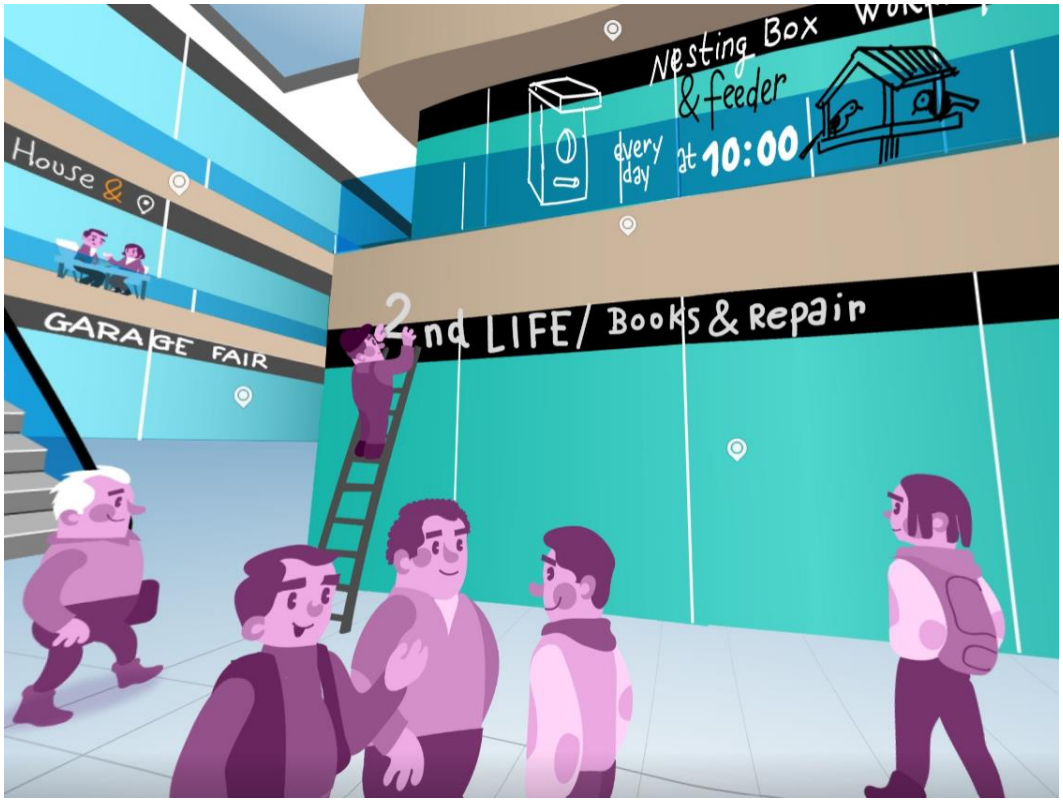
Shopping mall:



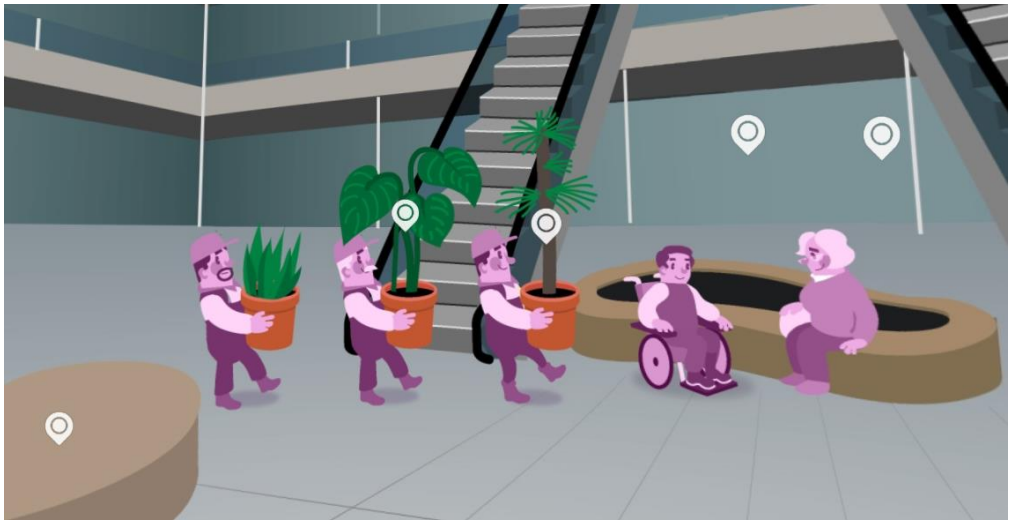

Nesting Box
& feeder
every day at 10:00
House &
GARAGE FAIR
nd LIFE/ Books & Repair


60%
60%
40%
100%
20%
DON'T THROW AWAY!
Repairing
workshop


BOOKS
SAVE
LIVES
second hand
BOOK
corner


Food Fumbles: We all know that feeling of opening the fridge and finding something that resembles a science experiment. But think about the resources wasted, the money down the drain, and the hangry you. Let's get savvy about food waste!
open discussion
STOP
food waste
30 years
LIFE LONG GUAR ANTEE
80%
80%
40%
60%
40%


SHARE 'N' GO ~ COWORKING ~
ARE EXPO
Pick Up Point
OWN GOODS Market
arket
ECO
30 years
LIFE LONG GUAR ANTEE
SELL your OLD stuff




Nesting Box Workhop
& feeder
every day at 10:00
DANCE THERAPY STUDIO
FASHION REUSE
2nd LIFE/ Books & Repair
CHARITY
STOP food waste
BOOKS SAVE LIVES
SELL your OLD stuff
FAST FASHION

8 ANNEX B: CHARTS OF TESTING RESULTS

The testing had the following results shown in charts:

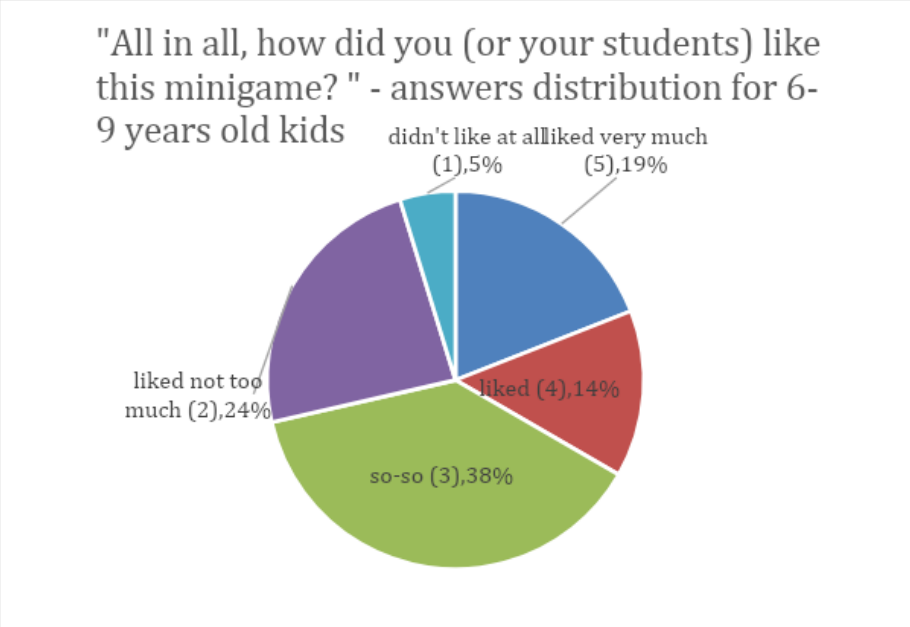


Chart 3. General Rating of the Game for 6–9-year-olds in the Learning Game Testing

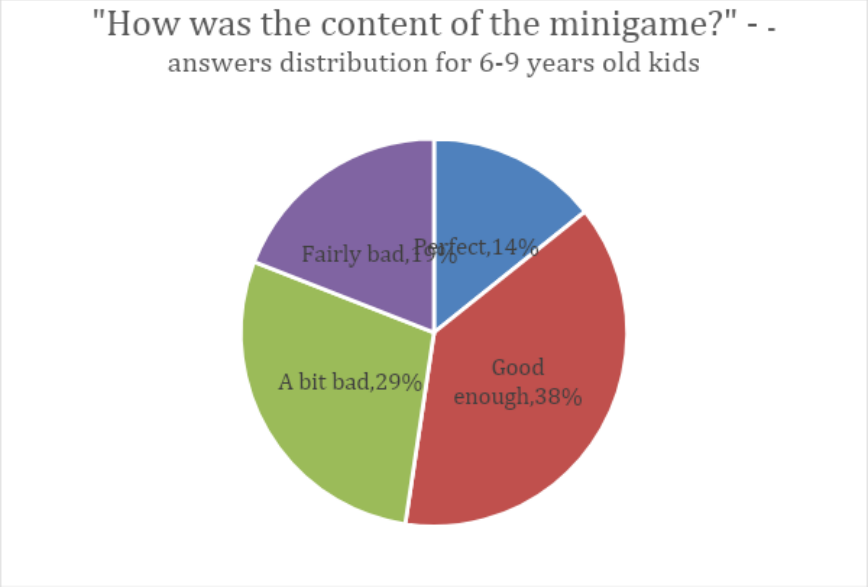


Chart 4. Opinions on the Content of the Game for 6–9-year-olds in the Learning Game Testing

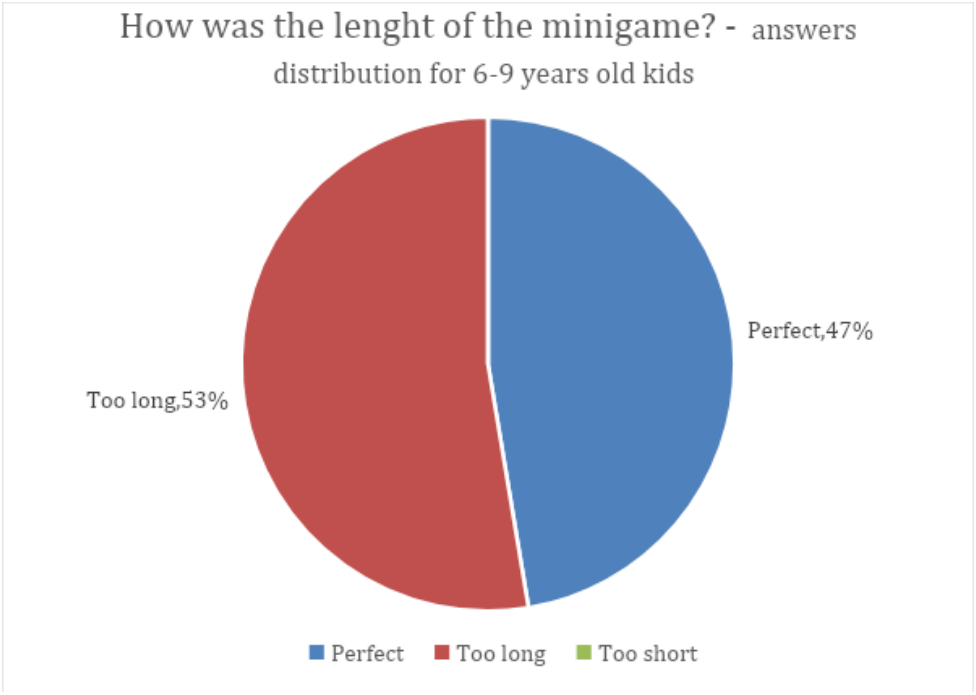


Chart 5. Opinions on the Length of the Game for 6–9-year-olds in the Learning Game Testing

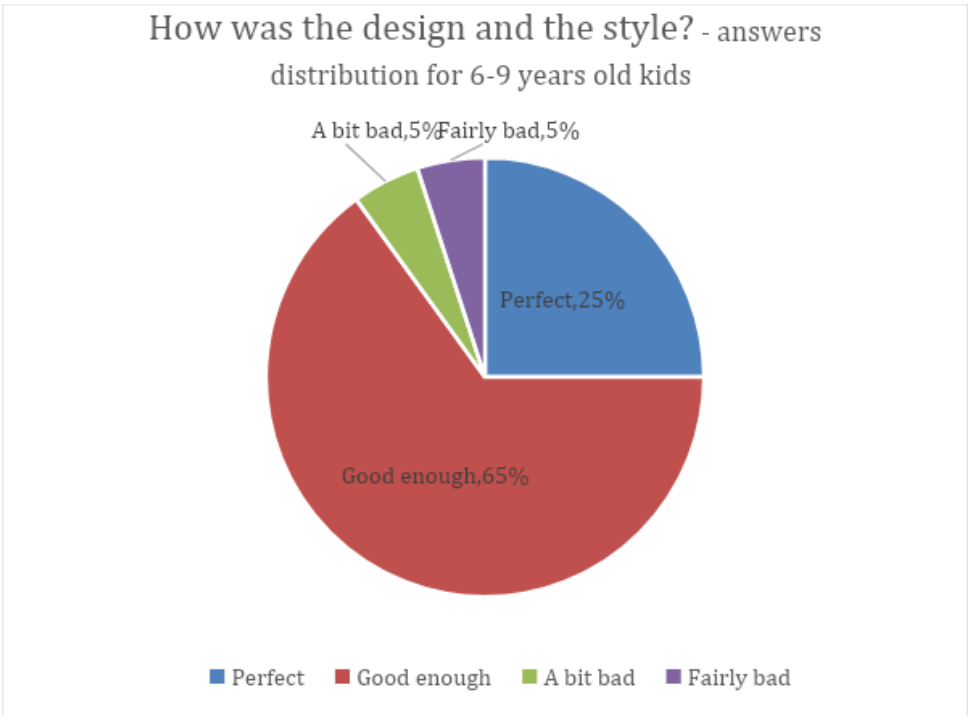


Chart 6. Opinions on the Design and Style of the Game for 6–9-year-olds in the Learning Game Testing

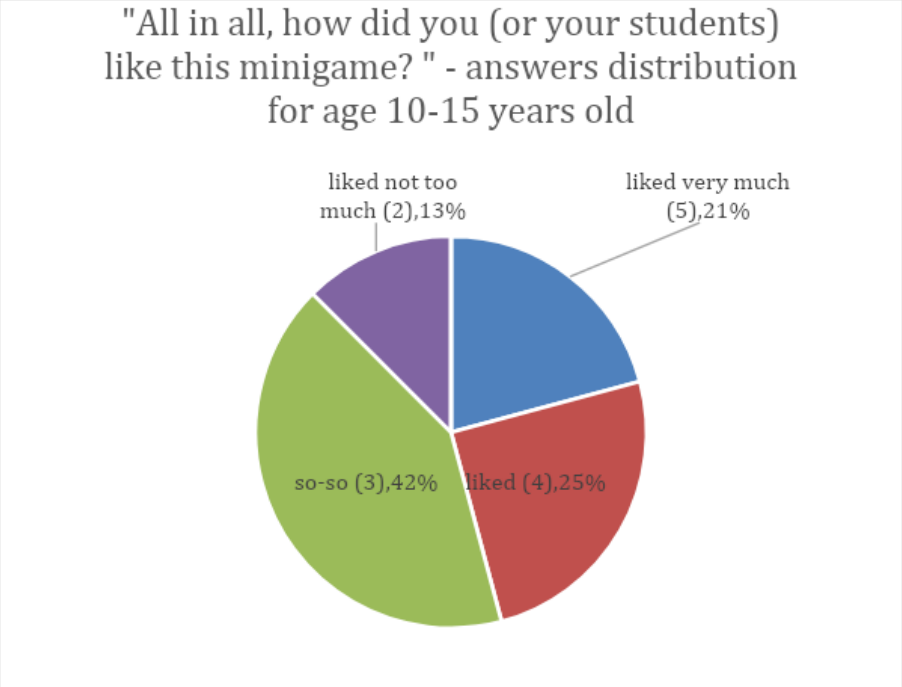


Chart 7. General Rating of the Game for 10-15-year-olds in the Learning Game Testing

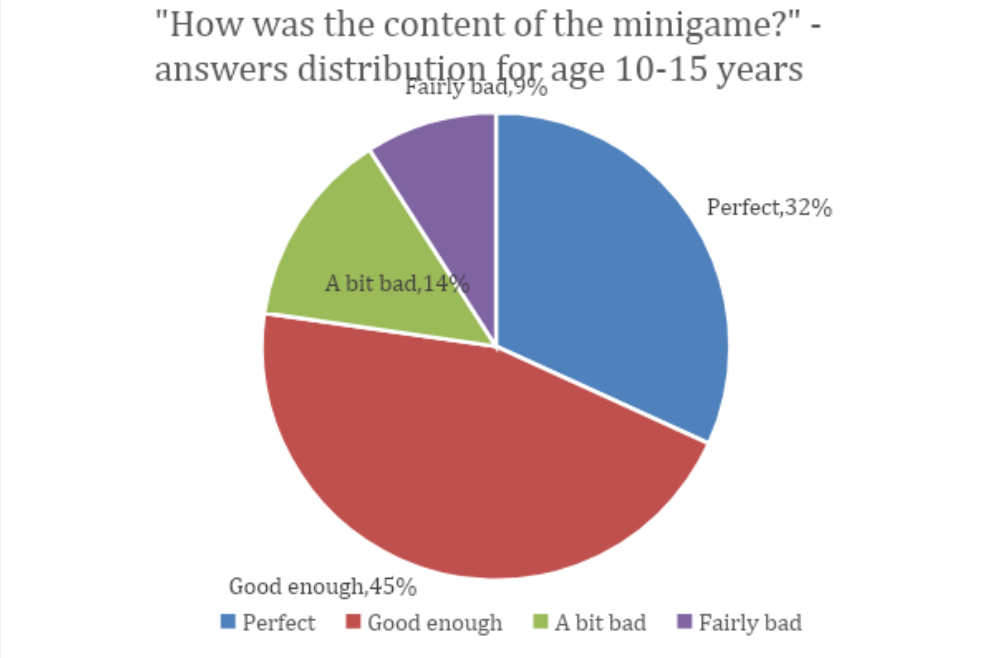
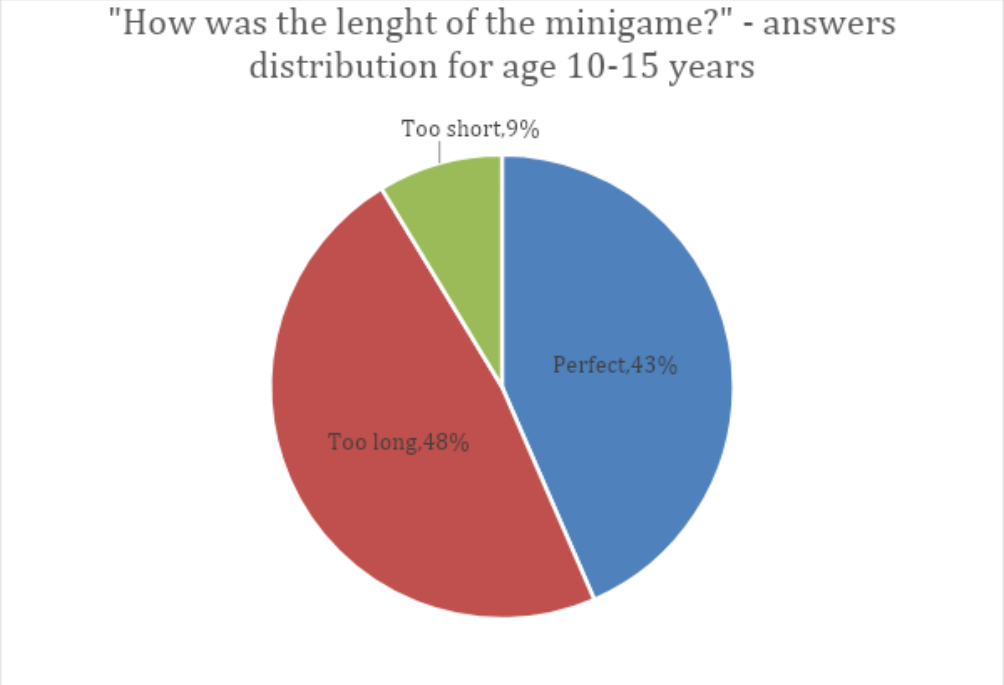


Chart 4. Opinions on the Content of the Game for 6–9-year-olds in the Learning Game Testing



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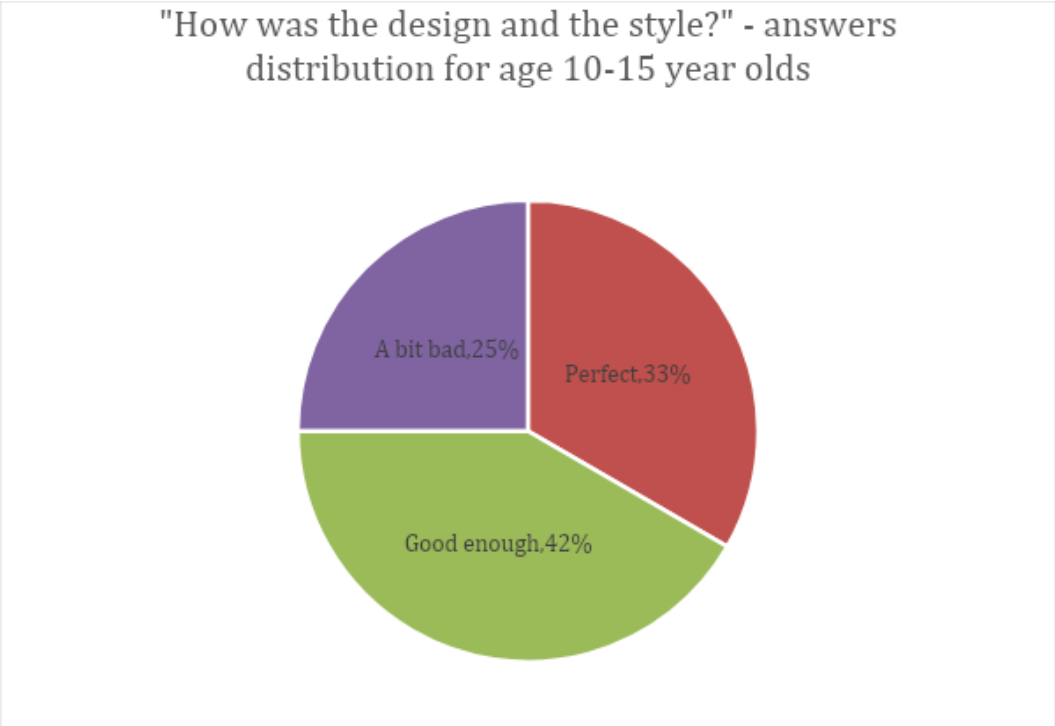


Chart 6. Opinions on the Design and Style of the Game for 10-15-year-olds in the Learning Game Testing

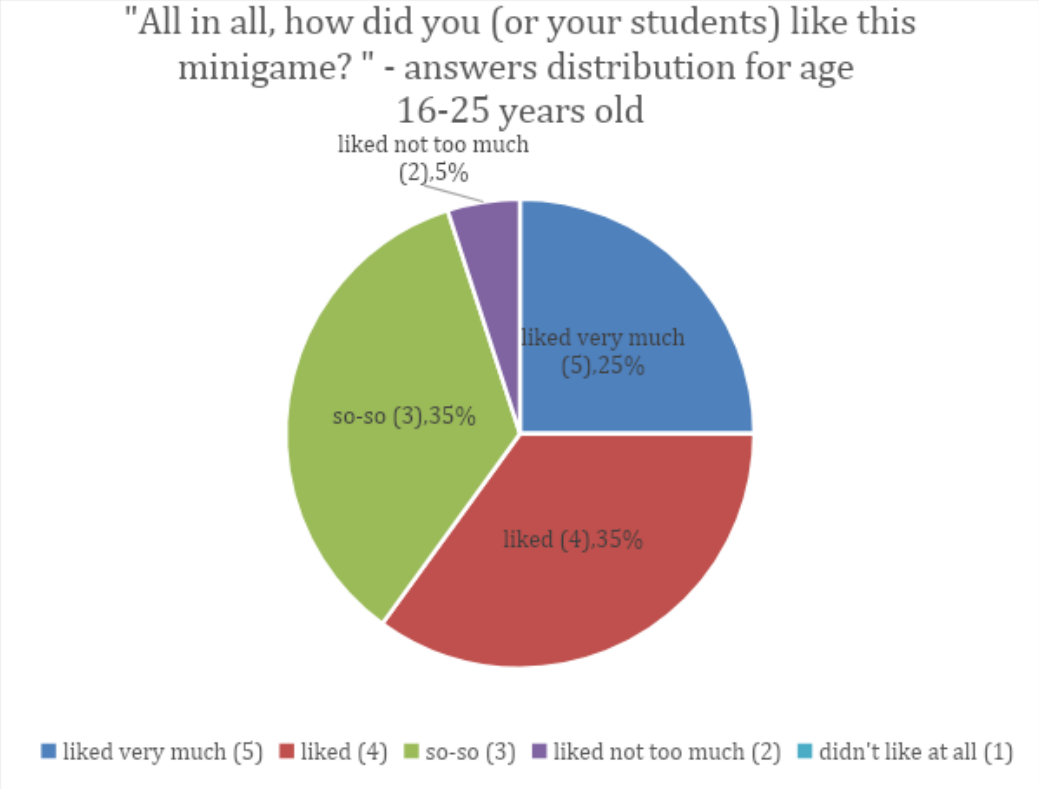


Chart 7. . General Rating of the Game for 16-25-year-olds in the Learning Game Testing

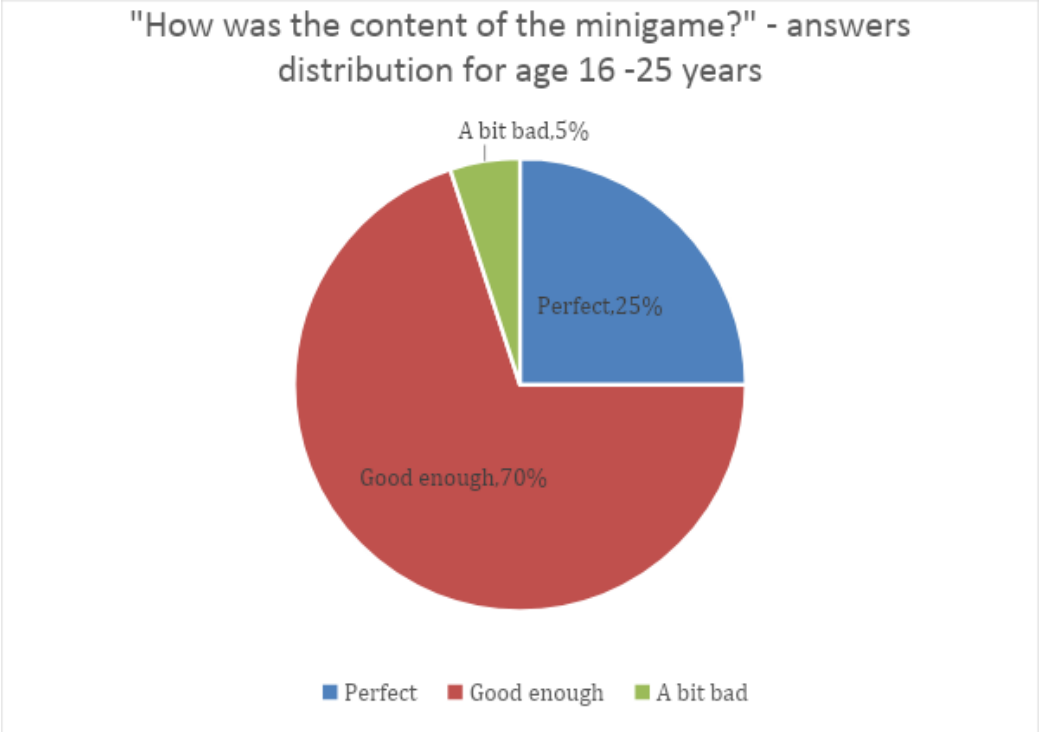
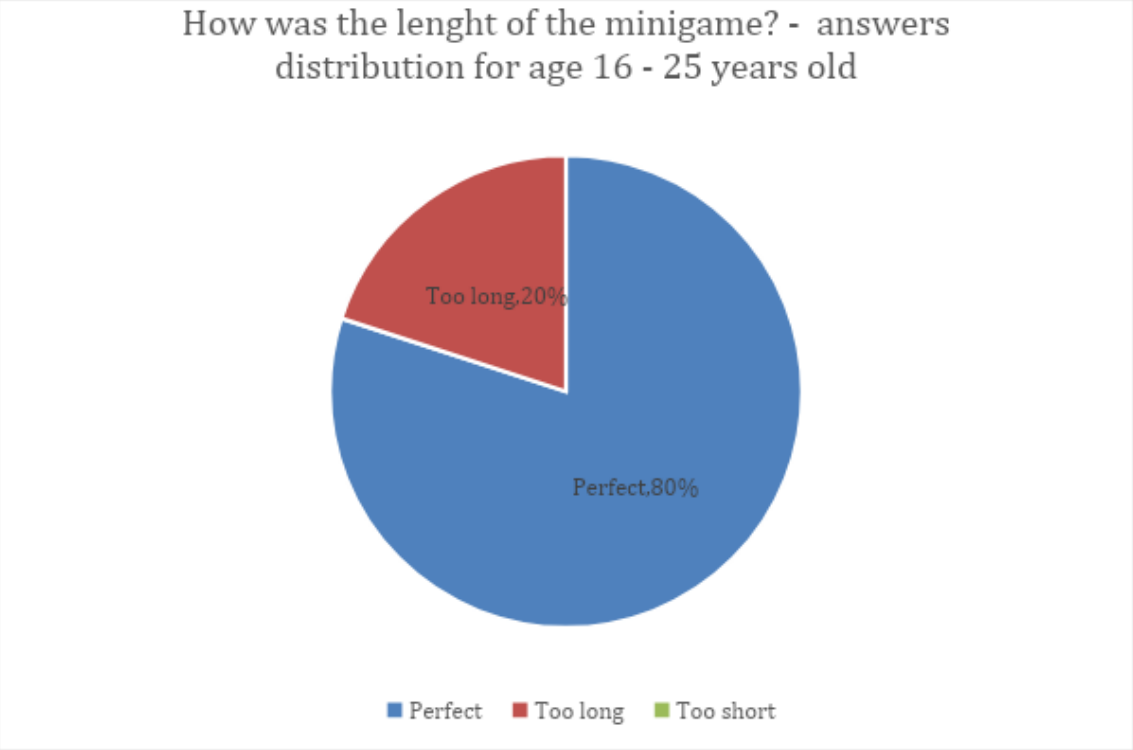


Chart 4. Opinions on the Content of the Game for 16-25-year-olds in the Learning Game Testing



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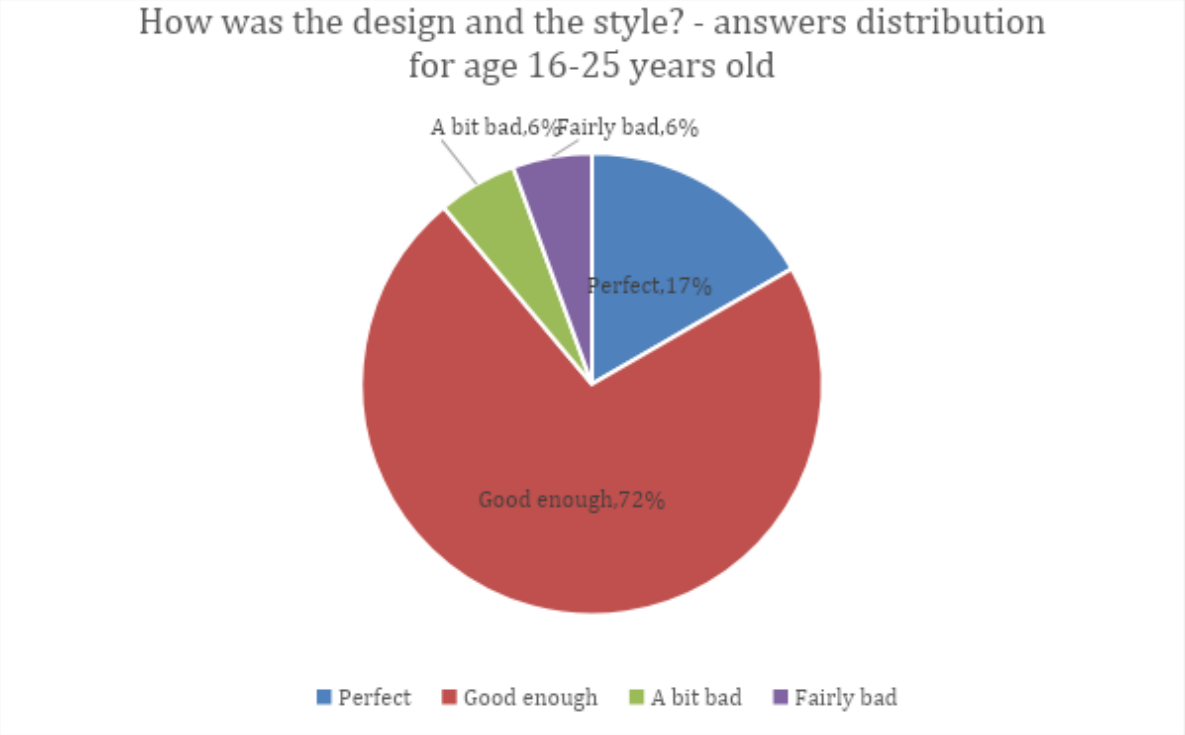

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