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**MULTIMEDIA – SPECIALIZATION IN INTERACTIVE TECHNOLOGIES AND DIGITAL GAMES**

# **WORLD BUILDING AND DESIGN OF AN IMMERSIVE EDUCATIONAL ESCAPE ROOM: ITS IMPACT ON IMMERSION**

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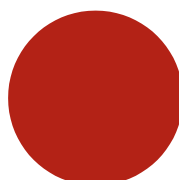
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Masters in Multimedia of University of Porto

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# Resumo

*Esta dissertação centra-se em World Building e no processo de conceção de Escape Rooms Educativos e Imersivos (IEER), em que consiste, e o seu impacto sobre a imersão. Neste sentido, aborda o World Design por detrás de um IEER e o seu impacto nos jogadores. A primeira fase envolveu investigação experimental imersiva. Para assegurar dados suficientes para complementar este projeto, houve contacto direto com o próprio IEER e trabalho colaborativo numa equipa multidisciplinar, permitindo o desenvolvimento da investigação, que envolve um alvo diferente.*

*O nosso objetivo é compreender melhor como o World Design afeta a imersão e como abordar questões de adaptabilidade para jogos educativos, especificamente, fotossensibilidade, epilepsia e daltonismo. Foram desenvolvidos dois protótipos: o protótipo 1, um IEER 2D com narrativa imersiva; e o protótipo 2, um IEER 3D sem narrativa ou feedback. Ambos os protótipos foram testados e os dados recolhidos foram estudados, permitindo reunir conclusões para uma melhor compreensão de como os Escape Rooms Educativos e Imersivos podem evoluir.*

*Relativamente às ferramentas utilizadas para gerar as paletas cromáticas de cada protótipo, foi possível concluir que funcionaram e permitiram aplicar a teoria da cor, melhorando a experiência do utilizador. No entanto, verificou-se que estas não foram suficientemente eficazes para tornar os protótipos totalmente seguros e acessíveis, pelo que é necessária mais pesquisa neste campo. Em quase todos os parâmetros, o protótipo 1 foi o preferido dos participantes, sendo mais intuitivo, imersivo e educativo. Todavia, os resultados obtidos sugerem que o protótipo 2 seria considerado mais imersivo se tivesse uma narrativa imersiva. O parâmetro da adaptabilidade foi o único com resultados inconclusivos, sendo evidente a necessidade de continuar a investigar.*

*Independentemente do protótipo, todos os participantes consideraram que os IEERs têm valor educativo, o que permite concluir que há interesse e relevância em continuar a explorar como é que os IEERs podem ser utilizados em ambiente de ensino e aprendizagem, como podem ser melhorados e como os tornar uma ferramenta acessível.*

*Palavras-chave: adaptabilidade, world design, imersão, level design, storytelling, escape room educativo, jogos sérios.*





# Abstract

This dissertation focuses on World Building and the design process of Immersive Educational Escape Rooms (IEER), what it consists of, and its impact on immersion. In this sense, it addresses the World Design behind an IEER and its impact on players. The first phase involved immersive experimental research. To ensure sufficient data to complement this project, there was direct contact with the IEER itself and collaborative work in a multidisciplinary team, allowing the development of the research, which involves a different target.

Our goal is to better understand how World Design affects immersion and how to address adaptability issues for educational games, specifically, photosensitivity, epilepsy and colour blindness. Two prototypes were developed: prototype 1, a 2D IEER with immersive narrative; and prototype 2, a 3D IEER without narrative or feedback. Both prototypes were tested and the data collected was studied, allowing the gathering of conclusions for a better understanding of how Immersive Educational Escape Rooms can evolve.

Regarding the tools used to generate the chromatic palettes of each prototype, it was possible to conclude that they worked and allowed applying the colour theory, improving the user experience. However, it was found that these were not effective enough to make the prototypes fully safe and accessible, thus further research is needed in this field. In almost all parameters, prototype 1 was preferred by the participants, being more intuitive, immersive and educational. Despite this, the results obtained suggest that prototype 2 would be considered more immersive if it had an immersive narrative. The adaptability parameter was the only one with inconclusive results, being evident the need for further research.

Regardless of the prototype, all participants considered IEERs to have educational value, which allows us to conclude that there is interest and relevance in further exploring how IEERs can be used in teaching and learning environments, how they can be improved, and how to make them an accessible tool.

*Keywords: adaptability, world design, immersion, level design, storytelling, educational escape room, serious games.*



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# Abbreviations and Symbols

ER	Escape Room
EER	Educational Escape Room
IEER	Immersive Educational Escape Room
WB	World Building
JSON	JavaScript Object Notation
PT	Prototype
PCG	Procedural Content Generation



# 1. Introduction

This dissertation focuses on an Immersive Educational Escape Room development, the guidelines for the building process allowing an immersive narrative and having adaptability issues in mind. It also concerns how the different variables impact immersion.

“Play and learning are not at opposite poles, on the contrary, they have always been intertwined.”(Moura & Santos, 2020)

The research made highlights several questions and the process behind our attempt to answer them. Deconstructing the concept of Educational Escape Rooms and go further to achieve immersive results is one of the goals.

## 1.1 Motivation / Problem specification

Universities have been seeking new strategies to achieve a greater adherence from students to learning methodologies, grading, and education. One of those strategies is through active learning, through distinct approaches, one of which is Immersive Educational Escape Rooms (IEER).

We expect to increase the quality of the user experience by promoting the consolidation of knowledge through the process and building of an IEER and developing new educational content.

A plausible nonlinear narrative is the main focus, along with the respective environment referred to as IEER and the respective study of level design. The main goal being to achieve an immersive environment, studying the corresponding impact on user experience and measure educational achievements.

There is a lot of research about the concept of immersion connected to video games and a significant amount done over world building. Nevertheless, there is none about the impact and influence world design can have over immersion in IEER, which is precisely what this dissertation will focus on.

## 1.2 Project

The project, in hand, encompasses to elaborate an immersive educational escape room, allowing a different approach for lecturers to stimulate learning experiences. We envision a functional, utterly digital escape room, built from the ground up, having in mind essential immersive elements, adaptability issues, and, of course, educational purposes and storytelling.

To test the impact immersion can have on world building, the challenge in hand provides a user focused project, and, hopefully, it will be enriched by real time data analyses.

With help from a multidisciplinary team (Fig. 1), we expect, firstly, to delineate a storyline backed with level design and basic immersion principles. For this specific phase, it is necessary to understand the target audience and the subject being lectured.

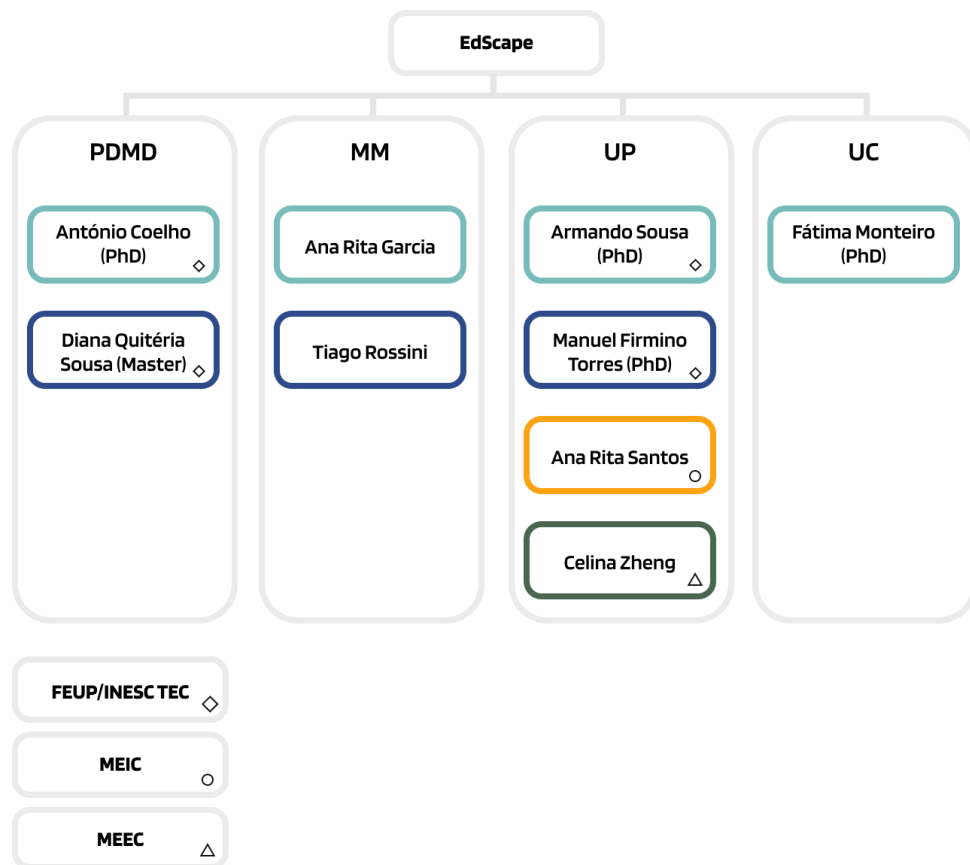


Figure 1 – Team of the project

Consequently, the first step was to study the usual environment to replicate and modify it when deemed necessary. The images bellow (Fig. 2-3) were taken to have a clearer notion of the environment of how an ordinary engineering office looks like.



**Figure 2 - Engineering office**



**Figure 3 - Engineering classroom**

The next stage was and will continue to be more practical, as part of the team defined how to make the game itself. When it comes to immersive purposes, the goal will be to further understand how to improve, through procedural methods, the users playing experience, guaranteeing a better engagement.

### **1.3 Objectives**

This research proposal has future perspectives to enlighten the concepts of IEER and world building and further investigate their impact on immersion. We expect to elaborate construction guidelines of IEER rooms to maximise students' learning experience.

Utterly focused on immersion, an experimental study was conducted to analyse the main variables that have an impact on the players' level of immersion while playing. There were set guidelines for modelling the IEER and a nonlinear narrative of the learning contents, and respective guidelines for building the world.

Further, in the research, we designed and conducted an experiment with users over the IEER, collected form data, and analysed the results.

As technology evolves, the users become more demanding of world building and what an immersive video game should or could be. This research also approaches immersion, world building, level design, and IEER and how related these concepts genuinely are.

### 1.3.1 Research questions

We explored several aspects of Playful Learning along the development of the project to answer the following research questions:

- **What is the impact immersive narratives and immersion have over IEER?**
- **How do the variables of presence, usability, adaptability, and flow affect immersion on an IEER?**

Understanding the impact world design has over immersion in IEER can help world builders and multimedia experts get better results when producing these games and even while projecting a new concept or idea, providing new educational tools and methods with a greater receptibility.

Setting guidelines for elaborating IEER accounting and adaptability concerns can be useful for further projects which intend to implement Educational Escape Rooms as a tool in learning contexts.

## 1.4 Structure of the dissertation

Concerning the structure of this dissertation, the first chapter highlights the motivation, objectives, and research questions while giving context to the experimental project. This also where the relevance of this research is tackled.

Following with three chapters that embed the literature review, summarising the content and combining the concepts approached. In the state of the art we begin with the concept of world building and all that entails. Understanding how level design works and how to generate grammars of both mission and space was crucial to assure the project followed the defined narrative correctly. Studying the concept of immersive narratives helped create the EER narrative, allowing to further understand how immersion can impact world building of an escape room. To guarantee this project to be inclusive for visual sensitive individuals, adaptability was one of the topics to investigate, in particular epilepsy and how video games have been affecting photosensitive individuals. Finally, as the EER will be generated with procedural modelling, understanding this process is deemed necessary. Immersion was evidently one of the topics that were researched, to understand how immersion and world building are connected and how they impact each other, and to create a partially immersive game, we had to understand what educational escape rooms were, for that, the research implied a deconstruction from Adventure Games, passing through escape rooms, to finally getting to educational escape rooms, serious games that provide learning experiences. When approaching immersion, the concept of embodiment was relevant to tackle as it entails how players perceive their own movements and

mindset as a whole. This leads us to the concept of Immersive educational escape rooms, building one, we are adhering gamification principles by promoting education through game mechanics.

Once finished the literature review, we approach the research methodologies implemented in the project, respective timelines for each task and explain the case studies conducted.

The design and implementation chapter encompass the process behind the development of the prototypes and all that entails. The immersive narrative is further explained, as well as the design choices made. All the adaptability concerns and proposed solutions are detailed, not leaving the set learning objectives and how they were implemented. Following then with a detailed description of each prototype built, the used tools and the process of development and implementation behind them.

The results chapter reintroduces the case studies and how they were conducted. It is also in this chapter where data analysis is displayed and a discussion over the gathered data, allowing conclusions over the results.

The last chapters summarise and conclude the content, inputting future work concerning this research. All references and appendices are in the end of this dissertation.

## 2. State of the Art

This chapter is a literature review of the core areas for this research, summarising the current content, combining the concepts approached to better understand the relevance of answering the questions of investigation, and how to develop the experimental prototype.

### 2.1 World Building

World Design is the process of creating worlds (Coulton et al., 2017). It approaches fields such as transmedia storytelling, user experience, and much more. It is a form of art that has been developing since arcade games. There is still not much research on this subject, perhaps due to the interest in it only becoming obvious since videogames evolved and provided reasonable interest and new opportunities to the players. Through advances in technology, world design techniques are constantly improving.

Despite the genre of the game, world building is about constructing imaginary realms, believable realms with preconceived stories with a meaning and a purpose. As mentioned before, the process of creating worlds is not strictly for games, and it's relatively common in cinema, animation, or even role-playing games.

The process of world building is described to begin way before the construction itself. Plausible narratives with meaningful data are essential for a convincing environment (Freytag & Wienrich, 2017), allowing the narrative to emerge from the world built. It usually starts with individual elements described as a whole, which will help develop a consistent fictional world. The generated data from this primary process is mirrored in the created environment. Not only should the world be convincing, but the interaction between the world and the characters inside it should be cohesive.

#### 2.1.1 Immersive narratives

In this project, the narrative concept is approached as a design tool for creating immersive simulations. The story behind gameplay determines how immersive an experience can be. The story line in character-centred games implies the main character itself, the background story, all details implied, and credibility.

Beyond simulating cinematic characteristics (like depth of field, hues, and textures), it's evident that the ground zero (for presence in the game world) can only be achieved when our

interactions with objects reproduce aspects of their behaviour in the real world (Gomes, 2005). Immersive narratives imply a realistic and embedding experience for the user, and the challenge will be to create an educational immersive story line.

### **2.1.2 Procedural modelling**

Procedural content generation (PCG) techniques are increasingly being used in game development. It describes the automatic creation of content through algorithms that consequently reduce the artist's workload in world building and level design. (van der Linden et al., 2014)

As any procedural technique, PCG in game development has pros and cons. Despite decreasing the amount of work and helping game designers achieve better results in a shorter amount of time, PCG is still restricted to very specific game elements and contexts. The results can be unpredictable and not as detailed as originally planned without controlling the modelling process from beginning to end. As so, PCG is a common technique for environment elements that, combined with 3D or 2D modelling for details, can still benefit and improve game development.

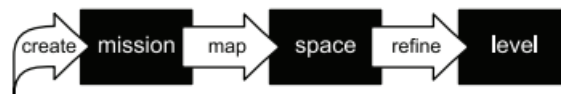
IEERs have both detailed elements and environment elements. For this project, PCG will be used to generate rooms and levels.

### **2.1.3 Level Design**

To be in a virtual environment through a character's embodied presence accounts for a significant portion of game play. The obstacles provided by the game are closely related to the perception we have over our body and control of it, every action or execution, regardless of it being a character or a first-person perspective. In what comes to immersive results, technology has been evolving as well as virtual experiences. However, level design from the very beginning of the development of the game is essential to assure embedding results. (Caldas & Keshavarzi, 2019)

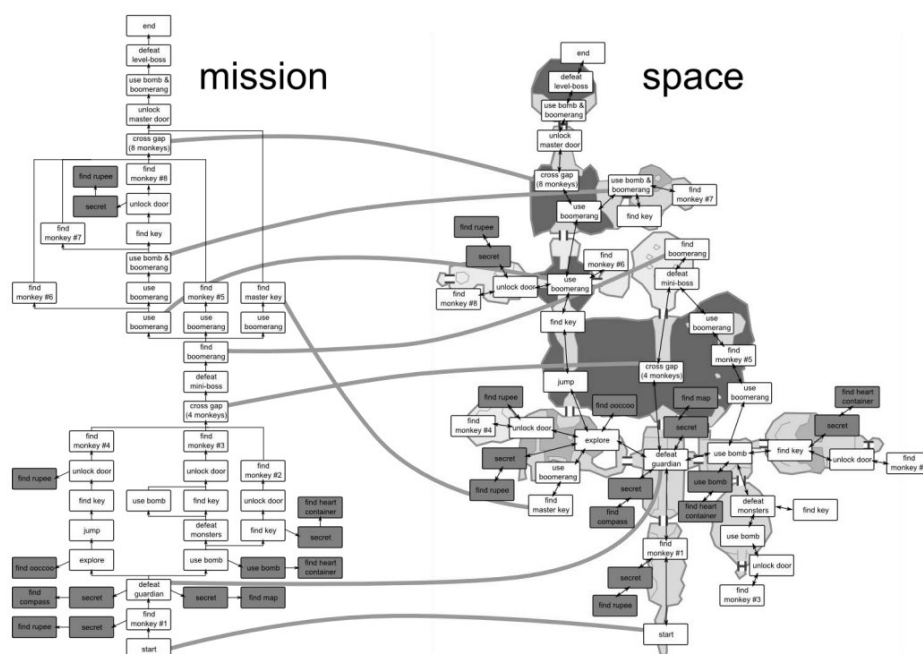
For practical matters, for this project, we focused on the generation of levels for adventure games, more specifically for educational escape rooms. Level design becomes more challenging in this category of games as it has to be enjoyable, have a solid immersive narrative, and still assure a flow and educational content. Working with procedural methods can hinder expressing these basic level design principles, as procedural modelling usually focuses on a wider scale, missing the details (Dormans, 2010).

Game levels are often designed through two structures: the mission of the game and the space the mission accommodates in (Dormans, 2011). The first step is to generate the mission and then the space, as one mission can be applied to different spaces if necessary (Fig. 4).



**Figure 4 – Steps to follow in level design. In *Dormans, Joris (2011)***

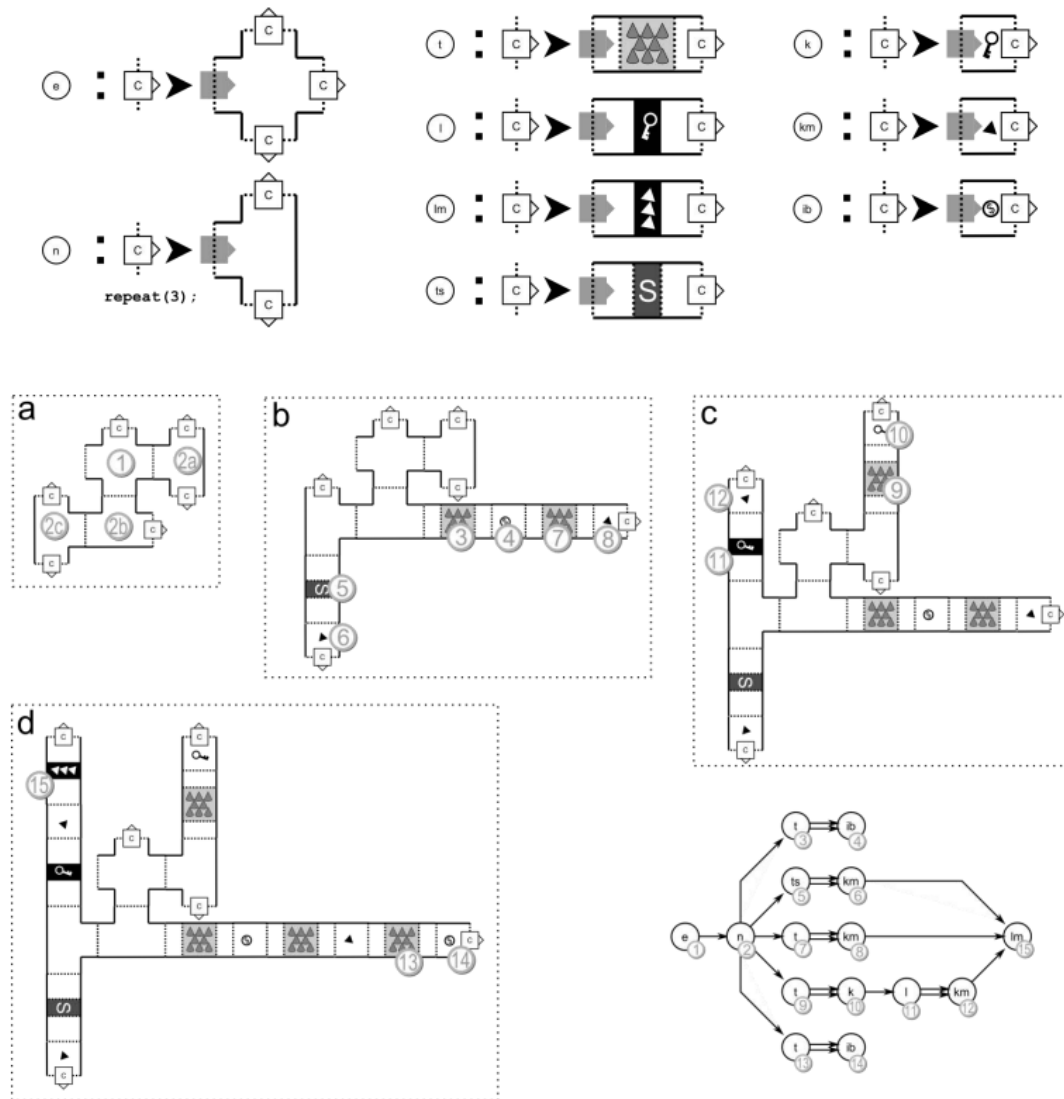
The only connection between the two structures is that the mission takes place in the levelled space and is mapped onto the latter (Fig. 5). An escape room game has a nonlinear mission, as there are several options and alternatives the user can choose, exploring the space, making it crucial for this project to follow these steps.



**Figure 5 – Mission and space in the Forest Temple level of the *The Legend of Zelda: The Twilight Princess*. In Dormans, Joris (2010)**

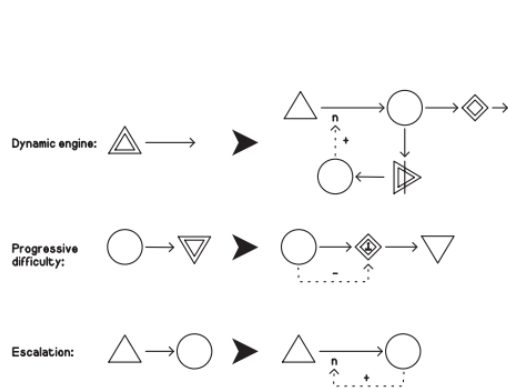
The use of generative grammars has become an option for nonlinear narratives. It usually consists of a set of rules to generate a space map that embeds the narrative and different options the level will have. We intend to create our graph grammar when constructing missions. The

following figure (Fig. 6) illustrates the process of generating a space map of a mission and how the final graph should look in the end:

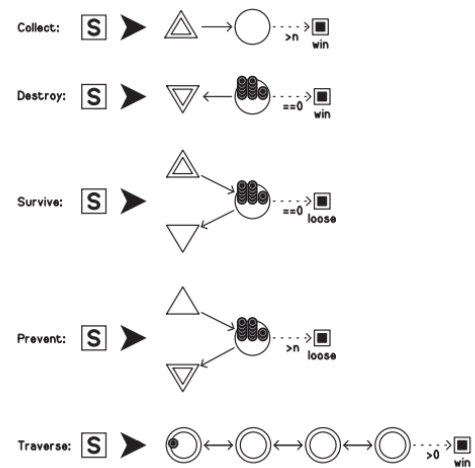


**Figure 6 – Space Generation using the rules and part of one mission. *In Dormans, Joris (2010)***

The same applies to the mechanics of the game. While designing the level and defining the different mechanics and options, generating mechanics' grammar graphs is important. Expanding generative grammars provides a better design and further development of the game. The figures below represent simple transformation rules as a starting point (Fig. 7-8).

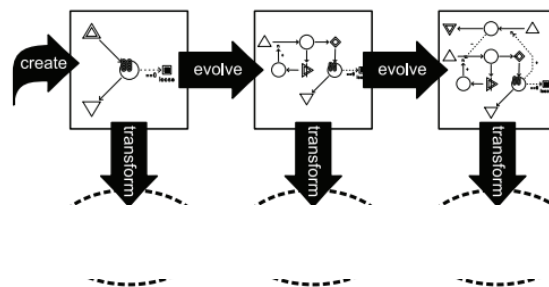


**Figure 7 - Rules to transform mechanics. *In Dormans, Joris (2011)***



**Figure 8 - Transformation rules to create a goal from an arbitrary starting point (the no-terminal symbol "S"). *In Dormans, Joris (2011)***

For educational purposes, tracing mechanics beforehand allows greater control of the progression from level to level, increasing the control over the experiment accordingly, as shown below (Fig. 9).



**Figure 9 – Levels progression. *In Dormans, Joris (2011)***

### 2.1.4 Adaptability

Adaptability concerns in game development are growingly more acknowledged by society since video games have become a part of our daily life. EER should be inclusive and adapted to visual sensitive individuals as education shouldn't be compromised by health issues. Adaptability also allows for a better flow and immersion as it allows the users to experience the game safely. One of the most common adaptability flaws in game development is the design of immersive games without triggering lights or colours. IEER designed for students must consider and guarantee an equal education for individuals with epilepsy, photosensitivity, or colour blindness.

In what concerns colour blindness, there are already solutions like ColorADD<sup>1</sup> (Fig.10) to make daily affairs easier for everyone. Inclusive and non-discriminative universal languages allow the colour-blind to identify colours whenever colours are decisive for choice making. In interactive and immersive environments is more challenging to use options such as ColorADD, although the principles can be harnessed.



**Figure 10 – ColorADD logotype**

Another tool that provides a design basis and colour-blindness concerns is Adobe Color<sup>2</sup>, an online site that helps create colour palettes and several features. It has accessibility tools: a Contrast Checker<sup>3</sup> (Fig. 11) that previews the legibility of certain colours when combined; and the Color Blind Safe<sup>4</sup> (Fig.12) that detects possible colour conflicts that confuse colour blinded individuals.

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<sup>1</sup> <https://www.coloradd.net/en/> (2022)

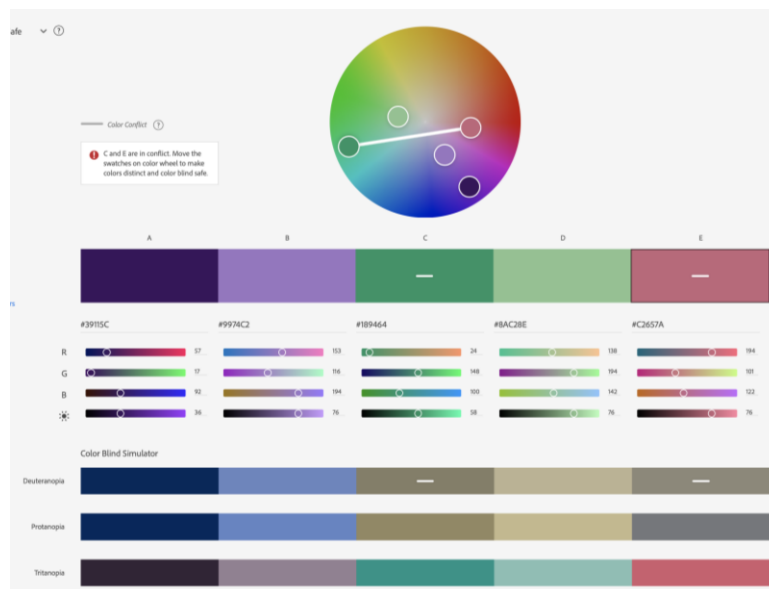
<sup>2</sup> <https://color.adobe.com/pt/create/color-wheel> (2022)

<sup>3</sup> <https://color.adobe.com/pt/create/color-contrast-analyzer> (2022)

<sup>4</sup> <https://color.adobe.com/pt/create/color-accessibility> (2022)



**Figure 11 - Adobe Color tool "Contrast Checker"**



**Figure 12 - Adobe Color tool "Color Blind Safe"**

#### 2.1.4.1 Epilepsy

According to Kasteleijn-Nolst Trenite (2002), cases of epileptic seizures related to video games only started to be noticed in January 1993 with the Super Mario World game. To further understand how to prevent these seizures and develop a safe escape room, it is important to see how and why certain games are more exciting than others.

Aspects such as proximity, patterns, background colours, and contrast are crucial to guarantee the least provocative game possible. Tests have been conducted with epileptic individuals from several countries to better understand how each parameter can affect users.

Making an IEER is of great interest to consider adaptability issues, as epilepsy is a considerably common disease, even if unfamiliar to the public. Epileptogenic effects can occur to people without a diagnosis, being, consequently, a crucial matter in this project. The most common triggers are high contrast geometrical patterns, fast moving, flashing, flickering images, and colour changes. Bright steady backgrounds also have been found to increase visual stimulation. When designing the game play, the horizontal eye movements should also be considered, as bright combinations (such as blue with green or red with blue).

The majority of the triggers mentioned above also have a great impact on the immersion of a game. While building an IEER, it is important that the constructed guidelines allow the users to experience a safe yet embedding environment. The next chapter approaches the concept of immersion, how it is affected, and how present it is in games, specifically adventure games and escape rooms. It also approaches the sense of embodiment and world perception in games.

## **2.2 Immersion**

Immersion in video games can depend on many variables, but what precisely is the impact of world design on immersion? A videogame is immersive when the player does not break his attention from the game, being completely focused on what stands in front of him.

It is essential to interact to obtain an immersive experience (Oprea et al., 2019).

The emotional state and arousal of the user is often an area of interest while measuring how immersive a game environment is and their level of involvement throughout the game, being this highly correlated to the users' engagement (Freytag & Wienrich, 2017). The response to external stimuli does have a massive correlation with engagement's levels.

Whether immersion and presence may improve architectural design outcomes in the early stages of development is yet unanswered (Caldas & Keshavarzi, 2019). However, according to Renata Gomes (2005), "Immersion and presence are two sides of the same coin". The development of systems capable of transforming an immersive experience into a perceptive live experience, based on the motivations of a compelling character, define how embedding the experience will be. An attempt to encompass more than just how things appear, focusing primarily on what can be called the system's overall behaviour as a whole.

### **2.2.1 Adventure games**

There is a substantial number of descriptions of what adventure games are. However, several of them allow us to establish connections between what different authors believe this concept to

be. Different views approach the categories of adventure games, and the immersion and tasks associated with them, the relevancy for this project is the educational games component.

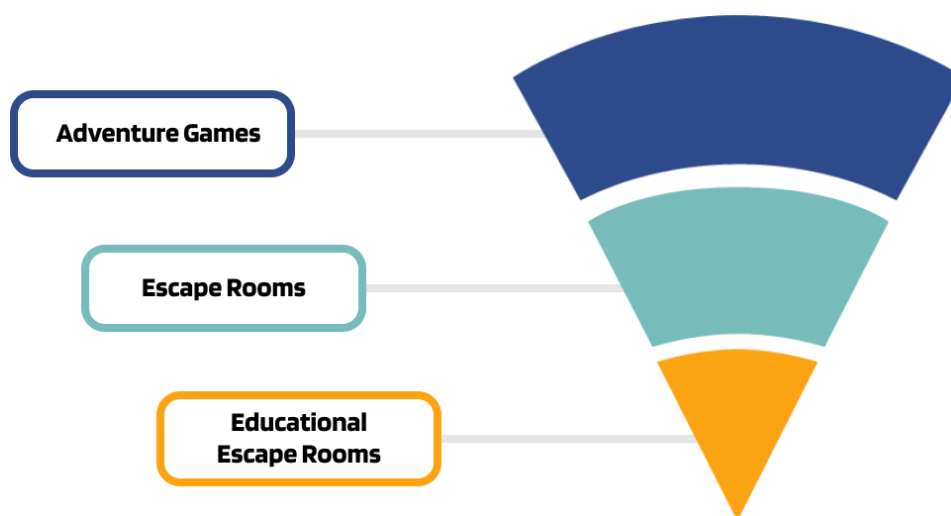
Adventure games, in any case, present users with an artificial environment, whether realistic or not, in which they are expected to interact and play to complete tasks or solve problems.

The design and development of the artificial environment are the very core of what the game will be. Exploring the context, writing the plot, creating the theme and characters, building the objects, and other world elements contribute to defining an adventure game. Even the game's text type provides a clearer set of rules and actions for the user to follow, which plays an important role in game development. Sound design, animation (where applicable), and user interface are examples of this.

For the project in hand, it becomes relevant to understand how adventure games, particularly escape rooms, can improve students' knowledge, skills, and attitudes and even be transferable to other situations.

According to Cavallari (1992), there are parameters to assure adventure games are used effectively, providing an educational purpose to the experience: ensuring the game is integrated into a theme is key, most commonly as a tool in classwork. The simulation is more immersive if implemented in a unit of work instead of a single exercise. Adventure games should be included in several curricula manners. A single game can encompass different topics if the basis of the game itself covers and promote the skills intended; an enhancement on immersion is also considered crucial for learning purposes. Additional resources, even if not educational, can improve the experience.

Considering all this, Educational Escape Rooms are within the niche of escape rooms, which, in turn, are inserted in Adventure Games genre (Fig. 13).



**Figure 13 – From Adventure Games to EER**

### **2.2.2 Embodiment**

When approaching emotional arousal and immersion, the concept of embodiment is somewhat relevant. It entails the recognition of both a person's movement and their mindset as an organic whole (Huang, 2019). Controlling an avatar is usually considered the start of the embodiment studies, being relevant for creating immersive games, as the embodiment dimension is critical for an effective result.

Changing the actual world perception through the embodiment of a character provides the possibility of potentially having an impact on both the physical and emotional states of users (Gomes, 2005).

Understanding these concepts will help develop an IEER. Nevertheless, to do so is crucial to first study what an escape room consists of, how it works, and its purpose. So, the following sub-chapter introduces the concept, primary objectives, and the importance of IEER in education.

## **2.3 Immersive Educational Escape Room**

The concept of Immersive Educational Escape Rooms began in the entertainment world, only coming to the education realm later. Serious Games have been explored in many areas such as medicine or psychology, showing positive results amongst several of them. In education, there was an excellent adherence from students (Moura & Santos, 2020). Combining the basic concepts of Serious Games and gamification with learning strategies, it was achieved better academic results (Gómez-Cambronero et al., 2019).

The purpose of an IEER is similar to a regular Escape Room (ER), where the player deciphers several riddles to escape the place where he is locked in. There is usually a narrative behind the ER, leading the users to clues or tasks. It is expected for an ER to be an immersive experience, where the player feels embedded and emotionally invested in playing the game. An IEER is similar, except that the game's story serves as a learning tool and an alternate resource for classes. It adheres to gamification principles by promoting education through the game's mechanics in a fun way. It's a player-centred learning game to get the user to achieve results.

There's a fine line between an enjoyable experience and a game that aids in learning, being the challenge in IEER to find the balance in this, providing both an immersive, enjoyable and educative game for the player. This fact does not mean games and formal education are opposites. Thus, they are connected, and through their interaction, it is possible to experience an embodiment from the user while playing educational games.

The importance of immersion in IEER is assuring the learning experience itself. The engagement of the IEER determines the learning experience, although it must support the learning process. The player can only practice his knowledge if his motivation is assured throughout the game. Once compromised, the learning process can be strongly affected.

# 3. Methodology

To achieve the goals defined to develop the work, this was separated into six distinct tasks.

First was conducted a literature review of the concepts of World Building, Immersive Narratives, Level Design, Adaptability, Immersion, and IEER, introducing them combined and already existing research. In February, the aim was to better understand and define the object of study with the most significance to the research at hand while further exploring the concept of IEER.

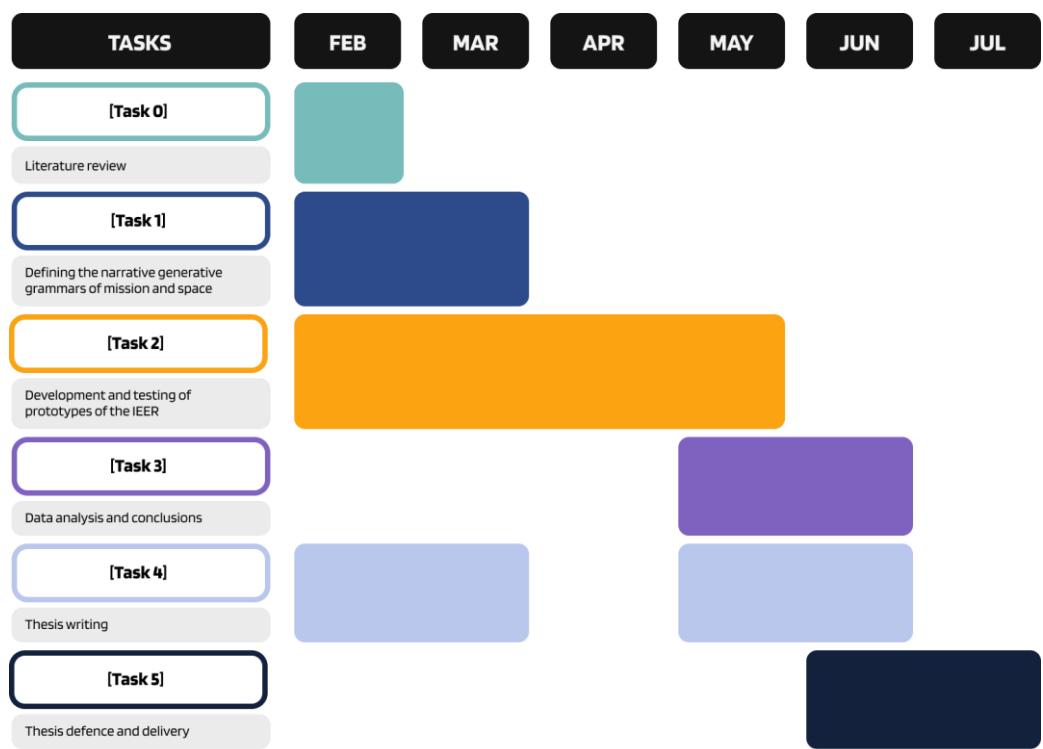
March set the mark for the conclusion of the second task, beginning in February with defining and closing the narrative and elaborating the generative grammars of mission and space.

The third task consisted of the development of several low fidelity prototypes of the IEER levels and consequential testing from April to May. This led us to the fourth task, as testing allowed the gathering of data for further analysis and conclusions that were closed by June.

The thesis writing is a continuous task, although it is of most relevance at the fifth stage, where all conclusions are reported and combined. This task was done till June.

Finally, the sixth and last task corresponds to the thesis defence and delivery, expected to take place in July (Tab. 1).

Table 1 - Gantt Chart.



### 3.1 Research methodologies

Regarding the research methodologies, this experimental project consists of quantitative research methodologies.

The initial aim was to have a qualitative method, and we would conduct an interview with a Neurologist specialized in epilepsy. The line of questioning would help gather data about adaptability issues and further information on how to define guidelines for a safe environment inside an IEER. Due to external limitations, it wasn't possible to interview a professional.

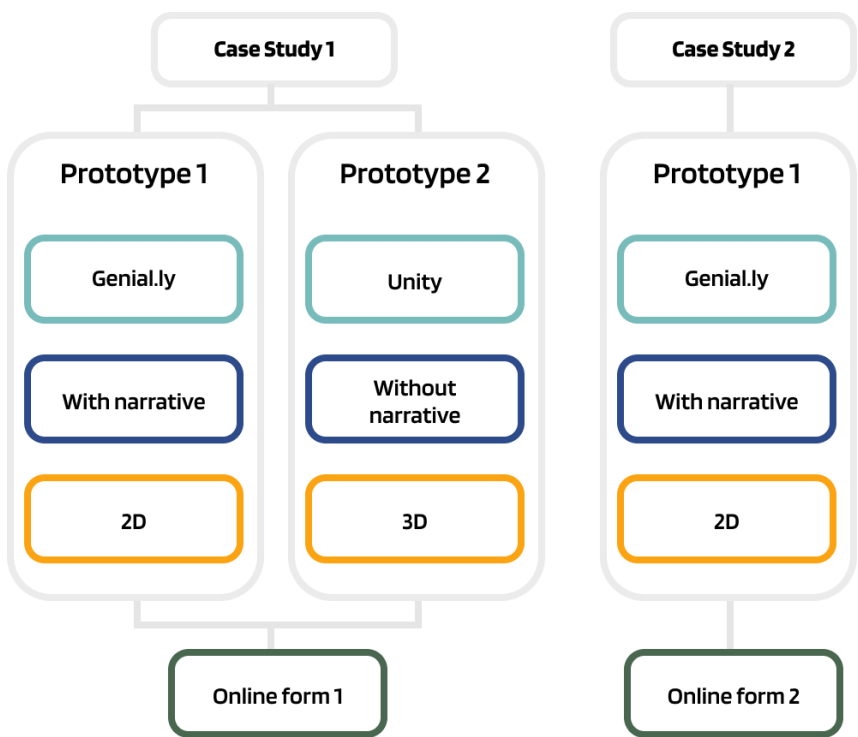
Regarding the quantitative methods, there were two separated stages:

- (1) First was the gameplay testing: through the development of two prototypes (differing in the environment, colours, and other variables), we made gameplay testing. This stage was separated in two case studies: in the first case study, each participant was invited to play two different prototypes, one with an immersive narrative and a 2D IEER game, and the other with no narrative in 3D; in the second case study each participant was invited to play only one prototype, the 2D game with an immersive narrative. Ideally, gameplay testing would be with a 3D prototype with procedural modelling and an immersive narrative. This version is already developed, but it wasn't possible to test it in a timely manner.
- (2) Secondly, we elaborated an online form post prototype. These forms helped determine if the participants found the experience immersive and if they found the game intuitive, educational, and accessible. There was a form for each case study.

This experimental project enlightened the questions made in this dissertation and hopefully will help create guidelines for building IEERs. The ideal would be to have participants from all genders, all students around the same age, and this was possible. For the first case study, the participants were from the Multimedia master's, enrolled in the Educational Software's class with similar ages and both genders. This case study was conducted in FEUP facilities in a closed environment for immersion purposes. The participants answered an online form at the end.

The participants from the second case study were IT engineering students with no educational software background, they were similar ages and both genders. The participants also filled an online form. The following scheme illustrates the research methodology approach (Tab. 2).

**Table 2 - Methodology**



For this project as a whole we used design science research methodology and covered almost every step. We were able to design an artifact, find the problem relevance and evaluate the design built. This project also has a research contribution, being in collaboration with the Institute for Systems and Computer Engineering, Technology and Science (INESCTEC)<sup>5</sup> and the current prototypes are used as a search process. The communication of the research is covered as we are waiting for a paper about this research to be published. The only step missing for the time being is the research rigor because of the early stage this research is still in.

We also used participatory design techniques as prototype 2 was enhanced after testing, using the feedback given by the participants.

As to timings, Case Study 1 was conducted in 31<sup>st</sup> of may and had a total of 9 participants and only 5 answered the form. This online form had a total of 54 questions because it was a

<sup>5</sup> <https://www.inesctec.pt/en/intro> (2022)

combined form. Before testing, the participants had access to a pitch about educational software's and related concepts, as well as PCG content, only after tested the prototypes. Of this 54, only 9 were related and considered relevant for this project and therefore analysed.

Case Study 2 was conducted later in 8<sup>th</sup> of June and had a total of 5 participants, all five answered the form. This online form had a total of 6 questions and they were all analysed.

## 4. Design and Implementation

The following stage of this research was to design an immersive narrative and implement it in a playable prototype to consequently test it and, hopefully, reach further conclusions. This chapter explains the process of developing the prototype, implementing it and how the experiments were conducted and further analysed.

### 4.1 Introduction

As depicted before, the goal is to generate an IEER combining narrative, learning objectives, game design and procedural methods to answer the investigation questions and better understand the degree of difficulty of usability for both lecturers and students.

The aim was to develop a 3D game, user-friendly, enriched and supported by all the research.

For this research stage, a 2D simulation of the game was developed, with a solid narrative and feedback. The users were expected to play and give feedback on how immersive the simulation was and if it had an impact on the game play and, consequently, the learning experience. A 3D IEER version without narrative was also developed to compare the participants' feedback regarding immersion, educational content, and adaptability. These are the two prototypes that have been tested. Due to unexpected circumstances, the latest version, although developed, is yet to be tested. This final prototype combines procedural modelling (made using Houdini) embedded in Unity. It includes narrative and feedback, as well as adaptability concerned design.

#### 4.1.1 Narrative

The first step in outlining the IEER's narrative was to delineate the time and space of the mission. We drafted several theme options (appendix 8) basing the final decision in the viability of each theme to make the prototype. This IEER is briefly about fixing a broken timeline by exploring and collecting key objects, solving mini games, and going through several environments to get to a final room where the time machine is located. The player is unaware of his location nor what is happening, and this information is provided throughout the game.



because of the options provided by Genial.ly. As for the 3D prototype that was tested, this narrative was not embedded in the game purposely. Regardless, the structure presented to the elements of the group, as guidelines, was the same. All necessary modifications were thought as the prototypes were developed. The narrative was written in two languages (English and Portuguese), the entire versions of the narrative are in Appendix 1.

**Table 3 – Game narrative**

		OBJECT	ACCESS POINT	ACTION	TYPE	MINI GAME	TIME LIMIT
SCIFI ROOM	1	PHONOGRAPH	KEYBOARD	Touch and play with keyboard	UNUSABLE OBJECT	-	-
	2	REMOTE	DESK	Search around desk	UNUSABLE OBJECT	-	-
	3	PEN	SOFA	Sit on sofa an feel something sharp	KEY OBJECT	COMBINATION	5"
TERROR ROOM	1	SLIME CREATURE	FLOOR	Walk and look at the floor	UNUSABLE OBJECT	-	-
	2	BREW	FIREPLACE	Drink from the cauldron	UNUSABLE OBJECT	-	-
	3	MIRROR	BOOKSHELF	Search between the books	KEY OBJECT	MATCHING PAIRS	5"
FANTASY ROOM	1	LAMP	BOAT'S PROW	Touch the engines engraved in the lamp	UNUSABLE OBJECT	-	-
	2	KEY	TABLE	Open the book on top of the table. Appears a creature that throws key	COLLECTABLE OBJECT	-	-
	3	STONE	PORTAL	Kick a stone near the portal	UNUSABLE OBJECT	-	-
	4	AMETHYST	CABINET	Open one of the drawers with the key	UNUSABLE OBJECT	-	-
	5	SCREWDRIVER	IVY	Search through ivy	KEY OBJECT	CROSS WORD PUZZLE	5"
REALISTIC ROOM	1	COAT	CHAIR	Sit on chair and find the coat on the back	UNUSABLE OBJECT	-	-
	2	PILLOW	SOFA	Sit on sofa and grab one of the pillows	COLLECTABLE OBJECT	-	-
	3	SNOW GLOBE	BOOKSHELF	Search through bookshelf	UNUSABLE OBJECT	-	-
	4	STAPLER	CABINET	Open one of the drawers	UNUSABLE OBJECT	-	-
	5	JASMINE	VASE	Go near the jasmine vase	UNUSABLE OBJECT	-	-
	6	FUTURISTIC COMPUTER	PRINTER	Look in the paper supply drawer	KEY OBJECT	TV SHOW QUESTIONNAIRE	10"

For the latest prototype version that is yet to be tested, the narrative has been slightly adjusted because of limitations from the software being used to develop it. Notwithstanding, the majority of the narrative is implemented, as well as the feedback and character thoughts.

## 4.1.2 Design

### 4.1.2.1 Icons

To assure the prototype was intuitive and user-friendly, all the icons were created using Figma to control the legibility and contrast, respecting the defined chromatic palette.

The designed icons were:

#### Clue

The purpose of this icon was to indicate to the player where to ask for a clue if needed. The shape of a lightbulb (Fig. 15) was the immediate thought, and the only change was from a version with more lines to a more simplistic version with less information.



Figure 15 – "Clue" icon

#### Exit

This icon served as a way for the player to leave the game. A door with a small arrow pointing out suggesting the way out was the final option (Fig. 16). To maintain coherence between the different icons, the thickness of the stroke remains the same.



Figure 16 – "Exit" icon

## Next

The “next” icon directs the player to another text section, another room, or to simply continue the game. To maintain a simplistic approach, the icon was an arrow pointing to the right (Fig.17).



**Figure 17 – "Next" icon**

## Play

This icon was used at the beginning of the game, making it the first icon to be seen. It is also an arrow pointing to the right, but it is filled and resembles more a triangle than an arrow (Fig. 19). The initial draft had “START” written (Fig.18), but to simplify and turn the icon more accessible, this was the final version.



**Figure 18 – First "Play"**



**Figure 19 – Final "Play" icon**

## Restart

The “restart” icon allowed the player to restart the game (Fig. 20) . As it appears next to the “exit” icon, it follows the same approach, as it is an arrow with the same stroke thickness that goes around.



**Figure 20 – "Restart" icon**

### Language button

These buttons (Fig. 21-22) allow the player to choose between different versions of the same game according to the language in which they prefer to play. These are the only icons in the game with letters, only containing the necessary to be comprehensible.



**Figure 21 - English "Language button" icon**



**Figure 22 - Portuguese "Language button" icon**

#### 4.1.2.2 Chromatic Palette

The colour palette was carefully selected, having in mind colour theory, legibility, and adaptability. Furthermore, four palettes are associated with the created narrative to enhance immersion while playing the game. There are four environments (sci fi, terror, fantasy and realistic); therefore, the four palettes correspond to each environment (Fig. 24 – 26). The realistic environment palette is wider because it is also used for the game icons and general aspect.

Adobe Color was used as a tool for both colour theory and legibility principles.



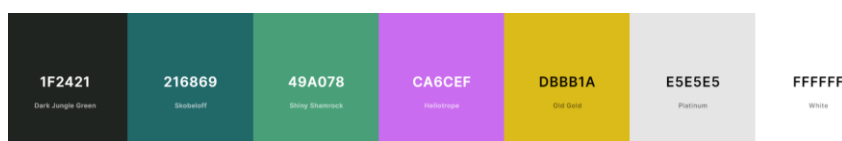
**Figure 23 - Sci Fi colour palette**



**Figure 24 - Terror colour palette**



**Figure 25 - Fantasy colour palette**



**Figure 26 - Realistic colour palette**

### 4.1.3 Adaptability

Each colour was chosen based on contrast, aesthetics and on the types of colour blindness. This approach was applied for each colour palette, encompassing achromatomaly, achromatopsia, deuteranomaly, deuteranopia, protanomaly, protanopia, tritanomaly, and tritanopia (Fig. 27-58).

#### Sci-Fi



Figure 27 – Protanopia: Sci-Fi



Figure 28 – Deuteranomaly: Sci-Fi



Figure 29 – Achromatopsia: Sci-Fi



Figure 30 – Protanomaly: Sci-Fi

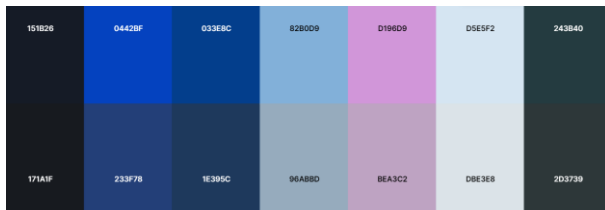


Figure 31 – Achromatomaly: Sci-Fi



Figure 32 – Deuteranopia: Sci-Fi



Figure 33 – Tritanopia: Sci-Fi

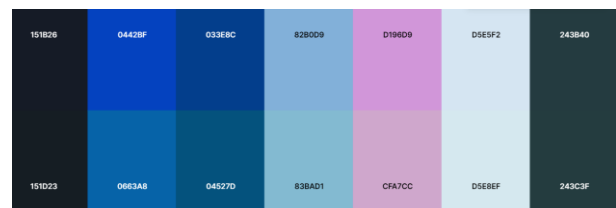


Figure 34 – Tritanomaly: Sci-Fi

## Terror

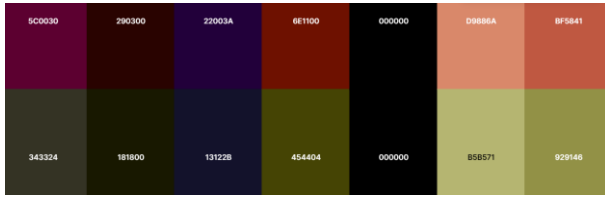


Figure 35 – Protanopia: Terror

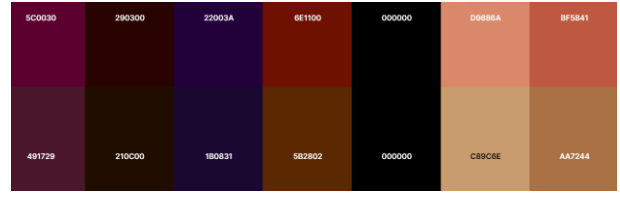


Figure 36 – Deuteranomaly: Terror



Figure 37 – Achromatopsia: Terror



Figure 38 – Protanomaly: Terror



Figure 39 – Achromatomaly: Terror

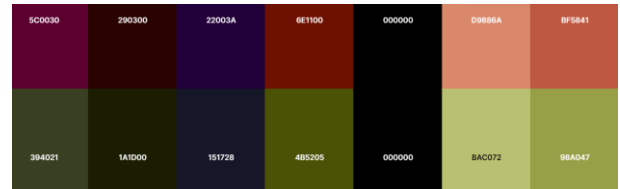


Figure 40 – Deuteranopia: Terror



Figure 41 – Tritanopia: Terror



Figure 42 – Tritanomaly: Terror

## Fantasy



**Figure 43 – Protanopia: Fantasy**



**Figure 44 – Deuteranomaly: Fantasy**



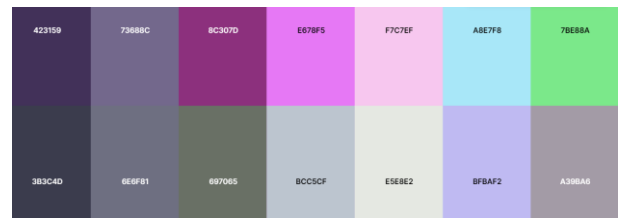
**Figure 45 – Achromatopsia: Fantasy**



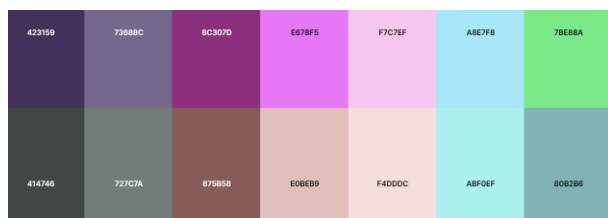
**Figure 46 – Protanomaly: Fantasy**



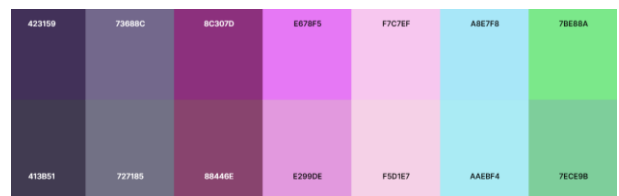
**Figure 47 – Achromatomaly: Fantasy**



**Figure 48 – Deuteranopia: Fantasy**



**Figure 49 – Tritanopia: Fantasy**



**Figure 50 – Tritanomaly: Fantasy**

## Realistic

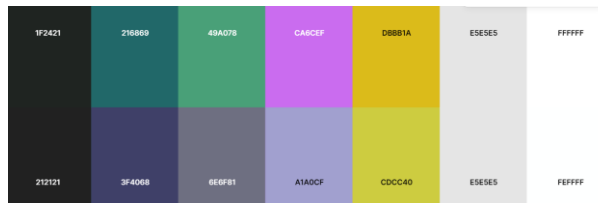


Figure 51 – Protanopia: Realistic

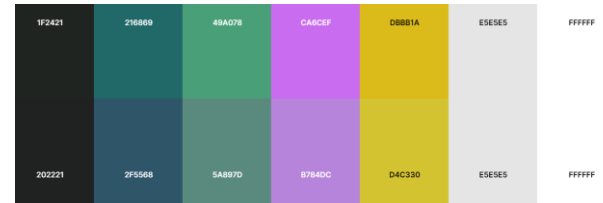


Figure 52 – Deuteranomaly: Realistic

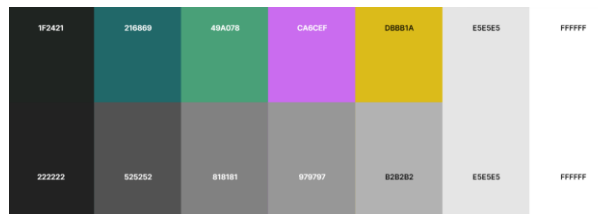


Figure 53 – Achromatopsia: Realistic

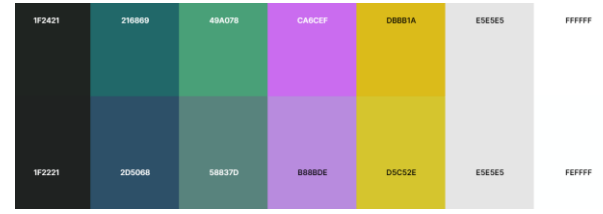


Figure 54 – Protanomaly: Realistic



Figure 55 – Achromatomaly: Realistic

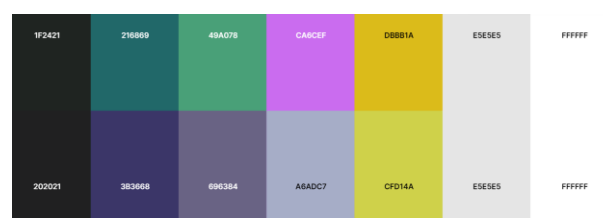


Figure 56 – Deuteranopia: Realistic

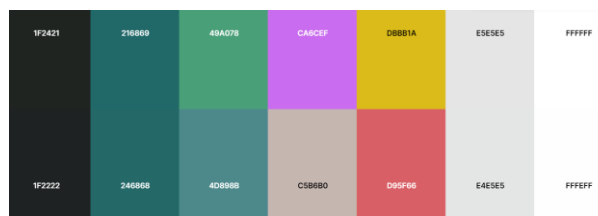


Figure 57 – Tritanopia: Realistic



Figure 58 – Tritanomaly: Realistic

#### 4.1.4 Learning Objectives

The learning objectives (Tab. 4) were based on the Bloom Taxonomy. Each objective, general or specific, has keywords that allow a better evaluation of each student (Haring et al., 2018).

**Table 4 – Learning Objectives**

				LEARNING OBJECTIVES	
ACTIVITY	TOOL	TIME LIMIT	GAME MECHANIC	GENERAL OBJECTIVE	SPECIFIC OBJECTIVE(S)
MECHANICS	WORDWALL	5"	COMBINATION	The student is expected to be able to <b>match</b> the key words with their definitions within a time limit of 5 minutes, through the game mechanic of combination, using "drag and drop".	At the end of the activity, students should be able to <b>recognise</b> the concept of "Mechanics" applied to game development and <b>identify</b> all the elements that compose it
AESTHETICS	WORDWALL	5"	MATCHING PAIRS	The student is expected to be able to <b>recognise</b> the images and match them with their respective pair within a time limit of 5 minutes, through the matching pairs game mechanic.	At the end of the activity, students should be able to <b>identify</b> the concepts and the respective images that belong to the semantics of "Aesthetics" in game development.
NARRATIVE	WORDWALL	5"	CROSSWORD PUZZLE	The student is expected to be able to <b>interpret</b> the clues provided and <b>identify</b> the corresponding concept within a time limit of 5 minutes, through the game mechanic of a crossword puzzle.	At the end of the activity, students should be able to <b>identify</b> the concept and <b>recognise</b> associated concepts.
TECHNOLOGY	WORDWALL	10"	TV SHOW QUESTIONNAIRE	The student is expected to be able to <b>compare</b> different answer options and <b>choose</b> the answer they think is correct to the question presented to them within a time limit of 10 minutes, through the game mechanic of a quiz game style television show (e.g. "Who Wants to be a Millionaire").	At the end of the activity, students should be able to: - <b>distinguish</b> and <b>define</b> the different concepts of "mechanics", "aesthetics", "narrative" and "technology" in game development; - <b>recognise, identify</b> and <b>explain</b> the concepts that make up the "Elemental Tetrad", associated with game development.

## 4.2 Prototype 1

This prototype is a 2D simulation and is a digital IEER with a time limit. It's called EdScape and uses the full narrative created. The mini games embedded in this prototype were made from scratch, including feedback (all feedback messages are in appendix 5) and learning objectives. The focus is mainly on the narrative and how it can impact immersion, even in a 2D version of an EER.

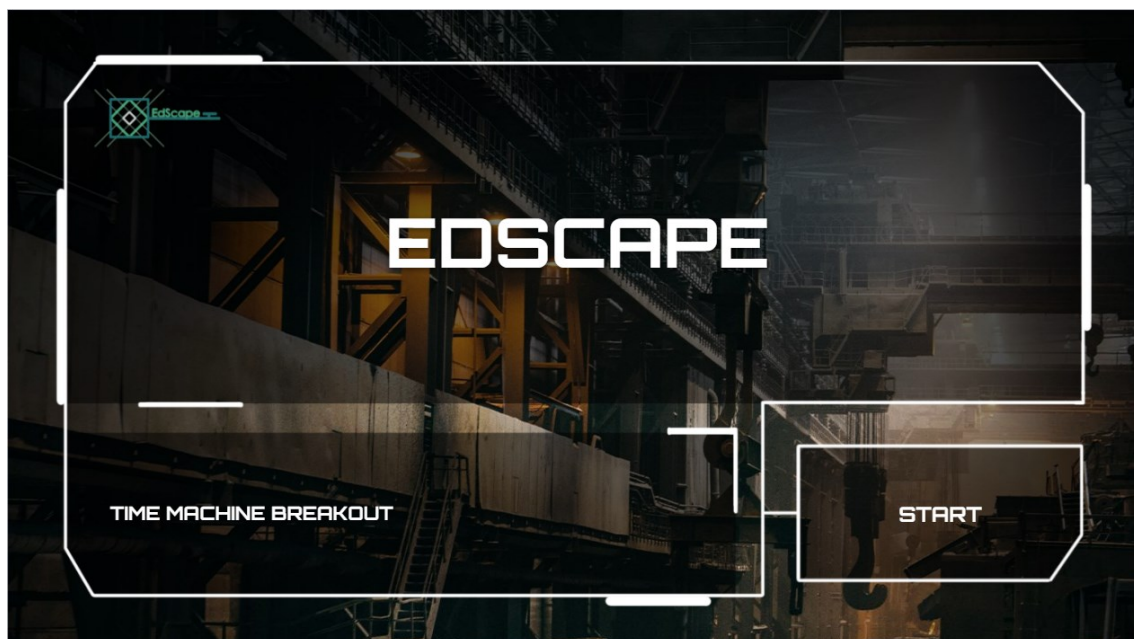
### 4.2.1 Tools

To cover everything from design to adaptability concerns, the most varied tools were used, each one adequate and focused on a specific field.

#### 4.2.1.1 Genial.ly

The initial prototype of this project was developed using Genial.ly<sup>6</sup>, an online software that provides several interactive tools to develop engaging designs, amongst them interactive learning methods.

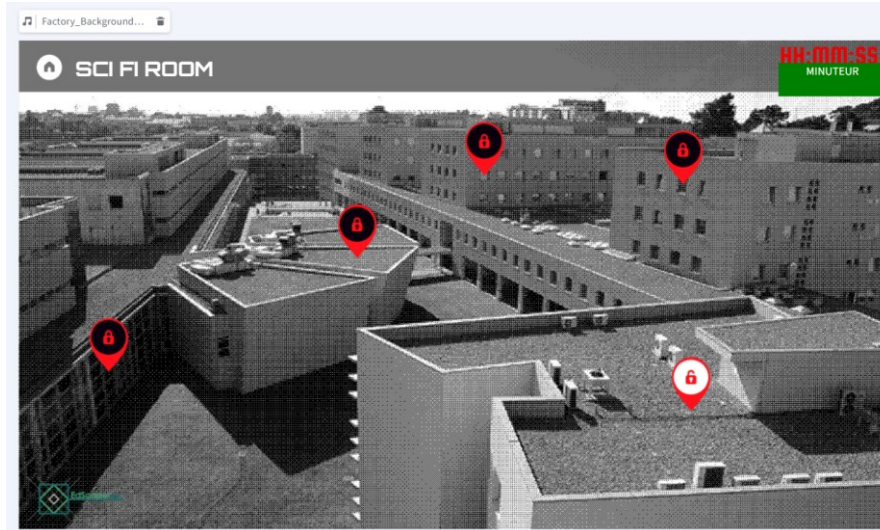
Our prototype (Fig. 59) was elaborated through an escape room template, applying the predefined colour palette, learning objectives and level design. As the goal is to test how immersive the narrative can be, the template's structure was redefined and adjusted to the narrative in hand.



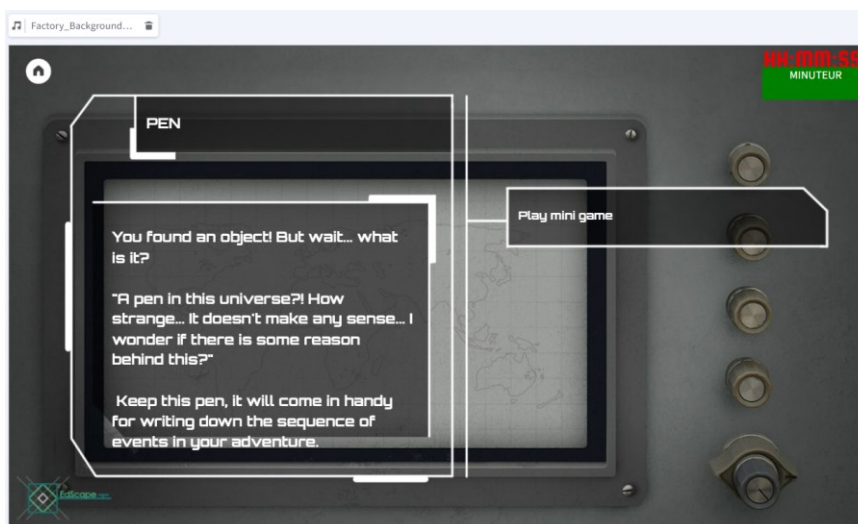
**Figure 59 – Initial page of Prototype 1**

Genial.ly has several interactive options that allowed to create an interactive menu (Fig. 60), point and click to find the key objects and access the mini games (Fig. 61). This enables a greater flow for the player. The narrative was separated in quotes throughout the game and by every mini game.

<sup>6</sup> <https://view.genial.ly/628bc11026be500011db551d/interactive-content-edscape> (2022)



**Figure 60 - Menu page from Prototype 1**

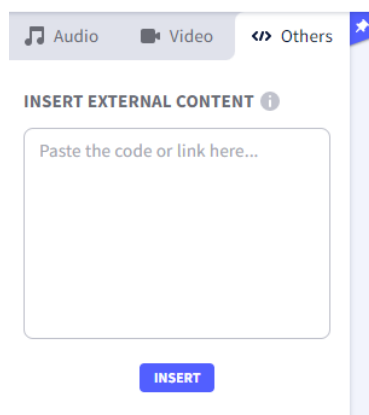


**Figure 61 - Finding an object page from Prototype 1**

Despite our best efforts, there were limitations. One of those limitations was the countdown clock (Fig. 62) to assure the player had a time limit to complete the game because it conflicted with the timer of each mini game. Another limitation were the mini games. Genial.ly does not have the required features for all the mini games necessary, so we imported the games from another platform. Genil.ly has an option to import external content (Fig.63) such as code which was the option selected.



**Figure 62 - Countdown feature in Prototype 1**



**Figure 63 - External content importer option in Genial.ly**

#### **4.2.1.2 Wordwall**

The prototype of the IEER had to encompass the predefined learning objectives, in this case, through various mini games that, together provide and strengthen the various concepts that the player is expected to acquire and understand. For the execution of these teaching resources, we chose Wordwall<sup>7</sup>, an online, intuitive tool that allows to elaborate mini games according to the defined learning objectives.

For this prototype, we created four mini games differing in the genre, time limit, purpose, and difficulty.

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<sup>7</sup> <https://wordwall.net/> (2022)

The first mini game is “Mechanics”<sup>8</sup> (Fig.64), a match up game about the first chapter of content. As it is the first game, it is consequently the most accessible and intuitive. It implied establishing keywords and corresponding definitions. Regarding usability, the player must drag and drop the keywords to the respective definitions within the time limit.







Edit content

---

Activity Title

**Mechanics**

+ Instruction

	Keyword	Definition	
1.	 Procedures	 Set of actions that the player must undertak	⬆ ⬇ ⬇ ⬆
2.	 Game rules	 Set of measures that define the gameplay	⬆ ⬇ ⬇ ⬆
3.	 Game levels	 Difficulty degree of game play	⬆ ⬇ ⬇ ⬆
4.	 Actions	 What the player can do (jump, run, search,...	⬆ ⬇ ⬇ ⬆

+ Add an item

**Figure 64 – Editing page of "Mechanics" game**






The second mini game is “Aesthetics”<sup>9</sup> (Fig. 65), a matching pairs game about the second chapter of content. The difficulty level increases, but not excessively, as this is only the second game.

Activity Title

**Aesthetics**

+ Instruction

☒ Pairs of identical items ☐ Pairs of different items

1.	 Color palette	⬆ ⬇ ⬇ ⬆
2.	 Logo	⬆ ⬇ ⬇ ⬆
3.	 Icons	⬆ ⬇ ⬇ ⬆
4.	 Objects	⬆ ⬇ ⬇ ⬆
5.	 Environment	⬆ ⬇ ⬇ ⬆

+ Add a pair  
min 3 max 20

**Figure 65 – Editing page of "Aesthetics" game**

This activity is designed by sorting pairs of identical items chosen according to the objectives. The player is expected to finish the game within the established time limit.

<sup>8</sup> <https://wordwall.net/resource/32501728> (2022)

<sup>9</sup> <https://wordwall.net/resource/32678958> (2022)

The third game is “Narrative”<sup>10</sup> (Fig. 66), a crossword game about the third chapter of content. This game is more difficult than the preceding ones, accompanying the players' evolution. Like any regular crossword puzzle, the player is given a clue and the number of letters of the answer. For this game, there is also a time limit.

Activity Title

**Narrative**

+ Instruction

	Answer	Clue	
1.	Character	A person or creature who appears in a story	⬅ ➡ 🗑
2.	Goal	Something that you are trying to do or achieve	⬅ ➡ 🗑
3.	Antagonist	Opponent, adversary of the main character	⬅ ➡ 🗑
4.	Plot	A series of events that build up the story	⬅ ➡ 🗑
5.	Quest	A journey made in search of something	⬅ ➡ 🗑
6.	Story	Connected series of events	⬅ ➡ 🗑
7.	Lore	Traditional knowledge, beliefs, and stories that re	⬅ ➡ 🗑
8.	Immersive	Embedding, believable environment	⬅ ➡ 🗑
9.	Storytelling	Art of writing an imaginary tale	⬅ ➡ 🗑
10.	Simulation	Recreate something that exists in real life	⬅ ➡ 🗑

+ Add an item

**Figure 66 – Editing page of "Narrative" game**

The fourth and final game is “Technology”<sup>11</sup> (Fig. 67), a gameshow quiz game about the fourth chapter of content. This is the most complex and challenging level, encompassing not only knowledge from this chapter, as well as prior knowledge. This game consists of a set of questions with several options being the correct answer, only one of the options presented.


<sup>10</sup> <https://wordwall.net/resource/32679130> (2022)

<sup>11</sup> <https://wordwall.net/resource/32679562> (2022)













Technology

+ Instruction


Question

1.  The character is













Answers

a   in narrator mode	d   in world view
b   in the 3rd person	e  
c   in the 1st person	f  

Question

2.  What is the least visible part of a video game?

Answers

a   The limits of what is possible	d   The game design
b   The mechanics	e  
c   The plot	f  

**Figure 67 – Editing page of "Technology" game**

If needed, the player receives feedback, encouragement, and help in all four games (Fig. 68-71). The difficulty level is progressive and regards the player's evolution, so he doesn't feel excessively frustrated or overwhelmed. These activities also follow the guidelines to accomplish the learning objectives.

0:03

Game levels

Actions

Procedures

Game rules



Set of measures that define the gameplay

Difficulty degree of game play

What the player can do (jump, run, search,...)

Set of actions that the player must undertake

Submit Answers

**Figure 68 – Preview of the game "Mechanics"**

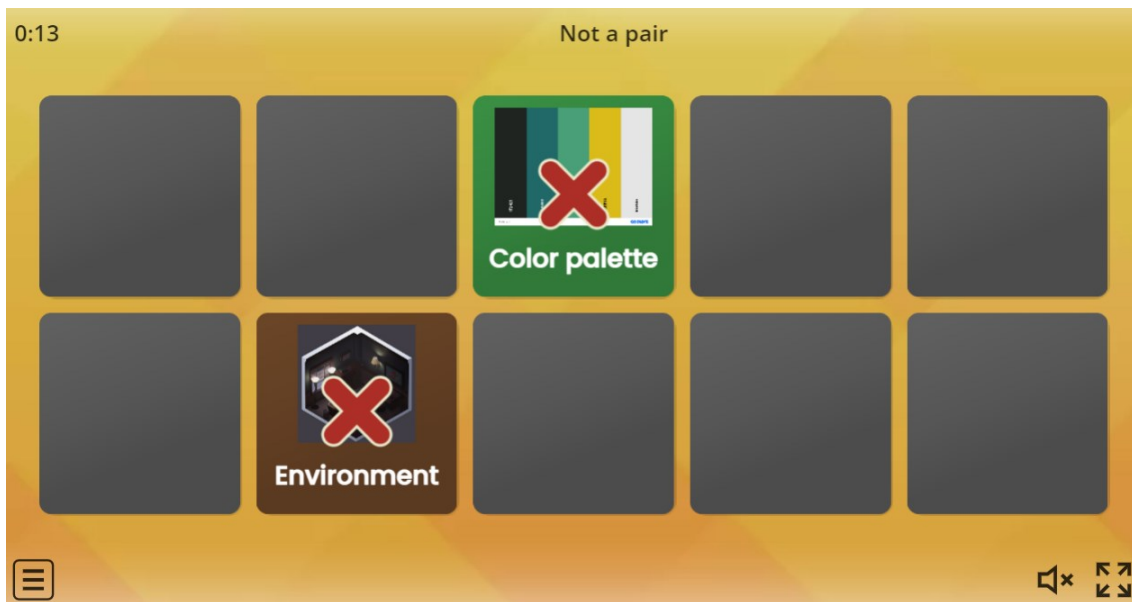


Figure 69 - Preview of the game "Aesthetics"

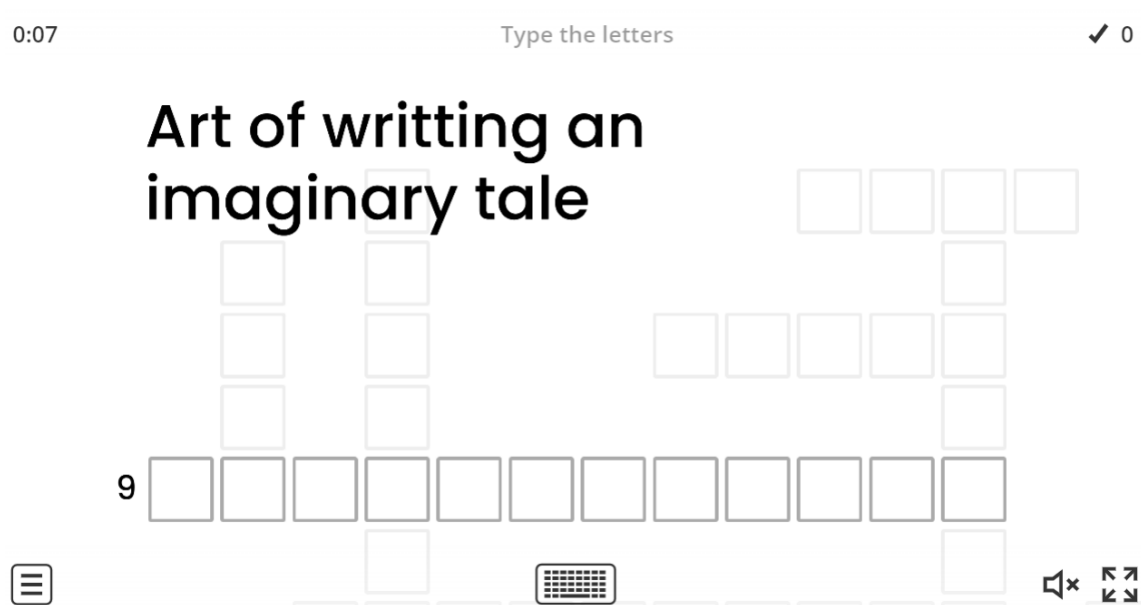
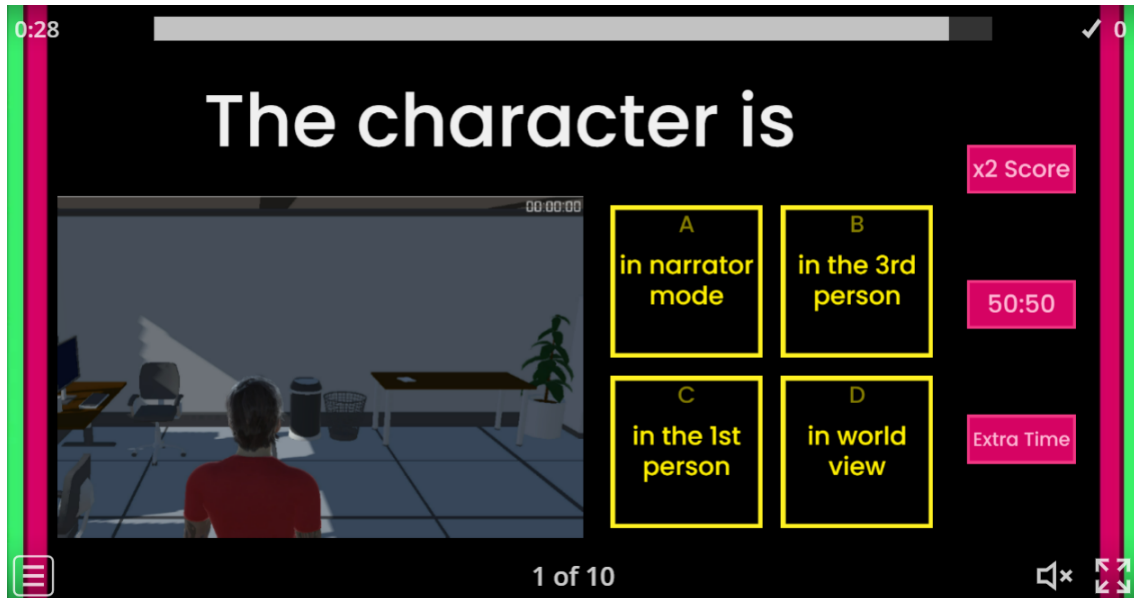


Figure 70 - Preview of the game "Narrative"



**Figure 71 – Preview of the game "Technology"**

## 4.3 Prototype 2

This prototype is a 3D IEER game with a time limit. It's also called EdScape<sup>12</sup>, and it doesn't have a narrative or feedback. The mini games embedded in this prototype were made from scratch. The purpose of this prototype is to understand how immersive this version can be without a narrative.

This prototype has different game options and is the basis on what the game is supposed to evolve if proven to work better. For this research, this prototype was focused on Ethics, and although having a plot, the game did not have the player's thoughts or character lines supporting the narrative.

### 4.3.1 Tools

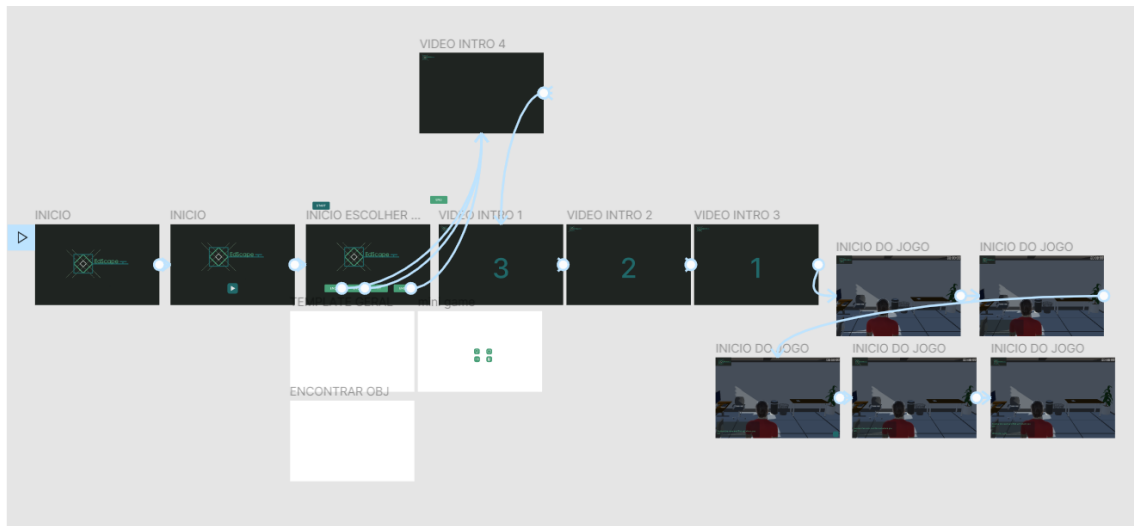
#### 4.3.1.1 Figma

Figma<sup>13</sup> was fundamentally used for design purposes and as a communication bridge with the part of the team responsible for implementing the defined colours, icons, fonts, and design of the interface.

<sup>12</sup> <https://web.fe.up.pt/~efeupinho/jogo01/> (2022)

<sup>13</sup> <https://www.figma.com/community> (2022)

It helped display how the game design should look and simulate the different transitions and how different types of information should be displayed (Fig. 72-74).



**Figure 72 - Figma framework of the work developed**



**Figure 73 - Preview in Figma of text display**



**Figure 74 - Preview in Figma of the Design**

#### **4.3.1.2 Unity**

This prototype was made using Unity<sup>14</sup>, a game engine chosen to develop the 3D IEER game. Unity (also known as Unity Engine or Unity 3D) is a cross-platform game development engine used to create 2D and 3D games. Unity was chosen because it has a plug-In to connect content from Houdini Engine to the content in Unity.

In what concerns the narrative, we created several JSON (Javascript Object Notation) files and later parsed them in Unity. Our other contributions towards Unity were the assets of every object for the game.

### **JSON**

As mentioned above, JSON stands for JavaScript Object Notation, and JSON files enable the storing and sharing of data in an easy, efficient, and accessible way. This was crucial to display the narrative in the prototype and guarantee the information was handled according to what was established.

We created a total of six JSON files for this prototype:

- The main file: in this JSON file is the core information regarding the narrative, clues, feedback, and indications for each object and is the most extensive file.

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<sup>14</sup> <https://unity.com/> (2022)

- The survey file: for research purposes, every participant had to answer a set of questions that appeared as a survey in the end of the game. This file determined the order of appearance of the questions and the questions itself.
- Mini game files: there was a JSON file for each game, determining feedback and introduction text of each.

The main file, the sections of the survey file, and the mini game files are in Appendices 2, 3 and 4.

### **Assets**

The 3D assets for this game were chosen according to the description made of each object in the narrative (Fig. 75-76). Some of the initial objects were downloaded from the Unity Asset Store, but most of them were collected from Sketchfab<sup>15</sup>, a 3D modelling platform website with free use assets.

The list of assets required was:

- Screwdriver, Hand mirror, Staple gun, Remote control, Phonograph, Slime creature, Cauldron, Amethyst crystal, Stone, Pillow, Snow Globe, Jasmine vase, Futuristic computer, Coat, Time machine, Table, Chair, Window, Door, Shelf, Cabinet, Pen and Key.



**Figure 75 - Staple gun asset**



**Figure 76 - Pillow asset**

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<sup>15</sup> <https://sketchfab.com/> (2022)

## 5. Results

Once the prototypes were made, the next stage was to conduct the experiment and analyse the collected data. Having two different prototypes, it was of matter to compare them and understand how participants would react to each prototype. In this chapter are listed the case studies conducted.

For the first case study, both prototypes were used, and each participant had contact with both prototypes, providing a comparison between them. As the data could be based only on comparison and to understand if the general opinion would change when in contact with only one of the prototypes, for the second case study, the participants only played prototype 1.

There was a different form for each case study, but the questions were formulated to be possible to cross results from both forms.

## 5.1 Case studies

Two different case studies were conducted to obtain more information on the prototypes. The following table (Tab. 5) enlightens the differences between the two case studies regarding the context and objectives, the participants of each case study and finally, the procedures and implementation of each.

**Table 5 – Case Studies**

	CASE STUDY 1	CASE STUDY 2
CONTEXT	The participants were presented with a 2D simulation of and EER game using Genial.ly and a 3D EER game without narrative and feedback made using Unity. Each participant played and answered a form.	The participants were presented only with a 2D simulation of and EER game using Genial.ly. Each participant played and answered a form.
PARTICIPANTS	Students enrolled in the Educational Software's class from the Multimedia Master with similar ages and both genders, this experiment encompassed 5 participants.	Students enrolled in FEUP with no Multimedia or Educational softwares background, with similar ages and both genders, this experiment encompassed 5 participants.
IMPLEMENTATION	Closed environment for immersion purposes, conducted in the facilities of FEUP.	Closed environment for immersion purposes, conducted in the facilities of FEUP.

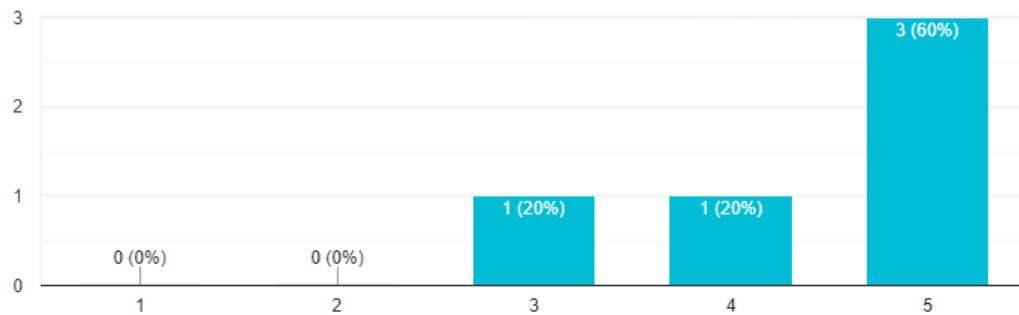
## 5.2 Data analysis and evaluation

There were two different forms to analyse since each case study had its own form. Since the questions between the forms were the same, it was possible to cross data between forms and combine answers. For clarity, Case Study 1's form and Case Study 2's form are correspondingly available for consultation in appendices 6 and 7.

Analysing question by question we can gather data from what the participants thought of the prototypes. Starting first with Case Study 1, where Likert scale was used, we have the following 9 questions.

### Question 1: Do you find this game intuitive and easy to use? (Genial.ly)

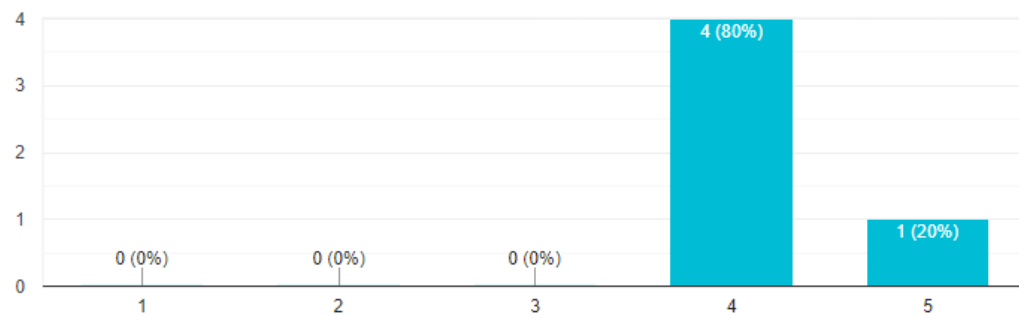
5 responses



The majority of the participants found prototype 1 to be intuitive and easy to use, as 60% strongly agreed with this question and 20% agreed with it. The other 20% didn't have a strong opinion over the subject. All 5 participants answered to this question.

### Question 2: Do you associate the different colour palettes with different themes/environments? (Genial.ly)

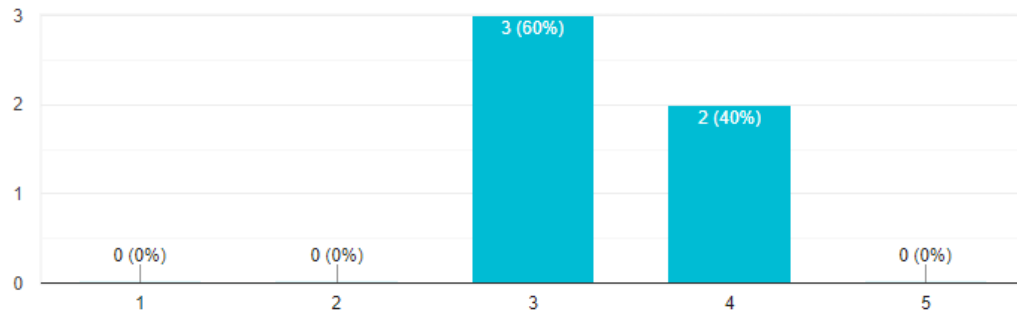
5 responses



This question also had five responses. We can read from the results that participants answered positively to this question, since 80% associated the colour palettes with the different environments and 20% considered them to be very easily associated. None of the participants felt indifferent towards this question.

**Question 3: Do you consider this game accessible for individuals with photosensitivity or colour blindness? (Genial.ly)**

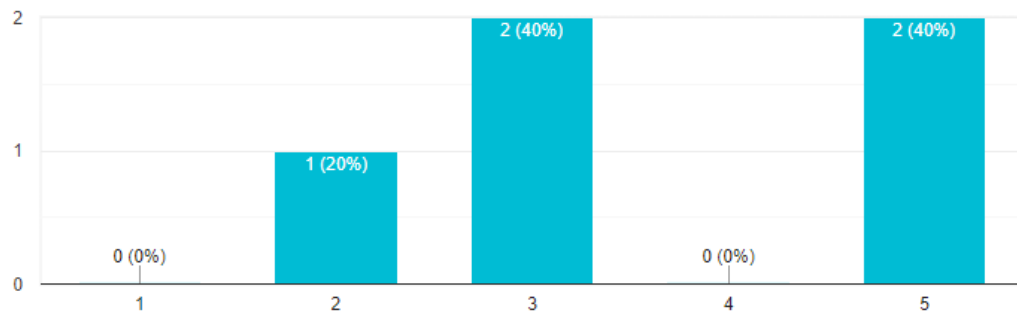
5 responses



All participants answered this question. The opinion was essentially neutral as 60% of the participants answered with an indifferent option. The other 40% considered the game moderately accessible.

**Question 4: When playing, did you feel immersed in the narrative and the generated environment? (Genial.ly)**

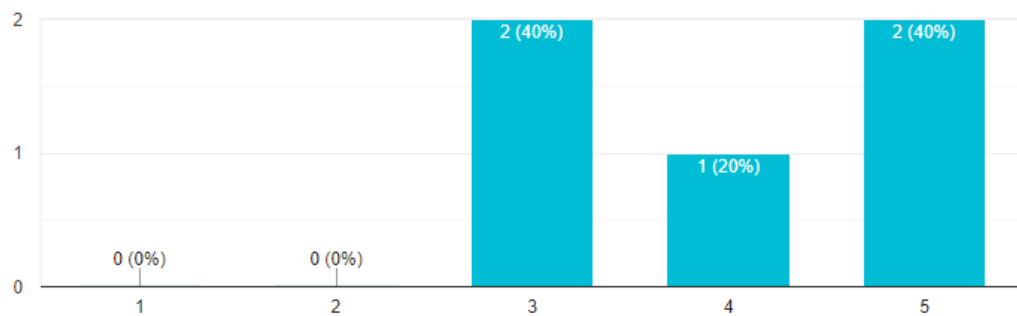
5 responses



There was variety in this question regarding participants opinion and all five answered the question. 40% felt greatly immersed in the narrative and generated environment, while other 40% did not have a strong opinion over this. One of the participants did not find prototype one to be immersive.

### Question 5: Do you feel you have learnt something from this game? (Genial.ly)

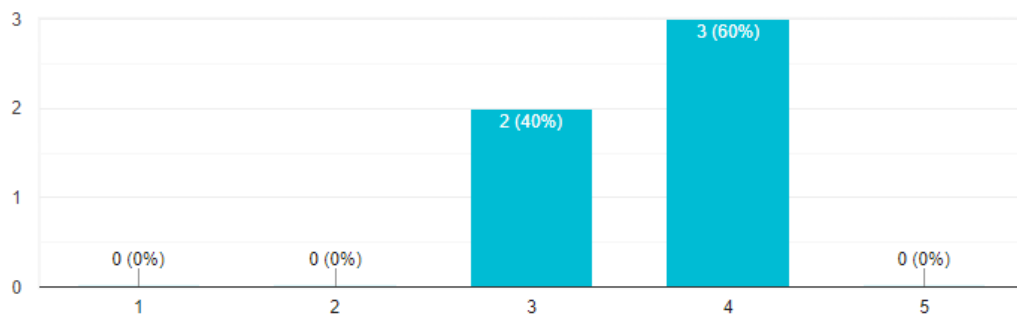
5 responses



This question had a positive outcome. 40% of the participants strongly agreed that they have learnt something with prototype 1 and 20% also agreed that they learnt something, but not with the same certainty. The remaining 40% had a neutral response, neither agreeing nor disagreeing. All participants answered the question.

### Question 6: Do you find this game intuitive and easy to use? (Unity)

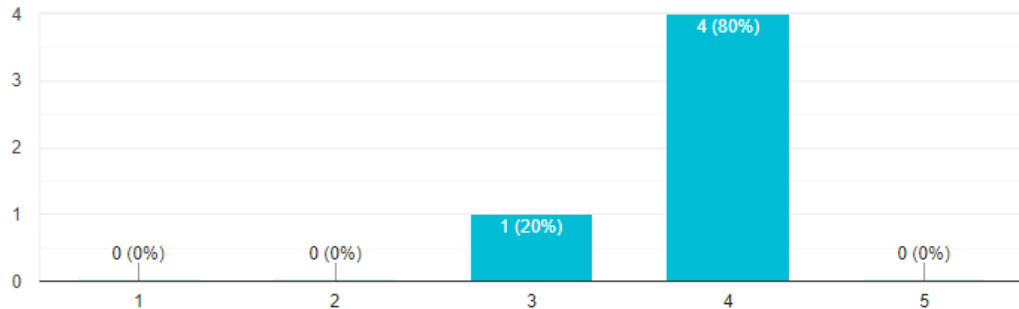
5 responses



This question was the first about prototype 2. The majority of the participants considered this prototype intuitive and easy to use as 60% agreed with this, while the other 40% had an indifferent opinion over the question. All participants answered.

**Question 7: When playing, did you feel immersed in the narrative and the generated environment? (Unity)**

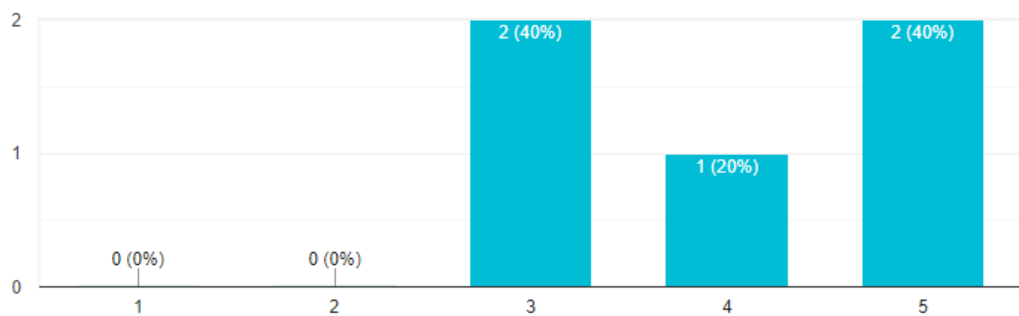
5 responses



The opinion in this question was almost unanimous as 4 out of 5 participants felt immersed in the narrative and in the generated environment. One of the participants had a neutral opinion. All five participants answered the question.

**Question 8: Do you feel you have learnt something from this game? (Unity)**

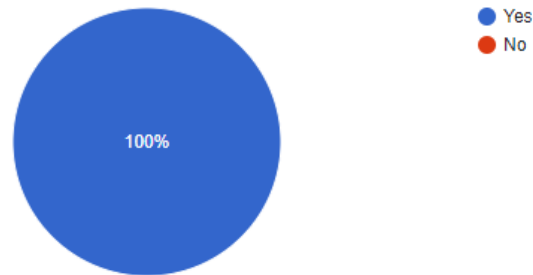
5 responses



The results for this question were the same as for question 5. Two of the participants greatly agreed that they learnt something from this prototype, other two felt neutral towards this and one participant agreed to have learnt. All the participants answered the question.

**Question 9: Overall, after our presentation, do you think that an EER has any educational value?**

5 responses

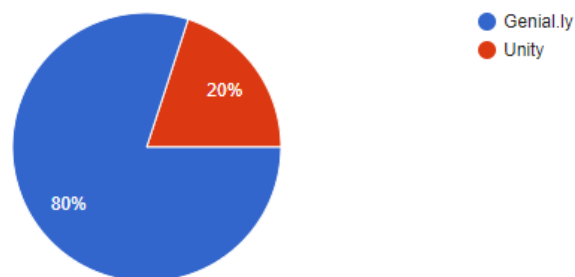


This was the only unanimous question, as all five participants considered that EERs have educational value.

Case Study 1 also allowed a comparison between prototypes and participants were asked to choose between prototypes 1 and 2 according to determined parameters.

**What was the EdScape version that you learned more from?**

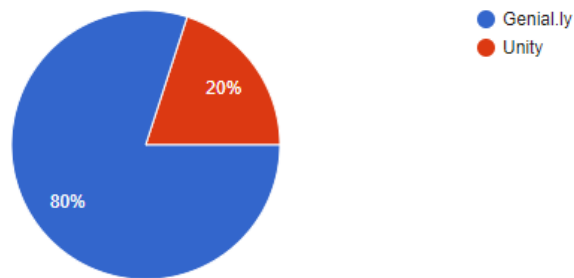
5 responses



When in comparison, 80% of the participants considered prototype 1 to be the one that they learnt more from, while the remaining 20% chose prototype 2. This question was answered by the 5 participants.

### Which EdScape version was the most intuitive?

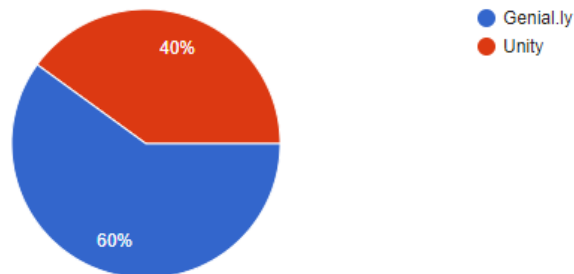
5 responses



Prototype 1 was also considered to be more intuitive than prototype 2 as 80% of the participants chose the Genial.ly prototype over the Unity one. This question also had 5 responses.

### What was the EdScape version where you had the feeling of being more immersed in the narrative and the environment?

5 responses

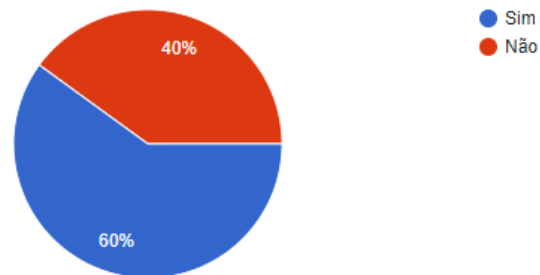


It was also possible to compare prototypes over immersion. Opinions were more divided in this question, but prototype 1 was considered more immersive, as well as its narrative with by 60% of the participants. The remaining 20% felt more immersed by prototype 2. All participants answered.

Following to Case Study 2, we could gather data from 6 questions and in this case, participants had to chose between 2 options (yes or no). There are less questions in this form because participants only played prototype 1 (Genial.ly/2D)

### Question 1: Do you find this game intuitive and easy to use?

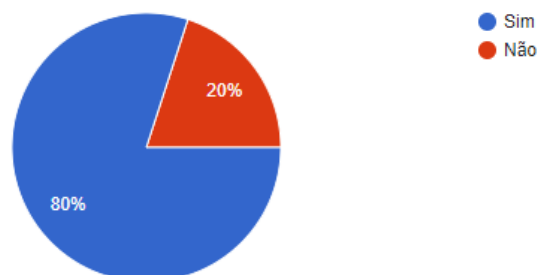
5 responses



All five participants answered this question. 60% considered the prototype intuitive and easy to use, while the other 40% didn't. This being said, participants opinion is divided, but the majority still finds prototype 1 to be intuitive.

### Question 2: Do you associate the different colour palettes with different themes/environments?

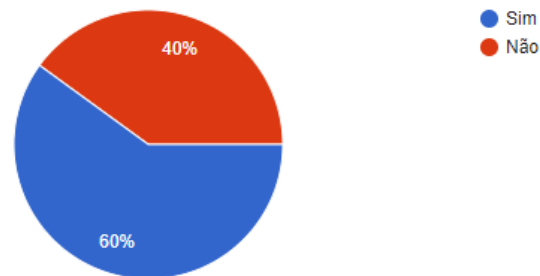
5 responses



This question was almost unanimous as only 1 of 5 participants didn't associate the colour palettes with the different environments, leaving 80% of the participants that did associate them with the respective themes. All participants answered the question.

**Question 3: Do you consider this game accessible for individuals with photosensitivity or colour blindness?**

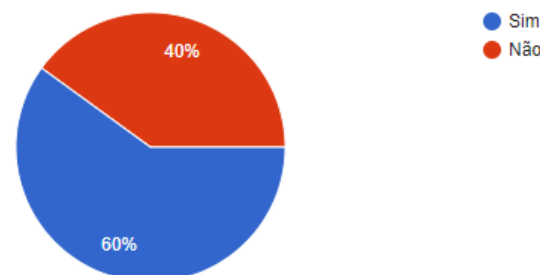
5 responses



This question had 5 responses. Participant's opinion was very divided in this question as 60% considered this prototype to be accessible for individuals with photosensitivity or colour blindness, but the other 40% didn't.

**Question 4: When playing, did you feel immersed in the narrative and the generated environment?**

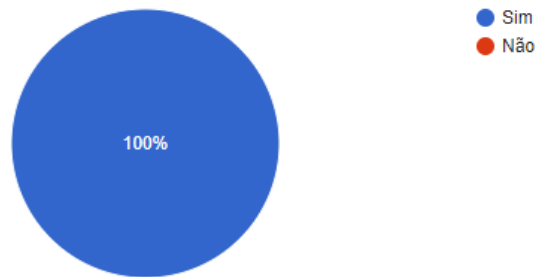
5 responses



In this question 60% answered positively towards feeling immersed and embedded in the narrative and generated environment and 40% didn't felt immersed. All 5 participants have answered the question.

### Question 5: Do you feel you have learnt something from this game?

5 responses



This was the only unanimous question as 100% of the participants answered positively. They all felt they have learnt something from this prototype, and all 5 participants answered the question.

### Question 6: Do you have any suggestions?

This was a long answer text type of question. From 5 participants, 4 answered this question with more specific feedback and suggestions. For practical purposes, participants from Case Study 1 were considered Person A to E and Person F to J are participants from Case Study 2. The more relevant answers are:

*“Some of the words in the crossword were a bit difficult to guess. Same for some of the quiz questions. Outside of that, being colour blind, I couldn't find the interactive objects in the first scene.”* – Person F

*“Maybe it would be better to explain the game element's part at the beginning rather than the end. It's a bit confusing for those who don't know how to answer some of the questions without having a context.”* – Person H

*“Environments more distinct from each other. More "obvious" point and click mechanics and the game's lines or hints don't correspond to the environment and what is seen by the player, so it's confusing to see comments about things you don't see or haven't interacted with.”* – Person J

To more visually analyse the information gathered concerning the first form, I elaborated a map with a different colour attributed to each answer option (Tab. 6).

**Table 6 - Visual map of form 1**



As Case Study 1 allowed to gather data concerning the comparison between the prototype made with Genial.ly (2D) and the prototype made using Unity (3D) it was possible to elaborate a map to easily visualize the preference between prototypes in each field (Tab. 7).

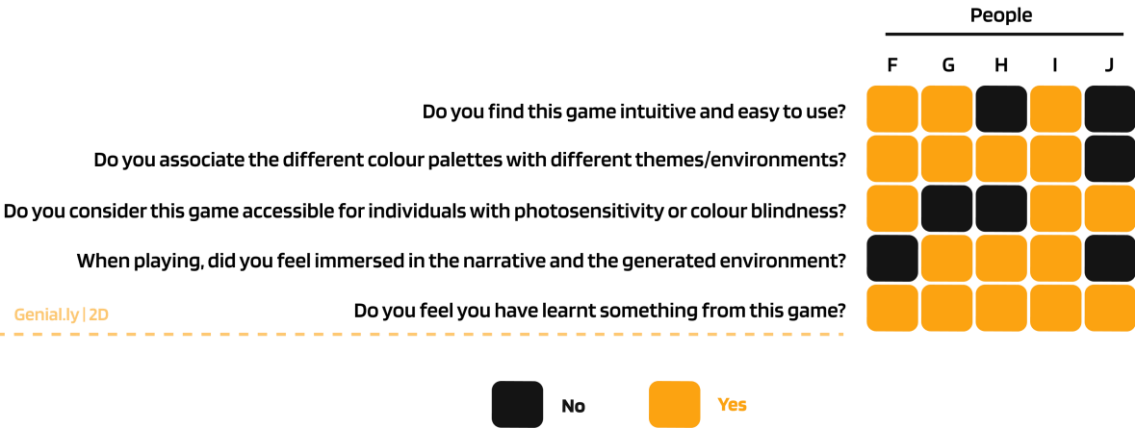
**Table 7 – Visual map of form 1 about the comparison between prototypes**



Here we can see that prototype 1, the 2D prototype made with Genial.ly is considered more educative, more intuitive, and more immersive than prototype 2 (3D prototype made with Unity).

It was also possible to make a map over the data from Case Study 2 using only two colours representing the possible answer options (Tab. 8).

**Table 8 - Visual map of form 2**



From this map is possible to easily understand that the overview of prototype 1 in this case study was mostly positive.

### 5.3 Discussion and conclusions

The results can be analysed from two ends, in comparison or individually about prototype 1 (PT 1). This also allows us to understand if having contact with both prototypes affects participants' opinions.

The first heat map displays PT 1 as the most intuitive one. In terms of the colour palette, only one of the participants considered the environment wasn't relatable to the colour palette. Therefore, we can assume that the tools used to create the colour palettes worked, helping follow colour theory and enhancing the user experience.

Regarding adaptability, 50% of the participants considered the prototypes accessible for colour blinded people, while the other 50% considered the opposite. This shows that it is necessary to further understand how to make games accessible and safe. Perhaps adapting the colour palette is not enough.

The PT considered to be the most educative is PT 1, being almost consensual. Prototype 2 (PT 2), on the other hand, has a very divided opinion between participants. Besides this, all of the participants considered IEERs to have an educational value, which presumes that, despite the format, an Escape Room is a tool to be explored in education.

Analysing the second heat map is clear that in terms of educational value, PT 1 was the preferred over PT 2. As the mini games of PT 1 had refined learning objectives and were

supported by the narrative, we can assume that, for an IEER to have greater educational value, feedback, a supporting narrative, and a set of learning objectives are crucial elements to consider.

In terms of how intuitive each prototype was, the results are, as expected, pointing to PT 1. In what comes to game design, 3D games are usually harder than 2D point and click games.

Regarding immersion and how embedding each prototype was, PT 1 was considered more immersive, and PT 2 was almost 50% of each opinion, which was not expected. 3D games are usually more immersive than 2D games, so one possible explanation for this data would be the narrative supporting PT 1. PT 2 does not have immersive narrative nor feedback. This can be a reason for participants to consider PT 1 more embedding because even being in 2D allows a stronger connection to the game.

In conclusion, in a general perspective, PT 1 had greater results than PT 2, being considered more intuitive, immersive, and providing a greater sense of educational content to the participants. Regarding adaptability, the results were not decisive, and the participants from case study 2 found PT 1 more immersive than those from case study 1. This can imply that PT 1 is only more immersive because of the narrative and that PT 2 would be more immersive if supported by an immersive narrative.

## 6. Conclusions

To understand the impact immersive narratives and immersion have over IEERs and how the variables of presence, usability, adaptability and flow can affect immersion in this context, we conducted an experiment.

For the IEER to be tested and this data gathered, it was designed and developed in two prototypes, one with an immersive narrative and feedback, and the other with no significant narrative nor feedback.

We conducted two case studies that allowed us to gather the data needed to answer our research questions. The first case study invited each participant to play both prototypes, and the second case study invited participants to play only prototype 1 (PT 1).

We elaborated an immersive narrative specifically for this project that was embedded in PT 1. All the assets were selected according to the game narrative, and all the colour palettes were generated based on colour theory and adaptability issues. The educational content was created from scratch, based on the predefined learning objectives.

Regarding the first research question “What is the impact immersive narratives and immersion have over IEER?” we found that most of the participants considered the prototype with an immersive narrative more educative, accessible, intuitive and embedding, despite not being a 3D version of an Escape Room. We can conclude that immersive narratives help users to feel more connected to the IEER, allowing a greater learning experience.

When we aimed to answer our last research question “How do the variables of presence, usability, adaptability, and flow affect immersion on an IEER?”, we understood that immersion impacts how participants experience an EER and that immersion is affected by the variables mentioned. Participants’ opinion of the prototypes varied depending on how intuitive the gameplay was, how embedding and how user-friendly it was. The more intuitive and accessible the prototype was, the more immersive the participants considered it to be.

However, more research should be made for this research to be more accurate and to allow a further understanding of how much immersion can impact educational purposes in Escape Rooms and how much each variable affects immersion.

Certain limitations throughout the project led the team to readjust the experiment and develop separate prototypes, and after testing, prototype 2 was enhanced, integrating now an immersive narrative and Procedural Modelling.

It would be relevant to test the latest version of prototype 2 to verify that a 3D IEER game, supported with narrative, is indeed more immersive.

## 7. Future work

As mentioned before, it would be of great relevance to continue testing the developed prototype of this research, enhancing the IEER concept further and hopefully set guidelines for creating safe, immersive tools for educational purposes.

The next step is to research how to assure an IEER to be safe and accessible for students with epilepsy, colour blindness or any visual impairment. For this, it would still be of great interest to interview Neurologists and other experts on this field.

Part of this future research would be to more accurately understand how to pragmatically allow lecturers to use IEERs as frequent learning tools in class, how to easily adjust them and edit them according to the theme wanted.

Verifying that IEERs with immersive narratives help and improve learning experiences can only happen with corroborative research, being an important future step to proceed with this research.

Another interesting next stage would be to compare two IEERs with different topics and learning objectives as to understand how to maintain the quality of the learning experience regardless of the area of study.

It would be interesting to continue this project and test the latest version of prototype 2 for it to be possible for teachers to use this IEER as an alternative in class for students to learn all sorts of content.

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# 9. Appendices

## 9.1 Appendix 1

### 9.1.1 Full Narrative EN version

#### EdScape

#### /// ROOM 1: SCI FI ///

The timeline seems to be broken!

You're trapped in a multiverse of realities, and you've lost your time machine.

To get back to your own reality you need to find specific objects, which are definitely out of place and don't belong to each reality you witness, to fix the time machine...

You look around and see a scenario straight out of a film about intergalactic battles, full of futuristic gadgets and psychedelic marvel technology.

**[player wakes up and starts thinking to himself]**

PLAYER

"Where am I?", "What year am I in?", "I must find out first what reality this is before I look for the object for the machine..."

**[In one glimpse, the player notices a fluorescent green dial saying in strange hieroglyphics '355CB-Venus']**

PLAYER

"Year of 355CB-Venus? This is definitely not my reality... I must be in a dystopian future"

You suddenly feel an unpleasant sensation of dissociation, your vision is blurred and you feel the ground shaking. Your memory is fragmenting and you are afraid to go back to square one.

The timeline is becoming more and more unstable and you have to repair it before it becomes impossible to return to your own reality!

It's time to explore this unfamiliar environment and figure out your next step...

**[Player begins to explore the room freely in search of the object]**

**[Pen is hidden in the seams of one of the sofa cushions]**

**[If the player takes a long time to find the desired object, a message appears in the bottom left corner with information that will guide him to discover what he has to look for. These clues follow an order and only appear after x seconds of the previous one being given, if the player still can't find the object.]**

Ex.:

**1- Don't know where to look? Try to find an object that doesn't look like it belongs in this room!**

**2- So close... look close to the sofa!**

**3- Try interacting with the objects in the room... who knows what you'll find!**

**[Player notices a device that looks musical and tries pressing some of the dusty buttons]**

PLAYER

"Such interesting music, I've never heard anything like it!"

**[default message for objects other than those intended]**

You found an object! It doesn't seem to be what you're looking for...

PLAYER

"Definitely, but what am I looking for in the midst of so much technology and imperceptible symphonies anyway?"

**[A constant beep is heard coming from the desk and after much searching the Player finds some sort of flashing tactile remote control from the bottom of a drawer]**

PLAYER

"How do you turn this off? It sounds interesting, but it's not what I'm looking for..."

[Player interacts with the sofa and sits down]

PLAYER

"Ow! I feel something hurting me...what could it be?"

[Player finds a pen]

[default message for the desired objects]

You found an object! But wait... what is it?

PLAYER

"A pen in this universe?! How strange... It doesn't make any sense... I wonder if there is some reason behind this?"

[Pop-up mini-game where introductory text appears]

Keep this pen, it will come in handy for writing down the sequence of events in your adventure.

[default message]

Solve this mini game to receive this object and fix the timeline!

[Name of the minigame: Narrative]

## **/// ROOM 2: TERROR ///**

[Jump out to the environment to which the pen belongs, TERROR]

The room shimmers and in a sudden, intense flash you see the room darken terrifyingly, as if you had fallen into a black hole. Suddenly, after adjusting your vision, you notice that you are now in a gloomy environment decorated with bloody, slimy motifs. Everything around you emanates a frightening and vile aura.

[player regains a sense of dissociation and realises that the temporal tissue begins to tear]

PLAYER

"What is this?"

"Time and space have changed again!", "A creepy, icy environment...all that's left is an axe-wielding psychopath coming out of the wall", "I must get out of here as soon as possible"

You've already discovered the first object!

Gather your courage, face your fears, and explore the room to discover your next step...

**[Player begins to explore the room freely in search of the object]**

**[The mirror is behind a book on a dusty bookshelf]**

**[If the player takes a long time to find the desired object, a message appears in the bottom left corner with information that will guide him to discover what he has to look for. These clues follow an order and only appear after x seconds of the previous one being given, if the player still can't find the object.]**

**Ex.:**

**1- Don't know where to look? Try to find an object that doesn't look like it belongs in this room!**

**2- So close... search through the leaves until you find your reflection!**

**3- Try interacting with the objects in the room... who knows what you'll find!**

**[Player notices a kind of green slime with a black layer of shiny protective fluff on it. As he picks it up he smells something so strong it brings tears to his eyes]**

PLAYER

"My eyes, such burning! What a nauseous smell!"

**[default message for objects other than those intended]**

You found an object! It doesn't seem to be what you're looking for...

PLAYER

"I have no idea what this creature is, but I think it's definitely not what I'm looking for"

**[Player throws the slime on the floor, which instantly crawls under the sofa]**

**[Player is attracted by the crackling of wood and the smell of hot embers from the fireplace. As he approaches he notices a small clay pot with a boiling liquid in it. It is vegetable stock. Player picks up the pot and tastes the concoction]**

PLAYER

"Hummm, what a treat to warm the stomach. I feel rejuvenated with energy."

**[The ground shudders once more and the broth spills over the embers]**

PLAYER

“Why am I wasting my time tasting food... I must hurry before it's too late! I doubt very much that this broth is the object I'm looking for in here”

**[Player puts the pot back over the hot fire and continues exploring the room]**

PLAYER

“I'm smelling a dizzying musty smell, I wonder if it's coming from that bookshelf.”

**[Player heads towards the bookshelf, sneezes, and headbutts a bunch of books, causing them to tumble slightly, thus noticing a fuxia mirror, encrusted with thousands of glittering mini diamonds, hidden behind the books]**

PLAYER

"This definitely stands out!"

"A mirror like this, capable of blinding anyone, in this universe?! How odd... It doesn't make any sense at all... I wonder if there's some reason behind this?"

**[default message for the desired objects]**

You found an object! But wait... what is it?

**[Pop-up mini-game where introductory text appears]**

A mirror to discover everything around you. Your allies in finding this object were your five senses...

**[default message]**

Solve this mini game to receive this object and fix the timeline!

**[Name of the minigame: Aesthetics]**

## **/// ROOM 3: FANTASY ///**

**[Jump out to the environment to which the mirror belongs, FANTASY]**

An ominous jolt brings you to the ground, to your knees. When you notice the space around you, you see that it has changed again. This time you're in a blindingly clear room in shades of blue, as if you're hovering in the sky. You see an altar in pure white marble, with a ruined portal structure, and a pedestal tangled in thick, verdant ivy, filled with insects, woodland animals and intense fragrances.

**[player gets a sense of dissociation again and notices that the universe he is in starts to show temporal rips around him, slowly]**

PLAYER

"What a relief! The terror is over!", "Where will I be now?"

"I can't believe time and space have changed once more! This way I'll never escape from here...", "Now I'm stuck in a fairy tale... I wonder if if I sing I can call the woodland creatures to me? ehheh", "I have to get out of here as soon as possible, nothing makes sense anymore..."

Two objects down! You're almost there!

Grab your sword, put on your armour, and set off on this next adventure...

**[Player begins to explore the room freely in search of the object]**

**[The screwdriver is behind the ivy on the pedestal, between the roots]**

**[If the player takes a long time to find the desired object, a message appears in the bottom left corner with information that will guide him to discover what he has to look for. These clues follow an order and only appear after x seconds of the previous one being given, if the player still can't find the object.]**

**Ex.:**

**1- Don't know where to look? Try to find an object that doesn't look like it belongs in this room!**

**2- So close... lose yourself in a tangle of threads and look deeper!**

**3- Try interacting with the objects in the room... who knows what you'll find!**

**[The player notices a lamp attached to the bow of a boat moored in the corner of the room. This one emits a dim, pulsating light that throbs every second. The lamp is unusual, with a series of grooves and protrusions. As you begin to move these elements, you hear small gears spring into action and the lamp begins to open slowly, like a lotus flower, illuminating intensely and dimming the space momentarily].**

PLAYER

"Wow! Am I dreaming? What a beautiful intensity!"

[default message for objects other than those intended]

You found an object! It doesn't seem to be what you're looking for...

PLAYER

"I really wish I could take this with me, but I feel it won't be possible for me and I will have to return to my search..."

[Player closes the lamp mechanism again and hangs it back on the bow]

[Player approaches a carved stone reading table, with an ancient book perched on it. Upon opening it he sees that it is filled with strange scrawls and runes. He tries to pronounce the strange charms written and suddenly, in a cloud of purple smoke, a small creature appears and throws a heavy gold key at his head].

PLAYER

"AU! What was that? Am I hallucinating?!"

[The ground shakes again, but this time more intensely, causing the player to fall flat on the ground. Looking up, he notices the small creature that was laughing behind him. Looking down, he notices the key lying on the ground and grabs it]

[default message for objects other than those intended]

You found an object! It doesn't seem to be what you're looking for...

PLAYER

"I'll keep it anyway, it might come in handy!"

[In an unexpected puff, the creature disappears, the book closes by itself and the key appears in the player's inventory].

[Player freely explores the room and comes across the most destroyed element of the room, reluctantly approaching]

PLAYER

"That portal sends shivers up my spine... what a mysterious aura...", "I'm not going near that thing... I'm going to throw something at it to see if it reacts"

**[The staircase on which the portal stands is littered with scattered small stone debris. The player sees a stone conveniently close to his feet and kicks it towards the ruins].**

**[default message for objects other than those intended]**

You found an object! It doesn't seem to be what you're looking for...

**[The stone hitting the ruins of the gateway causes it to let off an intense blue spark that goes against a cupboard hidden in a corner]**

PLAYER

"Ah...that's it? I was expecting something more surprising...", "Well, nothing to see here...I'll keep looking!"

**[The player sees that in the hidden corner of the room there is a cabinet, all stained in wood of different colours, full of little drawers full of engravings and runes]**

PLAYER

"Um, is that where the magic potions and powders of this universe are kept?"

**[The player approaches the grotesque cupboard and tries to open its drawers. Failing, he takes the key from his inventory and makes another attempt at the drawers. He manages to open them and starts rummaging through them. Amongst various powders and different herbs, the Player finds a glowing amethyst.]**

**[default message for objects other than those intended]**

You found an object! It doesn't seem to be what you're looking for...

PLAYER

"Oh boy, I was really hoping I could take this with me... it's even the right size to fit in my pocket..."

**[Player puts amethyst back in drawer and continues to explore the room]**

**[The only space missing that attracts the Player's attention is the verdant ivy that covers and climbs a huge marble pedestal on the opposite side of the room. It is full of small insects among its leaves. As he approaches, he notices a small reflection of light on a metal surface somewhere among the ivy. Player wades through the undergrowth to reach this strange glow, finally grabbing it].**

PLAYER

"A screwdriver? Why would something like that be here?!"

[default message for the desired objects]

You found an object! But wait... what is it?

[Pop-up mini-game where introductory text appears]

A screwdriver solves problems... If you don't always follow the rules, you may have to deal with this...

[default message]

Solve this mini game to receive this object and fix the timeline!

[Name of the mini-game: Mechanics]

## **/// ROOM 4: REALISTIC ///**

[Jump out to the environment to which the screwdriver belongs, REALISTIC]

The room shakes violently and pieces of the ceiling of the time space begin to collapse to the floor. You see the environment change again, this time to a corporate office reality, super dull and quiet. The environment is unfamiliar to you and you don't know the space, but it sure looks like the offices you saw in your reality, polished and simple, full of decorative and work junk. However, as you see some of the temporal fabric tear and crumble on the floor, you know that you are not back in your own world yet...

You must be approaching the time machine!

Find the missing object!

[player regains a sense of dissociation and realises that he's running out of time]

PLAYER

"My god, what a nightmare, it feels like I'm back in my office...", "I guess on the one hand it's a relief to know I'm not back to my reality yet...", "But I know I don't want to be stuck here forever and ever... I'm almost there!"

[Player begins to explore the room freely in search of the object]

[Futuristic computer, it resembles a small tablet and when turned on it emits an interactive blue, fluorescent hologram. It is located in the printer paper refill drawer]

[If the player takes a long time to find the desired object, a message appears in the bottom left corner with information that will guide him to discover what he has to look for. These clues follow an order and only appear after x seconds of the previous one being given, if the player still can't find the object.]

Ex.:

1- Don't know where to look? Try to find an object that doesn't look like it belongs in this room!

2- So close... sometimes the best thing is to get the ideas down on paper!

3- Try interacting with the objects in the room... who knows what you'll find!

[Player notices the desk in the centre of the room and an incredibly soft, velvety chair with ergonomic backrests, even as if it was taken from an advertisement for high-end office supplies. She sits down in the chair, but the jacket that is resting on its backrest bothers her back. He takes the coat and looks at it carefully]

[default message for objects other than those intended]

You found an object! It doesn't seem to be what you're looking for...

PLAYER

"What bad taste! It doesn't even look my size..."

[Player hangs up coat again and resumes exploration]

[The chair didn't satisfy the player so he goes to explore the polished and shiny leather sofas, filled with cushions of all shapes and forms but extremely elegant and sober. Player picks up one of the cushions that has shimmering tassels of contrasting hues]

[default message for objects other than those intended]

You found an object! It doesn't seem to be what you're looking for...

PLAYER

"Too bad I'm in such a hurry... I wouldn't mind at all taking a nap now."

[He puts the cushion back on the sofa and continues his search]

[The floor shudders once more, this time so intensely that it knocks several books off the bookshelf, breaking the harmony of the room. In an attempt to prevent anything else from falling, the Player moves towards the pile of books now sprawled on the floor.]

[On reaching the bookcase, and noticing all the disorder caused by the shaking, the Player notices a very funny snow globe, carefully placed at one end of the bookcase. The globe is an exact replica of the typical souvenir of holidays in the little land, with cartoonish and peculiar figures of regional folklore.

The player picks up the globe to examine it more closely.]

[default message for objects other than those intended]

You found an object! It doesn't seem to be what you're looking for...

PLAYER

“Ahah, what a hideous thing... They look just like the ones my mother keeps in the display case at home”

[Player puts down the globe and turns to the other side of the room]

PLAYER

“I have a cupboard at home exactly like that one, maybe it was bought in the same shop, if it were possible”

[Player approaches the dark mahogany cabinet and notices its giant, spacious drawers, adorned with dark metal handles full of welded floral motifs. Opening the various drawers, he finds an industrial-sized stapler that already looks well worn.]

[default message for objects other than those intended]

You found an object! It doesn't seem to be what you're looking for...

PLAYER

“Um, it may not be what I'm looking for, but real work is done here...”

[Player leaves the stapler in the drawer where it was and looks away as he smells an intense fragrance of familiar perfume.]

[In another cupboard the Player notices that the familiar, intoxicating smell is coming from a vase of Jasmine that is sitting. The Player reaches over to pick up the pot of aromatic herb and smells it.]

[default message for objects other than those intended]

You found an object! It doesn't seem to be what you're looking for...

PLAYER

"Jasmine tea is one of the best things for a stressful afternoon, but I don't have time for it now"

[Player returns vase to original position and finally notices the giant printer at the back of the room]

[When approaching the printer, the Player sees that the printer is turned on and making a strange noise, as if it were out of paper. He opens the paper supply drawer to confirm the situation and notices that instead of the typical ream of paper, there is a small device, similar to a tablet, lying inside. He picks it up curiously and when he touches it, it emits a big flash of intense blue light that projects upwards, resembling a futuristic interactive hologram]

[default message for the desired objects]

You found an object! But wait... what is it?

[Pop-up mini-game where introductory text appears]

A computer where you can catalogue all your inventory in one space, amazing!

[default message]

Solve this mini game to receive this object and fix the timeline!

[Name of the mini-game: Technology]

## /// ROOM 5: SCI FI ///

[Jump out to the environment where the futuristic computer belongs, SCI FI]

You did it!

You've found the objects to fix the timeline and leave everything as it was!

The final challenge now is to fix the time machine...

The room you've passed into in this last stage bears an immense resemblance to the first one you started in, but now there's a peculiarly large suitcase, full of coloured buttons and dials, flashing in the centre of the room. The space also appears to have taken an extremely strong jolt, like an earthquake, and through the cracks created by this destruction, you notice that the temporal fabric is now attached by a thread and begins to disintegrate at a rapid rate. You approach the suitcase in the centre of the room which you identify as your time machine, although you would hardly recognise it due to its battered and worn state.

Gather all the objects inside the time machine. You notice that the electronic display of the device starts flashing intensely when everything is finally in place, and a message is produced:

*In case you haven't noticed, the name of the four mini games you made are Narrative, Aesthetics, Mechanics, and Technology, which are precisely the four elements that make up a game.*

***Narrative** the sequence of events that unfolds in the game;*

***Aesthetics** is how the game looks visually, how it sounds, smells, tastes and feels;*

***Mechanics** are the procedures and rules of the game;*

***Technology** is the medium in which aesthetics take place, mechanics occur, and narrative unfolds.*

*The "skin" of the game is the **Experience**, which depends on these four elements. This is called **Elemental Tetrad**.*

Now with your curiosity quenched and all your questions answered, adjust the settings to set the date and place of your true reality and origin. It's been quite a journey, but you've managed to save the multiverse of realities by reaching your world again.

**THE END**

### 9.1.2 Full Narrative PT version

#### EdScape

#### **/// SALA 1: SCI FI ///**

A linha do tempo parece estar avariada!

Estás preso num multiverso de realidades e perdeste a tua máquina do tempo.

Para regressares à tua própria realidade precisas de encontrar objetos específicos, que definitivamente destoam e não pertencem a cada realidade que presenciares, para arranjar a máquina do tempo...

Olhas à tua volta e vês um cenário saído de um filme sobre batalhas intergaláticas, cheio de berloques futuristas e tecnologia mirabolante psicadélica.

**[jogador acorda e começa a pensar para si]**

JOGADOR

“Onde estou?”, “Em que ano estou?”, “Tenho de descobrir primeiro que realidade é esta antes de procurar o objeto para a máquina...”

**[Num só vislumbre, o jogador repara num mostrador verde fluorescente a dizer em estranhos hieróglifos ‘355CB-Venus’]**

JOGADOR

“Ano de 355CB-Venus? Esta não é definitivamente a minha realidade... devo estar num futuro distópico”

Sentes repentinamente uma sensação desagradável de dissociação, a tua visão fica turva e sentes o chão tremer. A tua memória está a fragmentar e tens receio de voltar (à estaca zero).

A linha do tempo está cada vez mais instável e tens de a reparar antes que seja impossível regressar à tua própria realidade!

Está na hora de explorares este ambiente nada familiar e descobrires o teu próximo passo...

[Jogador começa a explorar a sala livremente à procura do objeto]

[Caneta encontra-se entranhada nas costuras de uma das almofadas do sofá]

[Caso o jogador demore muito tempo a encontrar o objeto pretendido, uma mensagem aparece no canto inferior esquerdo com informação que o vai orientar de forma a descobrir o que tem de procurar. Estas pistas seguem uma ordem e só surgem passado x segundos da anterior ser dada, isto caso o jogador continue sem encontrar o objeto.]

Ex.:

1- Não sabes onde procurar? Tenta encontrar um objeto que não pareça pertencer a esta sala!

2- Tão perto... procura perto do sofá!

3- Tenta interagir com os objetos da sala... quem sabe o que vais encontrar!

[Jogador repara num aparelho que parece musical e experimenta premir alguns dos botões empoeirados]

JOGADOR

“Que música interessante, nunca ouvi nada assim!”

[mensagem default para objetos que não os pretendidos]

Encontraste um objeto! Não parece ser o que estás à procura...

JOGADOR

“Definitivamente, mas o que ando eu afinal à procura no meio de tanta tecnologia e sinfonias impercetíveis?”

[Ouve-se um beep constante miudinho vindo da secretária e após muita procura o Jogador encontra uma espécie de comando tátil a piscar do fundo de uma gaveta]

JOGADOR

“Como é que se desliga isto? Parece interessante, mas não é o que estou à procura...”

[Jogador interage com o sofá e senta-se]

JOGADOR

“Au! Sinto algo a magoar-me...o que será?”

**[Jogador encontra uma caneta]**

**[mensagem default para os objetos pretendidos]**

Encontraste um objeto! Mas espera...o que é isto?

JOGADOR

“Uma caneta neste universo?! Que estranho... Não faz sentido nenhum... será que existe alguma razão por detrás disto?”

**[Pop-up de minijogo onde aparece texto introdutório]**

Guarda esta caneta, vai ser útil para anotares a sequência de eventos da tua aventura.

**[mensagem default]**

Resolve este mini jogo para receberes este objeto e arranjares a linha do tempo!

**[Nome do minijogo: Narrativa]**

## **/// SALA 2: TERROR ///**

**[Jump out para o ambiente a que pertence a caneta, TERROR]**

A sala estremece e num clarão súbito e intenso vês a sala a escurecer atterradoramente, como se caísse num buraco negro. Subitamente, após ajustar a visão, reparas que estás agora num ambiente tenebroso, decorado com motivos sangrentos e viscosos. Tudo o que te rodeia emana uma aura assustadora e vil.

**[jogador volta a ter uma sensação de dissociação e percebe que o tecido temporal começa a rasgar]**

JOGADOR

“O que é isto?”

“O tempo e o espaço mudaram outra vez!”, “Um ambiente assustador e gelado...só falta sair um psicopata com machado da parede”, “Tenho de sair daqui o mais rapidamente possível”

Já descobriste o primeiro objeto!

Ganha coragem, enfrenta os teus medos e explora a sala para descobrires o teu próximo passo...

**[Jogador começa a explorar a sala livremente à procura do objeto]**

**[Espelho encontra-se atrás de um livro de uma estante poeirenta]**

**[Caso o jogador demore muito tempo a encontrar o objeto pretendido, uma mensagem aparece no canto inferior esquerdo com informação que o vai orientar de forma a descobrir o que tem de procurar. Estas pistas seguem uma ordem e só surgem passado x segundos da anterior ser dada, isto caso o jogador continue sem encontrar o objeto.]**

Ex.:

**1- Não sabes onde procurar? Tenta encontrar um objeto que não pareça pertencer a esta sala!**

**2- Tão perto... procura pelo meio das folhas até encontrares o teu reflexo!**

**3- Tenta interagir com os objetos da sala... quem sabe o que vais encontrar!**

**[Jogador repara numa espécie de gosma verde com uma camada negra de penugem protetora brilhante. Ao pegar nela sente um odor tão forte que lhe traz lágrimas aos olhos]**

JOGADOR

“Os meus olhos, que ardor! Que cheiro nauseabundo!”

[mensagem default para objetos que não os pretendidos]

Encontraste um objeto! Não parece ser o que estás à procura...

JOGADOR

“Não faço ideia do que será esta criatura, mas acho que definitivamente não é aquilo que procuro”

[Jogador atira a gosma para o chão, que instantaneamente rasteja para debaixo do sofá]

[Jogador é atraído pelo estalar da madeira e pelo cheiro a brasas quentes da lareira. Ao aproximar-se repara num pequeno pote de barro com um líquido a ferver. É caldo de legumes. Jogador pega no pote e prova o preparado]

JOGADOR

“Hummm, que delícia para aquecer o estômago. Sinto-me rejuvenescido com energia.”

[O chão estremece novamente e o caldo entorna por cima das brasas]

JOGADOR

“Porque estou a perder tempo a provar comida... tenho de me despachar antes que seja tarde demais! Duvido muito que seja este caldo o objeto que procuro aqui”

[Jogador pausa o pote de volta por cima do lume quente e continua a explorar a sala]

JOGADOR

“Estou a sentir um cheiro a mofo estonteante, será que vem daquela estante?”

[Jogador dirige-se para a estante, espirra, e dá uma cabeçada num molho de livros, fazendo-os tombar ligeiramente, reparando assim num espelho fuxia, incrustado com milhares de mini diamantes reluzentes, escondido atrás dos livros]

JOGADOR

“Isto definitivamente destoa!”

“Um espelho destes, capaz de cegar qualquer pessoa, neste universo?! Que estranho... Não faz sentido nenhum... será que existe alguma razão por detrás disto?”

[mensagem default para os objetos pretendidos]

Encontraste um objeto! Mas espera...o que é isto?

**[Pop-up de minijogo onde aparece texto introdutório]**

Um espelho para descobrires tudo o que te rodeia. Os teus aliados para encontrares este objeto foram os cinco sentidos...

**[mensagem default]**

Resolve este mini jogo para receberes este objeto e arranjares a linha do tempo!

**[Nome do minijogo: Estética]**

### **/// SALA 3: FANTASIA ///**

**[Jump out para o ambiente a que pertence o espelho, FANTASIA]**

Um abanão tenebroso leva-te ao chão, de joelhos. Quando reparas no espaço à tua volta, vês que este voltou a mudar. Desta vez, estás numa sala ofuscantemente clara em tons de azul, como se estivesses a pairar no céu. Vês um altar em mármore branco, puro, com uma estrutura de portal em ruínas, e um pedestal emaranhado numa hera espessa e verdejante, repleta de insetos, animais do bosque e fragrâncias intensas.

**[jogador volta a ter uma sensação de dissociação e repara que o universo em que está começa a mostrar rasgões temporais à sua volta, lentamente]**

JOGADOR

“Que alívio! O terror acabou!”, “Onde estarei agora?”

“Não acredito que o tempo e o espaço mudaram outra vez! Assim nunca mais escapo daqui...”, “Agora estou preso num conto de fadas... será que se cantar consigo chamar as criaturas do bosque até mim? eheh”, “Tenho de sair daqui o mais rapidamente possível, já nada faz sentido...”

Dois objetos já estão! Estás quase lá!

Agarra a tua espada, veste a tua armadura, e parte para esta próxima aventura...

**[Jogador começa a explorar a sala livremente à procura do objeto]**

**[Chave de fendas encontra-se atrás da hera do pedestal, por entre as raízes]**

**[Caso o jogador demore muito tempo a encontrar o objeto pretendido, uma mensagem aparece no canto inferior esquerdo com informação que o vai orientar de forma a descobrir o que tem de procurar. Estas pistas seguem uma ordem e só surgem passado x segundos da anterior ser dada, isto caso o jogador continue sem encontrar o objeto.]**

Ex.:

1- Não sabes onde procurar? Tenta encontrar um objeto que não pareça pertencer a esta sala!

2- Tão perto... perde-te num emaranhado de fios e procura mais fundo!

3- Tenta interagir com os objetos da sala... quem sabe o que vais encontrar!

[Jogador repara num candeeiro preso à proa de um barco atracado num canto da sala. Este emite uma luz fraca, pulsante, que palpita a cada segundo. O candeeiro é fora do comum, com uma série de ranhuras e saliências. Ao começar a mexer nestes elementos, ouvem-se pequenas engrenagens a entrar em ação e o candeeiro começa a abrir lentamente, como uma flor de lótus, iluminando intensamente e ofuscando o espaço momentaneamente.]

JOGADOR

“Wow! Estarei a sonhar? Que intensidade mais bela!”

[mensagem default para objetos que não os pretendidos]

Encontraste um objeto! Não parece ser o que estás à procura...

JOGADOR

“Gostava imenso de poder levar isto comigo, mas sinto que não me será possível e vou ter que retomar a minha procura...”

[Jogador fecha novamente o mecanismo do candeeiro e pendura-o novamente na proa]

[Jogador aproxima-se de uma mesa de leitura esculpida em pedra, com um livro antigo pousado. Ao abri-lo vê que está cheio de estranhos gatafunhos e runas. Tenta pronunciar os estranhos encantos escritos e de repente, numa nuvem de fumo roxo, aparece uma pequena criatura que lhe atira uma chave de ouro pesadíssima à cabeça.]

JOGADOR

“AU! Que foi isto? Estarei a alucinar?!”

[O chão estremece novamente, mas desta vez de forma mais intensa, fazendo o jogador cair estatelado no chão. Ao olhar para cima, repara na pequena criatura que estava a rir-se atrás dele. Ao olhar para baixo, repara na chave caída no chão e agarra-a]

[mensagem default para objetos que não os pretendidos]

Encontraste um objeto! Não parece ser o que estás à procura...

JOGADOR

“Vou guardá-la na mesma, pode vir a dar jeito!”

**[Num puff inesperado, a criatura desaparece, o livro fecha-se sozinho e a chave aparece no inventário do jogador.]**

**[Jogador explora livremente a sala e depara-se com o elemento mais destruído da mesma, aproximando-se relutantemente]**

JOGADOR

“Aquele portal dá-me arrepios pela espinha acima... que aura misteriosa...”, “Não me vou aproximar daquilo... vou atirar-lhe alguma coisa para ver se reage”

**[A escadaria em que o portal se encontra está repleto de pequenos destroços de pedra espalhados. O jogador vê uma pedra convenientemente próxima dos seus pés e chuta-a em direção às ruínas.]**

**[mensagem default para objetos que não os pretendidos]**

Encontraste um objeto! Não parece ser o que estás à procura...

**[A pedra ao embater nas ruínas do portal faz com que este largue uma faísca azul intensa que vai contra um armário escondido num canto]**

JOGADOR

“Ah... só isto? Estava à espera de algo mais surpreendente...”, “Bem, nada a ver aqui...vou continuar a procurar!”

**[Jogador vê que no canto escondido da sala existe um armário, todo manchado na madeira de diversas cores, repleto de pequenas gavetinhas cheias de gravuras e runas]**

JOGADOR

“Hum, será que é ali que se guardam as poções e pós mágicos deste universo?”

**[Jogador aproxima-se do caricato armário e tenta abrir as suas gavetas. Não conseguindo, pega na chave do seu inventário e faz uma nova tentativa nas gavetas, conseguindo abri-las e começando a vasculhar. Entre vários pós e diferentes ervas, o Jogador encontra uma ametista reluzente.]**

**[mensagem default para objetos que não os pretendidos]**

Encontraste um objeto! Não parece ser o que estás à procura...

JOGADOR

“Ora bolas, estava mesmo à espera de poder levar isto comigo... até tem o tamanho certo para caber no bolso..”

[Jogador repõe ametista na gaveta e continua a explorar a sala]

[O único espaço em falta que atrai a atenção do Jogador é a hera verdejante que cobre e trepa por um enorme pedestal de mármore no lado oposto da sala. Este encontra-se repleto de pequenos insetos por entre as suas folhas. Ao aproximar-se, repara num pequeno reflexo da luz numa superfície de metal algures por entre as heras. Jogador embrenha-se pelo meio da vegetação para alcançar este brilho estranho, agarrando-o finalmente.]

JOGADOR

“Uma chave de fendas? Porque haveria de estar algo assim aqui?!”

[mensagem default para os objetos pretendidos]

Encontraste um objeto! Mas espera...o que é isto?

[Pop-up de minijogo onde aparece texto introdutório]

Uma chave de fendas resolve problemas... Se não cumprires sempre as regras, podes ter de lidar com isto...

[mensagem default]

Resolve este mini jogo para receberes este objeto e arranjares a linha do tempo!

[Nome do minijogo: Mecânica]

## /// SALA 4: REALISTA ///

[Jump out para o ambiente a que pertence a chave de fendas, REALISTA]

A sala abana violentamente e pedaços do teto do espaço temporal começam a ruir para o chão. Vês novamente o ambiente a mudar, desta vez para uma realidade de escritório de empresa, super aborrecida e silenciosa. O ambiente não te é familiar e não conheces o espaço, mas parece mesmo ser como os escritórios que vias na tua realidade, polidos e simples, cheios de tralhas decorativas e de trabalho. No entanto, ao veres parte do tecido temporal rasgar e esmigalhar-se no chão, sabes que ainda não estás de volta ao teu mundo...

Deves estar a aproximar-te da máquina do tempo!

Encontra o objeto que falta!

[jogador volta a ter uma sensação de dissociação e percebe que o seu tempo está a esgotar]

JOGADOR

“Meu deus, que pesadelo, parece que estou de volta ao meu escritório...”, “Acho que por um lado é um alívio saber que ainda não voltei à minha realidade...”, “Mas sei que não quero ficar aqui preso para todo o sempre... estou quase lá!”

[Jogador começa a explorar a sala livremente à procura do objeto]

[Computador futurista, assemelha-se a um pequeno tablet e quando ligado emite holograma azul fluorescente interativo. Encontra-se na gaveta da recarga de papel da impressora]

[Caso o jogador demore muito tempo a encontrar o objeto pretendido, uma mensagem aparece no canto inferior esquerdo com informação que o vai orientar de forma a descobrir o que tem de procurar. Estas pistas seguem uma ordem e só surgem passado x segundos da anterior ser dada, isto caso o jogador continue sem encontrar o objeto.]

Ex.:

1- Não sabes onde procurar? Tenta encontrar um objeto que não pareça pertencer a esta sala!

2- Tão perto... às vezes o melhor é colocar as ideias em papel!

3- Tenta interagir com os objetos da sala... quem sabe o que vais encontrar!

[Jogador repara na secretária no centro da sala e numa cadeira incrivelmente suave e aveludada, com encostos ergonómicos, mesmo como se fosse retirada de um anúncio de material de escritório topo de gama. Senta-se na cadeira, mas o casaco que está pousado no seu encosto incomoda-lhe as costas. Pega no casaco e observa-o atentamente]

[mensagem default para objetos que não os pretendidos]

Encontraste um objeto! Não parece ser o que estás à procura...

JOGADOR

“Que mau gosto! Nem parece ser o meu tamanho...”

[Jogador volta a pendurar casaco e retoma a exploração]

[A cadeira não satisfez o jogador então ele vai explorar os sofás de couro polido e brilhante, repletos de almofadinhas de todas as formas e feitos mas extremamente elegantes e sóbrias. Jogador pega numa das almofadas que tem umas borlas cintilantes de tons contrastantes]

[mensagem default para objetos que não os pretendidos]

Encontraste um objeto! Não parece ser o que estás à procura...

JOGADOR

“Que pena estar com tanta pressa... não me importava nada de tirar agora uma sesta.”

[Pousa novamente a almofada no sofá e continua a sua procura]

[O chão estremece uma vez mais, desta vez de forma tão intensa que derruba vários livros da estante, quebrando a harmonia da sala. Numa tentativa de evitar que algo mais caia, o Jogador dirige-se para o monte de livros agora espalhado pelo chão.]

[Ao chegar à estante, e reparar em toda a desordem causada pelo abanão, o Jogador repara num globo de neve muito engraçado, cuidadosamente pousado numa das extremidades da estante. O globo é uma réplica exata da típica recordação de férias na terrinha, com figuras caricatas e peculiares de folclore regional. O jogador pega no globo para o analisar melhor.]

[mensagem default para objetos que não os pretendidos]

Encontraste um objeto! Não parece ser o que estás à procura...

JOGADOR

“Ahah, que coisa horrenda... Parecem mesmo os que a minha mãe guarda na vitrine lá de casa”

[Jogador pousa o globo e vira-se para o outro lado da sala]

JOGADOR

“Tenho um armário lá em casa exatamente igual àquele, se calhar foi comprado na mesma loja, se fosse possível”

[Jogador aproxima-se do armário em mogno escuro e repara nas suas gavetas gigantes e espaçosas, adornadas com puxadores em metal escuro, repletos de motivos florais soldados. Ao abrir as diversas gavetas encontra um agraphador de tamanho industrial já com aspeto de muito uso.]

[mensagem default para objetos que não os pretendidos]

Encontraste um objeto! Não parece ser o que estás à procura...

JOGADOR

“Hum, pode não ser o que estou à procura, mas que aqui se trabalha a sério trabalha...”

[Jogador deixa o agraphador na gaveta onde estava e olha para o lado ao sentir uma fragrância intensa de perfume familiar.]

[Num outro armário o Jogador repara que o odor familiar e inebriante vem de um vaso com Jasmim que está pousado. O jogador aproxima-se para pegar no vaso da erva aromática e cheirá-lo.]

[mensagem default para objetos que não os pretendidos]

Encontraste um objeto! Não parece ser o que estás à procura...

JOGADOR

“Chá de jasmim é das melhores coisas para uma tarde stressante, mas agora não tenho tempo para isso”

[Jogador devolve vaso à posição original e finalmente repara na impressora gigante ao fundo da sala]

[Ao aproximar-se da impressora, o Jogador vê que a impressora está ligada e a fazer um barulho estranho, como se com falta de papel. Abre a gaveta das recargas de papel para confirmar a situação e nota que em vez da típica resma de papel, está um pequeno aparelho, semelhante a um tablet, pousado lá dentro. Pega nele curiosamente e ao tocar-lhe este emite um grande flash de luz azul intensa que se projeta para cima, assemelhando-se a um holograma futurista e interativo]

[mensagem default para os objetos pretendidos]

Encontraste um objeto! Mas espera...o que é isto?

[Pop-up de minijogo onde aparece texto introdutório]

Um computador onde podes catalogar todo o teu inventário num espaço só, incrível!

[mensagem default]

Resolve este mini jogo para receberes este objeto e arranjares a linha do tempo!

[Nome do minijogo: Tecnologia]

## /// SALA 5: SCI FI ///

[Jump out para o ambiente a que pertence o computador futurista, SCI FI]

Conseguiste!

Encontraste os objetos para arranjar a linha do tempo e deixar tudo como era!

O desafio final agora é arranjar a máquina do tempo...

A sala para onde passaste nesta última etapa assemelha-se imenso à primeira onde começaste, mas agora existe uma mala de viagem peculiarmente grande, cheia de botões coloridos e mostradores, a piscar ao centro da sala. O espaço também parece ter sofrido um abanão extremamente forte, como se de um terramoto se tratasse, e pelas fendas criadas com esta destruição, reparas que o tecido temporal está agora preso por um fio e começa a desintegrar-se a uma rápida velocidade. Aproximas-te da mala ao centro da sala que identificas como sendo a tua máquina do tempo, apesar de que quase nem a reconhecias devido ao seu estado maltratado e desgastado.

Reúne todos os objetos dentro da máquina do tempo. Reparas que o mostrador eletrónico do aparelho começa a piscar intensamente quando tudo está finalmente no lugar, e uma mensagem é produzida:

*Caso não tenhas reparado, o nome dos quatro mini jogos que fizeste são **Narrativa**, **Estética**, **Mecânica**, e **Tecnologia**, que são precisamente os quatro elementos que compõem um jogo.*

***Narrativa** a sequência de eventos que se desenrola no jogo;*

***Estética** é como o jogo aparenta visualmente, como soa, cheira, sabe e se sente;*

***Mecânica** são os procedimentos e as regras do jogo;*

***Tecnologia** é o meio em que a estética tem lugar, a mecânica ocorre, e a narrativa se desenrola.*

*A “pele” do jogo é a **Experiência**, que depende destes quatro elementos. A isto chama-se **Elemental Tetrad**.*

Agora com a curiosidade saciada e todas as tuas dúvidas respondidas, ajusta as definições para acertares a data e local da tua verdadeira realidade e origem. Foi uma viagem e pêras, mas conseguiste salvar o multiverso de realidades, alcançando o teu mundo novamente.

**FIM**

## 9.2 Appendix 2 – main JSON file

```
{
  "gameId": "rita_test_en",
  "creationDate": "05/06/2022 00:00:00",
  "issuerEmail": "asousa@fe.up.pt",
  "spaceId": "5Rooms",
  "infoIntroductionTitle": "Instructions",
  "infoIntroductionText": "\nControls:\n - Rotate the camera: Right mouse button + Mouse cursor.\n - Change camera type: 'C' key.\n - Movement: 'AWS'D keys, Arrow keys or Left mouse button by clicking on a position in the room.\n - Interact with objects in the room: Objects appear highlighted when you pass the mouse cursor, to interact with them left click.\nGame:\n - The time is in the top right corner.\n - In the bottom right corner you can ask for hints but each hint is associated with a 10 second time penalty.\n - Each object in the game can be a means to get what you need to escape, it can contain relevant information or a mini-game. If you manage to solve the challenges correctly you automatically get that same object :)\n - Getting a challenge wrong or getting out of a challenge is a 1 second penalty, but it doesn't make it impossible for you to leave the room, because you can always try again!\nSuggestion:\n - Solve the game by taking the time to study and you'll escape to success!" ,
  "introductionText": "The timeline seems to be broken!\n\nYou are trapped in a multiverse of realities and have lost your time machine.\n\nTo return to your own reality you need to find specific objects, which are definitely out of place and do not belong to each reality you witness, to fix the time machine...\n\nYou look around you and see a scenario straight out of a film about intergalactic battles, full of futuristic gadgets and psychedelic marvellous technology.\n\nWhere am I? What year is this? I have to find out first what reality this is before I can find the object for the machine...\n\n[In one glimpse, you notice a green dial saying in strange hieroglyphics '355CB-Venus']\n\nYear of 355CB-Venus? This is definitely not my reality...I must be in a dystopian future'\n\nYou suddenly feel an unpleasant feeling of dissociation, your vision is blurred and you feel the ground shaking. Your memory is fragmenting and you're afraid you're going back to square one.\n\nThe timeline is becoming increasingly unstable and you must repair it before it becomes impossible to return to your own reality!\n\nIt's time to explore this unfamiliar environment and figure out your next step...",
  "startText": "Time starts after you press play.",
  "initialTime": 1500,
  "clueObjs":
  [
    {
      "itemIdNotOwned": "Pen",
      "showClueAfterTime": 10.0,
      "message": "Don't know where to look? Try to find an object that doesn't look like it belongs in this room!",
      "penalization": 0,
      "destroyAfterShowing": true
    },
    {
      "itemIdNotOwned": "Pen",
      "showClueAfterTime": 10.0,
      "message": "Try interacting with objects in the room...who knows what you'll find!",
      "penalization": 0,
      "destroyAfterShowing": true
    },
    {
```

```

        "itemIdNotOwned": "Pen",
        "showClueAfterTime": 10.0,
        "message": "So close... look close to the sofa!",
        "penalization": 10,
        "destroyAfterShowing": false,
        "suppressNextCluesUntilGrabItem": true
    },
    {
        "itemIdNotOwned": "Mirror",
        "showClueAfterTime": 10.0,
        "message": "Don't know where to look? Try to find an object that doesn't look like it belongs in this
room!",
        "penalization": 0,
        "destroyAfterShowing": true
    },
    {
        "itemIdNotOwned": "Mirror",
        "showClueAfterTime": 10.0,
        "message": "Try interacting with objects in the room...who knows what you'll find!",
        "penalization": 0,
        "destroyAfterShowing": true
    },
    {
        "itemIdNotOwned": "Mirror",
        "showClueAfterTime": 10.0,
        "message": "So close... search through the leaves until you find your reflection!",
        "penalization": 10,
        "destroyAfterShowing": false,
        "suppressNextCluesUntilGrabItem": true
    },
    {
        "itemIdNotOwned": "Screwdriver",
        "showClueAfterTime": 10.0,
        "message": "Don't know where to look? Try to find an object that doesn't look like it belongs in this
room!",
        "penalization": 0,
        "destroyAfterShowing": true
    },
    {
        "itemIdNotOwned": "Screwdriver",
        "showClueAfterTime": 10.0,
        "message": "Try interacting with objects in the room...who knows what you'll find!",
        "penalization": 0,
        "destroyAfterShowing": true
    },
    {
        "itemIdNotOwned": "Screwdriver",
        "showClueAfterTime": 10.0,
        "message": "So close... lose yourself in a tangle of threads and look deeper!",

```

```

        "penalization": 10,
        "destroyAfterShowing": false,
        "suppressNextCluesUntilGrabItem": true
    },
    {
        "itemIdNotOwned": "FuturisticComputer",
        "showClueAfterTime": 10.0,
        "message": "Don't know where to look? Try to find an object that doesn't look like it belongs in this
room!",
        "penalization": 0,
        "destroyAfterShowing": true
    },
    {
        "itemIdNotOwned": "FuturisticComputer",
        "showClueAfterTime": 10.0,
        "message": "Try interacting with objects in the room...who knows what you'll find!",
        "penalization": 0,
        "destroyAfterShowing": true
    },
    {
        "itemIdNotOwned": "FuturisticComputer",
        "showClueAfterTime": 10.0,
        "message": "So close... sometimes the best thing is to get the ideas down on paper!",
        "penalization": 10,
        "destroyAfterShowing": false,
        "suppressNextCluesUntilGrabItem": true
    }
],
"thoughtObjs":
[
    {
        "itemGrabbed": "Phonograph",
        "showThoughtAfterTime": 1.0,
        "message": "Definitely, but what am I looking for in the midst of so much technology and imperceptible
symphonies anyway?"
    },
    {
        "itemGrabbed": "Pen",
        "showThoughtAfterTime": 1.0,
        "message": "A pen in this universe?! How strange... It doesn't make any sense... I wonder if there
is some reason behind this?"
    },
    {
        "itemGrabbed": "Mirror",
        "showThoughtAfterTime": 1.0,
        "message": "A mirror like this, capable of blinding anyone, in this universe?! How odd... It doesn't
make any sense at all... I wonder if there's some reason behind this?"
    },
    {

```

```

        "itemGrabbed": "Slime",
        "showThoughtAfterTime": 1.0,
        "message": "I have no idea what this creature is, but I think it's definitely not what I'm looking
for"
    },
    {
        "itemGrabbed": "Brew",
        "showThoughtAfterTime": 1.0,
        "message": "Hummm, what a treat to warm the stomach. I feel rejuvenated with energy."
    },
    {
        "itemGrabbed": "Brew",
        "showThoughtAfterTime": 2.0,
        "message": "Why am I wasting my time tasting food... I must hurry before it's too late! I doubt very
much that this broth is the object I'm looking for in here"
    },
    {
        "itemGrabbed": "Lamp",
        "showThoughtAfterTime": 1.0,
        "message": "I really wish I could take this with me, but I feel it won't be possible for me and I
will have to return to my search..."
    },
    {
        "itemGrabbed": "Key2",
        "showThoughtAfterTime": 1.0,
        "message": "I'll keep it anyway, it might come in handy!"
    },
    {
        "itemGrabbed": "Stone",
        "showThoughtAfterTime": 1.0,
        "message": "That portal sends shivers up my spine... what a mysterious aura..., I'm not going near
that thing... I'm going to throw something at it to see if it reacts"
    },
    {
        "itemGrabbed": "Stone",
        "showThoughtAfterTime": 2.0,
        "message": "Ah...that's it? I was expecting something more surprising..., Well, nothing to see
here...I'll keep looking!"
    },
    {
        "itemGrabbed": "Amethyst",
        "showThoughtAfterTime": 1.0,
        "message": "Oh boy, I was really hoping I could take this with me... it's even the right size to
fit in my pocket..."
    },
    {
        "itemGrabbed": "Screwdriver",
        "showThoughtAfterTime": 1.0,
        "message": "A screwdriver? Why would something like that be here?!"
    }

```

```

    },
    {
      "itemGrabbed": "Coat",
      "showThoughtAfterTime": 1.0,
      "message": "What bad taste! It doesn't even look my size..."
    },
    {
      "itemGrabbed": "Pillow",
      "showThoughtAfterTime": 1.0,
      "message": "Too bad I'm in such a hurry... I wouldn't mind at all taking a nap now."
    },
    {
      "itemGrabbed": "SnowGlobe",
      "showThoughtAfterTime": 1.0,
      "message": "Ahah, what a hideous thing... They look just like the ones my mother keeps in the display
case at home"
    },
    {
      "itemGrabbed": "Stapler",
      "showThoughtAfterTime": 1.0,
      "message": "Um, it may not be what I'm looking for, but real work is done here..."
    },
    {
      "itemGrabbed": "Jasmine",
      "showThoughtAfterTime": 1.0,
      "message": "Jasmine tea is one of the best things for a stressful afternoon, but I don't have time
for it now"
    }
  ],
  "interactiveObjs":
  [
    {
      "id": "Pen",
      "initialPosition": [7.692, 0.69, 6.93],
      "miniGame":
      {
        "id": "LabelGame",
        "path": "Rita/mini_jogo_1.json"
      }
    },
    {
      "id": "Phonograph",
      "initialPosition": [11.86, 0.778, 5.215],
      "initialRotation": [270, -78.3, 0],
      "finalIntroText": "You found an object! It doesn't seem to be what you're looking for..."
    },
    {
      "id": "Remote",
      "initialPosition": [8.246, 0.685, 6.74],

```

```

        "finalIntroText": "You found an object! It doesn't seem to be what you're looking for...",
    },
    {
        "id": "DoorTiago",
        "initialPosition": [14.291, 0.03500002, 12.913],
        "initialRotation": [0, -180, 0],
        "finalRotation": [0, 19.114, 0],
        "unlockItemsIds": ["Pen"],
        "messageLocked": "You don't have the necessary object for this interaction. Keep looking!",
        "finalIntroText": "The room shimmers and in a sudden, intense flash you see the room darken
terrifyingly, as if you had fallen into a black hole. Suddenly, after adjusting your vision, you notice that
you are now in a gloomy environment decorated with bloody, slimy motifs. Everything around you emanates a
frightening and vile aura. \nWhat is this?\nTime and space have changed again! \nA creepy, icy environment...all
that's left is an axe-wielding psychopath coming out of the wall, I must get out of here as soon as
possible\nYou've already discovered the first object! \nGather your courage, face your fears, and explore the
room to discover your next step..."
    },
    {
        "id": "Mirror",
        "initialPosition": [21.143, 0.619, 12.577],
        "miniGame": {
            "id": "LabelGame",
            "path": "Rita/mini_jogo_2.json"
        }
    },
    {
        "id": "Slime",
        "initialPosition": [24.087, 1.39, 12.025],
        "finalIntroText": "You found an object! It doesn't seem to be what you're looking for..."
    },
    {
        "id": "Brew",
        "initialPosition": [15.12, 0, 18.41],
        "initialRotation": [-90, 0, 0],
        "finalIntroText": "You found an object! It doesn't seem to be what you're looking for..."
    },
    {
        "id": "DoorTiago",
        "initialPosition": [22.858, 0.03500002, 25.479],
        "initialRotation": [0, 90, 0],
        "finalRotation": [0, -13.383, 0],
        "unlockItemsIds": ["Mirror"]
    },
    {
        "id": "DoorTiago",
        "initialPosition": [22.984, 0.03500002, 28.575],
        "initialRotation": [0, 90, 0],
        "finalRotation": [0, -77.426, 0],

```

```

        "messageLocked": "You don't have the necessary object for this interaction. Keep looking!",
        "finalIntroText": "An ominous jolt brings you to the ground, to your knees. When you notice the
space around you, you see that it has changed again. This time you're in a blindingly clear room in shades of
blue, as if you're hovering in the sky. You see an altar in pure white marble, with a ruined portal structure,
and a pedestal tangled in thick, verdant ivy, filled with insects, woodland animals and intense fragrances.\nWhat
a relief! The terror is over!, Where will I be now?\nI can't believe time and space have changed once more! This
way I'll never escape from here..., Now I'm stuck in a fairy tale... I wonder if if I sing I can call the
woodland creatures to me? eheh, I have to get out of here as soon as possible, nothing makes sense anymore...\nTwo
objects down! You're almost there!\nGrab your sword, put on your armour, and set off on this next adventure..."
    },
    {
        "id": "Screwdriver",
        "initialPosition": [31.445, 0.543, 31.054],
        "initialRotation": [-90, 0, 0],
        "miniGame": {
            "id": "LabelGame",
            "path": "Rita/mini_jogo_3.json"
        }
    },
    {
        "id": "Amethyst",
        "initialPosition": [29.09, 1.326, 36.981],
        "initialRotation": [0, 0, 0],
        "finalIntroText": "You found an object! It doesn't seem to be what you're looking for..."
    },
    {
        "id": "Stone",
        "initialPosition": [22.829, 0.144, 33.999],
        "initialRotation": [0, 0, 0],
        "finalIntroText": "You found an object! It doesn't seem to be what you're looking for..."
    },
    {
        "id": "Key2",
        "initialPosition": [20.565, 1.3512, 32.875],
        "initialRotation": [-89.9, 90.11, 89.051],
        "finalIntroText": "You found an object! It doesn't seem to be what you're looking for..."
    },
    {
        "id": "Cabinet",
        "initialPosition": [29.277, 1.371, 36.829],
        "finalRotation": [0, 159.681, 0],
        "unlockItemsIds": ["Key2"],
        "messageLocked": "You don't have the necessary object for this interaction. Keep looking!"
    },
    {
        "id": "Lamp",
        "initialPosition": [33.12423, 0.4831499, 32.82928],
        "finalIntroText": "You found an object! It doesn't seem to be what you're looking for..."
    }

```

```

    },
    {
      "id": "DoorTiago",
      "initialPosition": [34.682, 0.03500002, 40.263],
      "initialRotation": [0, 180, 0],
      "finalRotation": [0, 68.536, 0],
      "unlockItemsIds": ["Screwdriver"],
      "messageLocked": "You don't have the necessary object for this interaction. Keep looking!",
      "finalIntroText": "The room shakes violently and pieces of the ceiling of the time space begin to collapse to the floor. You see the environment change again, this time to a corporate office reality, super dull and quiet. The environment is unfamiliar to you and you don't know the space, but it sure looks like the offices you saw in your reality, polished and simple, full of decorative and work junk. However, as you see some of the temporal fabric tear and crumble on the floor, you know that you are not back in your own world yet...\nYou must be approaching the time machine!\nFind the missing object!\nMy god, what a nightmare, it feels like I'm back in my office..., I guess on the one hand it's a relief to know I'm not back to my reality yet..., But I know I don't want to be stuck here forever and ever... I'm almost there!\n"
    },
    {
      "id": "FuturisticComputer",
      "initialPosition": [37.33, 0.798, 35.444],
      "miniGame": {
        "id": "LabelGame",
        "path": "Rita/mini_jogo_4.json"
      }
    },
    {
      "id": "Jasmine",
      "initialPosition": [43.191, 0, 26.87],
      "initialRotation": [-90, 0, 91.717],
      "finalIntroText": "You found an object! It doesn't seem to be what you're looking for..."
    },
    {
      "id": "Stapler",
      "initialPosition": [43.119, 0.566, 37.307],
      "finalIntroText": "You found an object! It doesn't seem to be what you're looking for..."
    },
    {
      "id": "SnowGlobe",
      "initialPosition": [35.457, 0.564, 30.242],
      "finalIntroText": "You found an object! It doesn't seem to be what you're looking for..."
    },
    {
      "id": "Pillow",
      "initialPosition": [47.184, 1.01, 35.938],
      "initialRotation": [5.67, -8.185, 104.769],
      "finalIntroText": "You found an object! It doesn't seem to be what you're looking for..."
    },
    {

```

```

        "id": "Coat",
        "initialPosition": [40.591, 0.75, 28.9],
        "initialRotation": [0, 29.18, 0],
        "finalIntroText": "You found an object! It doesn't seem to be what you're looking for..."
    },
    {
        "id": "DoorTiago",
        "initialPosition": [49.075, 0.03500002, 34.292],
        "initialRotation": [0, -180, 0],
        "finalRotation": [0, 81.386, 0],
        "unlockItemsIds": ["FuturisticComputer"],
        "messageLocked": "You don't have the necessary object for this interaction. Keep looking!",
        "finalIntroText": "You did it!\nYou've found the objects to fix the timeline and leave everything as
it was!\n\nThe final challenge now is to fix the time machine...\n\nThe room you've passed into in this last stage
bears an immense resemblance to the first one you started in, but now there's a peculiarly large suitcase, full
of coloured buttons and dials, flashing in the centre of the room. The space also appears to have taken an
extremely strong jolt, like an earthquake, and through the cracks created by this destruction, you notice that
the temporal fabric is now attached by a thread and begins to disintegrate at a rapid rate. You approach the
suitcase in the centre of the room which you identify as your time machine, although you would hardly recognise
it due to its battered and worn state."
    },
    {
        "id": "TimeMachine",
        "initialPosition": [59.259, 1.717, 27.42],
        "initialRotation": [0, 0, 0],
        "finalPosition": [59.259, 4.402, 27.42],
        "finalRotation": [0, 2.642, 0],
        "winsGame": true,
        "messageLocked": "You don't have the necessary object for this interaction. Keep looking!",
        "finalIntroText": "Gather all the objects inside the time machine. You notice that the electronic
display of the device starts flashing intensely when everything is finally in place, and a message is
produced:\n\nIn case you haven't noticed, the name of the four mini games you made are Narrative, Aesthetics,
Mechanics, and Technology, which are precisely the four elements that make up a game.\n    - • Narrative the
sequence of events that unfolds in the game;\nAesthetics is how the game looks visually, how it sounds, smells,
tastes and feels;\nMechanics are the procedures and rules of the game;\nTechnology is the medium in which
aesthetics take place, mechanics occur, and narrative unfolds.\n\nThe skin of the game is the Experience, which
depends on these four elements. This is called Elemental Tetrad. \n\nNow with your curiosity quenched and all your
questions answered, adjust the settings to set the date and place of your true reality and origin. It's been
quite a journey, but you've managed to save the multiverse of realities by reaching your world again."
    }
],
    "congratulationsText": "You've done it! Congratulations!\n\n You managed to escape, fix the timeline
and leave everything as it was!",
    "timeEndedText": "Time's up, but you can still try to escape! If you want, restart and try to make it
on time!",
    "endAfterSurveyText": "Thanks! Your feedback means a lot! :)",
    "finalSurveyPath": "Rita/survey.json"
}

```

### 9.3 Appendix 3 – survey JSON file

```
{
  "questions":
  [
    {
      "questionText": "Jogariam um jogo com este feature?",
      "answers":
      [
        "sim",
        "não"
      ]
    },
    {
      "questionText": "Os elementos usados são adequados para um escape room?",
      "answers":
      [
        "sim",
        "não"
      ]
    },
    {
      "questionText": "Os elementos usados são adequados para um escape room?",
      "answers":
      [
        "sim",
        "não"
      ]
    },
    {
      "questionText": "A forma como a sala se molda parece te eficaz?",
      "answers":
      [
        "sim",
        "não"
      ]
    },
    {
      "questionText": "A forma como a sala se molda parece te eficaz?",
      "answers":
      [
        "sim",
        "não"
      ]
    },
    {
      "questionText": "Associas as diferentes paletas cromáticas a temas/ambientes diferentes?",
      "answers":
      [
```

```

        "sim",
        "não"
    ]
},
{
    "questionText": "Consideras este jogo acessível para indivíduos com fotossensibilidade ou daltonismo?",
    "answers":
    [
        "sim",
        "não"
    ]
},
{
    "questionText": "Sentes que aprendeste algo com este jogo?",
    "answers":
    [
        "sim",
        "não"
    ]
},
{
    "questionText": "Consideras este jogo intuitivo e fácil de utilizar?",
    "answers":
    [
        "sim",
        "não"
    ]
},
{
    "questionText": "Ao jogar, sentiste-te embebido na narrativa e no ambiente gerado?",
    "answers":
    [
        "sim",
        "não"
    ]
}
],
"openQuestions":
[
    "Sugestões?",
    "Que mais controladores a sala deve ter?"
]
}

```

## 9.4 Appentix 4 – mini game JSON file

```
{
  "finalIntroTextIfWin": "A mirror to discover everything around you. Your allies in finding this object
were your five senses...",
  "imagePath": "Rita/mini_jogo_2.png",
  "endGameSucceededFeedbackText": "Good job! You did it!",
  "endGameSucceededWithHelpFeedbackText": "You're getting there! Keep training and next time you won't need
help!",
  "endGameFailedFeedbackText": "Try again, don't give up! Train a bit and you'll succeed!",
  "hintButtonFeedback": "Elimina respostas erradas.\nPenalização: -1 ponto.",
  "exitButtonFeedback": "Sai do jogo.\nPenalização: -1 segundo.",
  "timeLimitInSeconds": 5,
  "pointsRemovedForAskingHint": 1,
  "penaltyTimeFail": 1,
  "penaltyTimeHelpNeeded": 1,
  "penaltyTimeExit": 1,
  "pointsAddedForCorrectAnswer": 10,
  "puzzleItems":
  [
    {
      "name": "AQUI"
    }
  ],
  "puzzleSlots":
  [
    {
      "correctItem": "AQUI",
      "position":{"x":0, "y":0}
    }
  ]
}
```

## 9.5 Appendix 5 – Feedback messages

// MESSAGES

\* messageLocked: if you don't have the necessary items to let the item interact

You don't have the necessary object for this interaction. Keep looking!

\* messageSucceeded: you have interacted with no mini-game involved or without help (receives item)

Good job! You did it!

\* messageSucceededWithHelp: mini-game involved + asked for help or made a mistake until you got the right answer (receives item + penalty\_requested\_help in time)

You're getting there! Keep training and next time you won't need help!

\* messageExited: gave up (no item + penalty\_exit in time)

Try again, don't give up! Train a bit and you'll make it!

## 9.6 Appendix 6 – Form of Case Study 1

### Educational Escape Room Form\_26May22

This form will be only use for research purposes.

Please, don't forget save the keys! :)

Key: 0

Thank you in advance for your participation.

**\*Obrigatório**

1. The GDPR gives users greater control over their data by organizations. It is confirmed that this questionnaire will only be used for research purposes within the scope of the Digital Media Doctoral Program, accepting the sharing of your data and contact via email by the responsible coordination. \*

*Marcar apenas uma oval.*

- ☐ I authorize the use of my data for the purposes mentioned above.  
☐ I do not authorize the use of my data for the purposes mentioned above.

Considering the narrative, level design and adaptability

28. Do you associate the different chromatic palettes with different themes/environments? \*

*Marcar apenas uma oval.*

	1	2	3	4	5	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very much

29. Do you consider this game accessible for individuals with photosensitivity or color blindness? \*

*Marcar apenas uma oval.*

	1	2	3	4	5	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very much

Considering the EERs

30. Do you feel you have learned something from EdScape (Genial.ly)? \*

*Marcar apenas uma oval.*

	1	2	3	4	5	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very much

31. Do you feel you have learned something from EdScape (Unity)? \*

*Marcar apenas uma oval.*

	1	2	3	4	5	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very much

32. What was the EdScape version that you learned more from? \*

*Marcar apenas uma oval.*

- ☐ Genial.ly  
☐ Unity

33. Do you find EdScape (Genial.ly) intuitive and easy to use? \*

*Marcar apenas uma oval.*

	1	2	3	4	5	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very much

34. Do you find EdScape (Unity) intuitive and easy to use? \*

*Marcar apenas uma oval.*

	1	2	3	4	5	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very much

35. Which EdScape version was the most intuitive? \*

*Marcar apenas uma oval.*

- ☐ Genial.ly  
☐ Unity

36. When playing, did you feel immersed in the narrative and in the EdScape (Genial.ly) environment? \*

*Marcar apenas uma oval.*

	1	2	3	4	5	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very much

37. When playing, did you feel immersed in the narrative and in the EdScape (Unity) environment? \*

*Marcar apenas uma oval.*

	1	2	3	4	5	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very much

38. What was the EdScape version where you had the feeling of being more immersed in the narrative and the environment? \*

*Marcar apenas uma oval.*

- ☐ Genial.ly  
☐ Unity

39. Overall, after our presentation, do you think that an EER has any educational value? \*

*Marcar apenas uma oval.*

- ☐ Yes *Avançar para a pergunta 40*  
☐ No *Avançar para a pergunta 44*

## 9.7 Appendix 7 - Form of Case Study 2

### EdScape

Questionário sobre o protótipo do jogo EdScape.

*\*Obrigatório*

#### RGPD

O RGPD dá aos utilizadores um maior controlo sobre os seus dados por parte das organizações. Este questionário só será utilizado para investigação no âmbito do Mestrado em Multimédia, aceitando a partilha dos seus dados e o contacto via e-mail pela coordenação responsável. Ao submeter este questionário aceita os termos referidos.

1. Consideras este jogo intuitivo e fácil de utilizar? \*

Marcar apenas uma oval.

☐ Sim

☐ Não

2. Associas as diferentes paletas cromáticas a temas/ambientes diferentes? \*

Marcar apenas uma oval.

☐ Sim

☐ Não

3. Consideras este jogo acessível para indivíduos com fotossensibilidade ou daltonismo? \*

Marcar apenas uma oval.

☐ Sim

☐ Não

4. Ao jogar, sentiste-te embebido na narrativa e no ambiente gerado? \*

Marcar apenas uma oval.

☐ Sim

☐ Não

5. Sentes que aprendeste algo com este jogo?

Marcar apenas uma oval.

☐ Sim

☐ Não

6. Tens alguma sugestão?

---

---

---

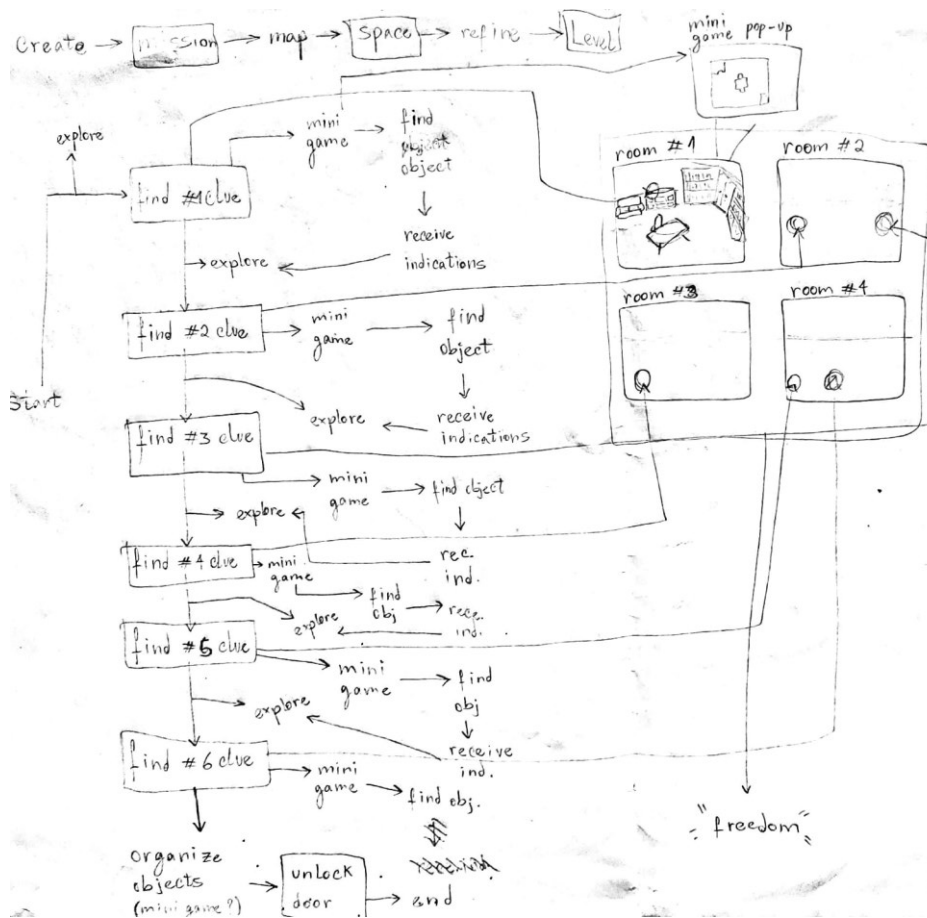
---

---

## 9.8 Appendix 8 – Initial narrative draft



## 9.9 Appendix 9 – Initial drafts of Mission and Space



### IDEAS:

- master key?
- inside/outside
- receive more objects

Some  
lake

- if failed mini game

