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Escola Politècnica Superior d'Enginyeria  
de Vilanova i la Geltrú



# EPS - PROJECT

## TITLE

Interactive activities for families and kids

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# 1. Abstract

Museums are generally considered to be essential for our current society and to play a very important role in today's world. They are a great source of knowledge, since they preserve our heritage and educate their visitors. In addition, museums tend to create a sense of community and unite people with the same interests. For these reasons, such an important museum as the Railway Museum of Catalonia is believed to add a lot of value to the community and always wants to offer a great service offering innovative activities.

This report details the project "Interactive Activities for the Railway Museum of Catalonia" developed in 2021 by five international students of the EPS. This project was elaborated at the EPSEVG (Escola Politècnica Superior d'Enginyeria de Vilanova i la Geltrú) located in Vilanova i la Geltrú.

The Railway Museum of Catalonia wanted to create a set of interactive activities for families, so children could discover the museum and learn important concepts related to trains in an entertaining way. This, added to the fact that the museum was being renovated, and that other museums also offer "games" for children and families, made them decide to contact the UPC to organize this project with the goal of creating an entertaining set of activities for boys and girls.

First of all, extensive research was done. Many museums offer activities, so it is important to know what exactly they offer, and if their activities are effective to educate and entertain or not. Moreover, research about the psychology related to children and interactive activities was essential to understand how to attract children and catch their attention to educate them in an effective manner while they are entertained.

The following step was to think about the activities that could fit the museum in Vilanova i la Geltrú. Taking into account the results obtained in the research, different possibilities were thought. Since we had several options, we evaluated them considering the advantages and disadvantages of each of them, and we came up with a final idea.

Thirdly, the activity was entirely developed. We created a set of activities implemented on a booklet, and we created a little reward for children that participate in the game. In addition, we developed an online game. This online game has two functions: firstly, it offers a free activity to users that visit the Railway Museum webpage, so people that cannot come to the museum due to different reasons can enjoy it, and secondly, it serves as an appetizer, if someone plays and likes it, there is a greater probability that this person will come to the museum to enjoy the on-site activities.

While we developed the face-to-face activity, we realized that people that wanted to complete the activities would need some materials to be able to play. These materials are not free. So, a budget was prepared, and together with our company supervisor, it was decided to look for a sponsor to fund the activities, so the museum could offer them for free.

In addition, a test was done. A group of children was taken to the museum and they were asked to complete the activities. When they finished the game, they were asked some questions. Thanks to the results, we were able to incorporate their feedback. Taking into account the feedback received from the families that participated in the test, we adapted the questions that were either not clear enough or too difficult.

Lastly, we have added to the report a section of conclusions, where there is an explanation of the results obtained and how the activity is going to be completely implemented at the museum.



## 2. Introduction

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The present project report is the documentation of all the research and the process followed to complete the project “Interactive activities for families at the Railway Museum of Catalonia”. This project is a cooperation between the EPSEVG (Universitat Politècnica de Catalunya), represented by 5 students of the EPS (European Project Semester), and the local company Railway Museum of Catalonia.

### 2.1 About the company “Railway museum of Catalonia”

[1]

The Railway museum of Catalonia, which is located in Vilanova i la Geltrú, is an internationally recognized institution in the train world. They offer one of the best exhibitions of historical trains in Europe, and they receive thousands of visitors per year. For this reason, they always want to be innovative with the provision of new features and activities to their visitors.

Opened in 1972, the Railway Museum of Catalonia established itself in Vilanova i la Geltrú, where the old deposit of locomotives was located, but it was not until 1999 that it was registered in the “Registro de Museos de la Generalitat de Cataluña” as an official museum. Since this major event, the museum has been under constant growth. Thanks to the economic support of the government and the great number of collaborations with companies related to trains, the museum has obtained an extensive selection of historical elements that attract people from all around Europe. In addition, their collaborative facet permits them to develop many projects that benefit the society, for instance, all the projects developed in collaboration with the EPSEVG. During the last 20 years the museum has acquired a well-deserved reputation as one of the most important museums of Europe related to trains.

The aim of the institution is to preserve the legacy of the trains used in Spain and to educate and inform its visitors of the importance of this transport throughout the history. Moreover, this institution is focused on transmitting the most important concepts of old, current and future trains.

### 2.2 Problem Statement and Brief

Recently renovated, the Railway Museum wants to improve their offer of activities for families. The intention is to attract more families. Other museums, related or not to trains, offer a wide variety of activities for different age ranges, and the museum of Vilanova wants to have a similar selection of exercises. They also would like to attract more children to the museum, and to educate them with an entertaining game. Many children that came to the museum got bored while visiting it because of the lack of interactive elements. In consequence, they did not retain important information about the museum. With the game, this problem should be solved, because children will be able to learn while they have fun.

Last year EPS group prepared an online escape room for children, so they could learn important concepts online. This year, we have to develop interactive and innovative activities for families for them when they come to the museum.

The problems stated above must be solved considering that the activities have to be accessible for differently-abled children and they must be adaptable to the COVID-19 situation.

### 2.3 Project Goal and Objectives

The objectives of this project are to create activities for families to interact with the museum in an entertaining way. The families will benefit because they will be able to explore the museum in an innovative way and they will learn without getting bored. In addition, the participants will collaborate together, and this will result in a stronger link between them.

The main objectives of the project are to:



Figure 1: Railway Museum of Catalonia Logo

\* Entertain families in the museum: It is essential that the activities have to be entertaining for the entire family. If visitors enjoy their day at the museum, the major objective will be accomplished.

\* Teach families and children important concepts about trains: Another important point is that families that come to the museum should retain the most important information. Children that come to the museum have to be aware of the benefits of the railway system, how it works and the “dangers” of it.

\* Encourage family bonding: A collaboration between the different family members will improve the relationship between them.

\* Make the museum more attractive to families: This project also aims to an increase of families that visit the museum. For this reason, we have prepared an “appetizer” of what families will find at the museum with an online game activity.

## 2.4 Group Introduction

The UPC and the museum have collaborated for many years, and they have established a symbiotic relationship. Both institutions benefit from these collaborations. For instance, last year’s team developed an online escape room for the museum, so children could play from home during the pandemic. This year’s challenge of creating a set of interactive activities for families, has been carried out by a group of 5 people:

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## 2.5 Structure of the Report

This report is structured in a logical sequence to ease the audience to understand everything that the project has involved.

The first point is this introduction, to clarify the main points of the project, give a little background of the Railway museum of Catalonia and present the group that has completed the project.

Next, there is a research related to the psychological factor. It is very important to understand the reason why interactive activities are beneficial for children to educate them. We also did a benchmark to compare the different activities that other museums offered. This helped us to know what worked for other museums.

The following point is an explanation of the process of the project. In this point we explain the different stages of the project and what we took into account when we decided the type of game that we wanted to create.

The next section is a clear and exhaustive explanation of the games that we created, the different elements that interact with children during the game, how we prepared the activities and how we attract people to the museum with an online game. This section also includes an analysis of the results of a test that we did. The feedback of the test helped us to perfect the games. Included in this section, the reader can also find a budget that summarizes the price of the different elements that the users will need for the game, and how we contacted several sponsors to fund the game.

The report continues with the conclusions of the entire project, what could be improved and how the museum implemented the activities.

# 3. Research

3

## 3.1 Psychological research

In this part we will deal with the part of the work related to psychology. We need to know what in the museums can attract children, and what in the trains can do so too from a psychological point of view. This is essential if we want to make children enjoy our activities. We also want to confirm that interactive activities are the most effective form of teaching children and the benefits that children extract from these activities. Understanding children's behaviour and their interests is very important to create a successful set of activities.

### 3.1.1 What is an interactive activity?

The first step of this research is to define what an interactive activity is. It is considered an interactive activity every kind of activity that involves an interaction between two elements or persons. In our case, the interaction between families and the museum so they learn. In interactive activities (that are intended to teach something) information is presented in a dynamic way and the user is able to interact with that information and can give feedback about it. [2]

Interactive activities have been studied for a long time and almost every research paper published [23], article and public information available agree in the final conclusion: Interactive activities help children to learn faster, more effectively and with enthusiasm. All the research done states that these activities are beneficial when comparing the advantages and the disadvantages. [3] [4] [5]

Taking this into account, we created a set of activities in which families can decide what they want to do, these activities require the interaction between families and the museum, and finally families are able to give feedback about them.

### 3.1.2 Learning information and soft skills

This type of activity enables the users to become involved with the knowledge. In our project, families are able to interact with the environment and the information given. It is generally agreed that thanks to the interaction,

users are more focused on what they are doing, and in consequence, they learn more. If users feel that they are challenged or they simply like the activities, they will perform better and will extract more benefits from the "game". These activities also provide to the developers the possibility to modify the content or the way that that content is presented depending on the feedback provided. If a specific explanation is not clear enough, can be changed to adapt to the user's behaviour. The combination of both these aspects result in a perfect relationship between users and "information presenters".

Interactive activities permit exercises to challenge the user's abilities. This type of education stimulates the learners and also makes them develop the popular "soft skills". These types of skills are skills that are not directly related to one specific topic, but are developed during an individual's years. These soft skills can not be learned by studying, but there are certain actions or behaviours that enhance the learning of them. Soft skills include characteristics such as teamwork, cooperation, communication or creativity. It is proven that activities that require interaction with elements or other people help to develop these skills greatly [6]. In our project, children will not develop all the existent soft skills, but they will need and use a lot of them. Some of these skills are: Communication abilities, teamwork, cooperation, organization, creativity, adaptability and initiative. With interactive activities children learn both consciously and unconsciously.

Activities that involve more than one member help to develop a stronger relationship between the participants. Several articles [24] state that group activities help members to develop the links between them and help learn social skills in general. The general research done, mainly focuses on activities and groups that interact for a long time and in which group members do not know much of other members, this is not our case. In our case, members interact for only 1 hour and they already know each other. However, we can extrapolate the research done to our case. If we do so, we can confirm that these activities help the members of the group to strengthen their relationship, even if this benefit is not as pronounced as the other ones.

### 3.1.3 Accessible for everyone

[7]

One essential factor that we have considered when developing the activities is accessibility. It is very important from a psychological point of view that all children are able to participate in the missions. All missions must be



designed to be accessible for everyone. We want everyone to be able to participate, and physical or mental conditions can not be an obstacle for children that may have difficulties. The research done, clearly states that activities should be designed in a way that everyone can participate in order to not affect children's state and to make sure that everyone can benefit from the activities.

The museum already offered a lot of facilities for disabled visitors. These eases include resources such as Braille explanations or easy access to all parts of the museum. The activities have been designed considering the limitations that some visitors may have. The missions are developed in easily accessible areas of the museum. We also considered the scale of colors used and the explanations are given in both audio and written format. One important fact is that these activities are entirely completed in family, so family members can help if any problem appears.

However, we have not had time to completely adapt our missions to everyone. One step that is missing is the adaptation of the booklet created to the Braille alphabet. This is one of the next steps that could be done by the museum to completely adapt the activities.

### 3.1.4 Additional research

In addition to the research done about children's education and response to interactive missions, we think that is very important to know what our main attraction transmits. After some research, we can see that generally, children that are in our age range (from 4 to 12 years old) are globally interested in trains because it is a complex mechanical device: it is a big machine, containing engines, transforming energy to produce moves and steam and some specific noises (choo-choo). This eases our task of teaching and gives us the opportunity to create something that children will really enjoy. Creating interest in trains for children will be much easier if children are already interested in trains or other railway elements.

Additionally important, is the fact that children change interests depending on their age. This is very important, because children will be attracted to trains from different points of view and the activities have to have different difficulties to satisfy the educational needs of everyone in our bracket. To enhance their exploratory behavior and their learning, some specific means can be used: one option is self-esteem. It is possible to easily use their self-esteem to make them enjoy activities by giving them a feeling to

achieve things. Another thing that the children adore is spending time playing with their parents. Children are also interested in artefacts, which could get them interested in fields such as history or technology long before they would learn about it at school. They also like learning by themselves and for themselves rather than for school, at their own pace. In order to get them more interested in the artefacts and exhibition, it is also important to make a link between the artefacts that come from the past, and the current issues. This would also allow the children to better understand our world.

### 3.1.5 Keeping their attention

However, despite all these reasons why the children could love some activities, they can still have other reasons to get bored. For instance, the interactions between the museum and the families, if maladroite, can be boring. To avoid that, the activities, their instructions, and in general the transmitted information need to be clear and attractive. For example, long and complex instructions can turn them away from the activities. It is also important to have simple and adapted visual representations. The use of explicit and colorful images completes the words and makes it more pleasant to read. The time spent for a specific interaction can also make the child bored if too long. Adding feedback, through the use of sounds for example, is making it more alive, and more pleasant to the children. [8]

Some examples of what museums can do, that could respond to these problems, are the following ones: providing materials for crafting; workshops that recreate activities related to the museum; providing things like lego bricks to help recreate scenes; giving them the tools to record their activities in order to tell stories. All these examples could make them relate with history by making them learn about the past, and also by giving them entertaining activities to do; using their attraction towards trains. They would also create interactions between the museum and the children, as well as inside the families. [9]

However, not all these examples are applicable to the railway museum, due to the specific type of exhibition or to the specifications, but also to the accessibility criteria that is paramount.

## 3.2 Museum research

3

We did some benchmarking to see what other museums are offering as interactive activities for children. It is very good for us to get some inspiration for our museum and to see what is working for them. This information is very valuable since we can see what children like and improve their weaknesses to offer an attractive activity.

We researched about many different museums on their official webpages and newspaper articles. To be able to have a wide perspective of the different activities offered, the research was not fully focused on museums related to trains. We researched about the most famous European museums, however, in this report there is only information related to museums that offer the most interesting “games” for families. The distance between most of these museums and Vilanova i la Geltrú and the Covid-19 restrictions limited our research, since we could not go to these places to experience these activities personally.

### 3.2.1 DB Museum Nürnberg, Germany

At first we had a look for railway museums and we analysed the DB Museum which is located in Nürnberg, Germany.

The core of the museum is an exhibition on the history of the railroad in Germany from its beginnings around 1800 to the present and with a view to the future on a total of 6,800 m<sup>2</sup>. Unlike in most railroad museums, the technical development here forms only one of several narrative threads as part of a close network of relationships. [10]

The DB Museum has created a large, interactive exhibition for children on around 1,000 square meters. A multitude of interactively presented objects, from original locomotives to advertising signs, fill this mesh with life. The following things are offered for children and families with kids:

You can find twelve stations where children can collect sheets on which they can draw, solve riddles and read exciting stories. At the end, the children bind all the slips together into a travel book and take it home with them.

The children pick up knowledge about steam, electric and diesel locomotives along the way - partly with full physical effort when shoveling coal, partly in virtual use on the driving simulator. At the end of the journey, all visitors, young and old, can experience a ride in a high-speed train in a repli-

ca ICE compartment.

Moreover, there is a song to sing along to, this is about Oli and Polly, the two cartoon characters from the Railway Museum and of course about train travel. [11]

**Conclusion:** Of this offer, we really like the fact that there is such a big scope of things to do. Children learn by doing things physically which is also very good because it is very challenging and kids can enjoy it while picking up knowledge about locomotives. Also the fact that there is a song for children to sing along is very nice because it is very funny for them and entertaining.

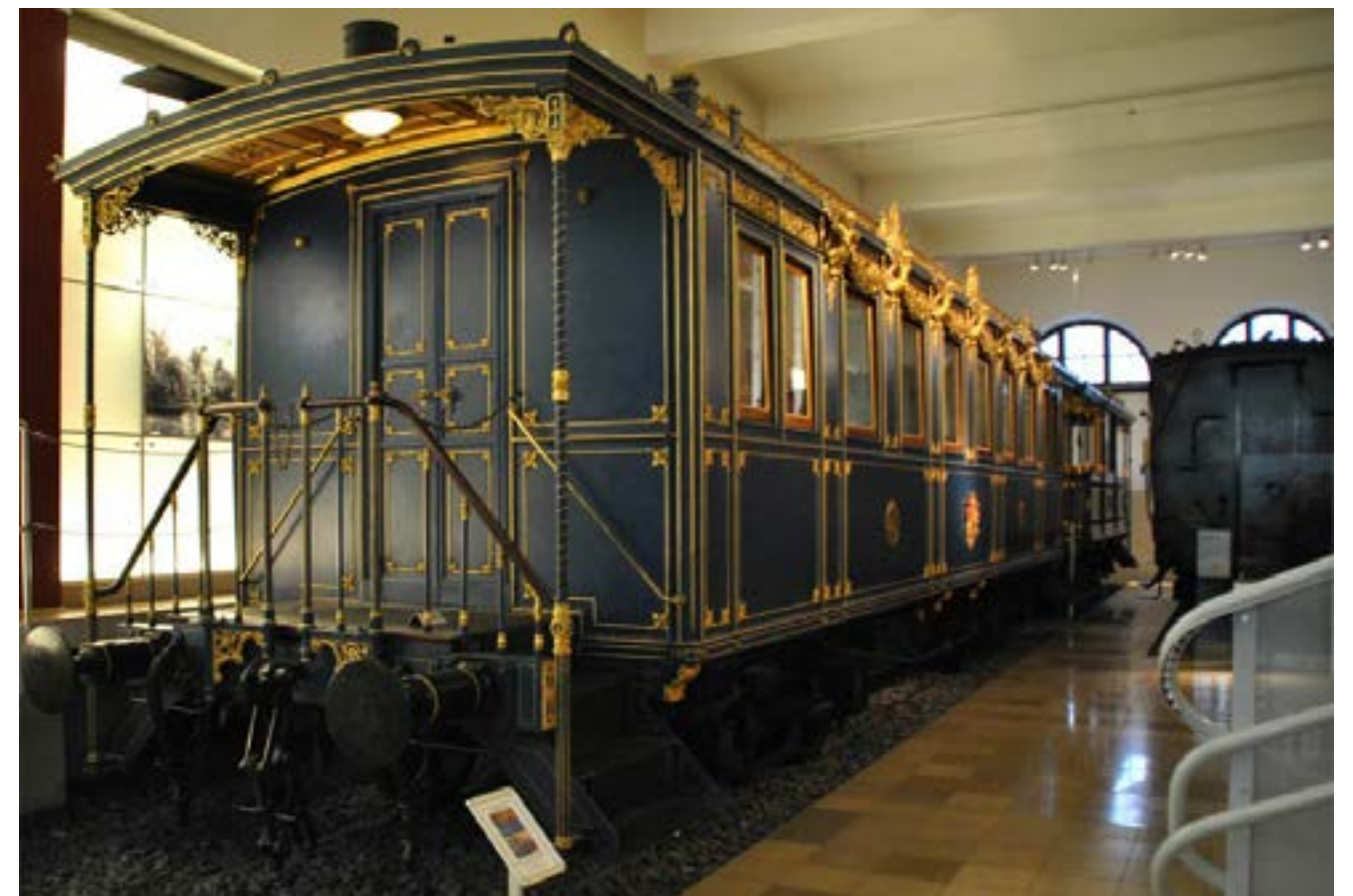


Figure 2: DB Museum Nürnberg, Germany

### 3.2.2 CosmoCaixa Barcelona, Spain

The second museum is the CosmoCaixa Museum in Barcelona, Spain. It is a science museum and features a variety of exhibitions, permanent and temporary, that showcase the environment, nature, science, and space. CosmoCaixa also has a planetarium and exhibitions devoted to interaction such as touch and play for small children. [12]

The following things are offered for children and families with kids:

Kids aged from 3: The Klik workshop offers the little ones the opportunity



to enjoy scientific discoveries through play and observation. Thanks to the work of a specialized CosmoCaixa educator and a companion, children between the ages of 3 and 6 will be able to experiment with endless objects in a space specially designed for them. Mirrors, magnifying glasses, water swirls and boats that do not sink, machines that allow us to lift three times our weight, utensils to make soap bubbles, mechanisms to make music or feel the force of the wind ... in the Klik workshop the little ones perform his first steps in the world of science.

Kids aged from 7: Creactivity CosmoCaixa is a space that has four different areas: mechanics, wind, electricity and light, so that children from 7 years old can practice the art of thinking with their hands while they design and experiment. Creactivity offers a new way of learning by working with very everyday materials that are easy to obtain with low- and high-tech tools. [13]

**Conclusion:** The CosmoCaixa Museum offers children a very informative and educative interactive activity. We like that they have different activities depending on the age range of the visitors, so children can extract the most benefit out of the museum. The activity for the kids from three to seven years old was created by a specialized CosmoCaixa educator and a companion which shows that they really want to ensure that the children learn a lot of things there.

As a negative aspect, there are no giveaways for the children and so there is the risk that the kids will forget about all they explored after their visit.



Figure 3: CosmoCaixa Barcelona, Spain

### 3.2.3 Deutsches Museum Munich, Germany

The German Museum of Masterpieces of Science and Technology (usually just called the Deutsches Museum) located in Munich, Germany is the third Museum we researched about. It is the largest science and technology museum in the world by exhibition space. Around 28,000 objects from about 50 fields of science and technology are exhibited in the museum, which is visited by about 1.5 million people every year. [14]

The following things are offered for children and families with kids:

Book with Puzzles in it, where you can find the answer in the Museum by exploring and researching in the museum. There are also detailed illustrations, amazing facts, humorous interviews, experiments, and a large poster playfully taking readers into the topic.

The experimental workshop offers programs for museum visitors, school classes and groups. The topics and experiments change and are continuously expanded. Thermal imaging camera, 3D printer, laser, fiber optics and much more are explored interactively here. [15]

**Conclusion:** For sure, this activity was made on purpose by some highly educated science and technology experts to show that to the kids. Unfortunately they seemed to forget about the fun factor. Kids need to enjoy their experience. At least they tried a bit but as long as there is no challenge, no cartoon character to identify with or not even a song to sing along it will get boring for the kids very fast.



Figure 4: Deutsches Museum Munich, Germany



### 3.2.4 The Tate Modern Museum in London, England

The Tate Gallery of Modern Art in London, England is one of the world's largest museums of modern and contemporary art. It is located in a converted power station on the banks of the Thames in the borough of Southwark. It is a considerably different kind of museum compared to the others, but we decided to mention it in this report because even the interactive activity for children is in an interesting way adaptable for us.

All activities of this museum are offered online. [16]

The following things are offered for children and families with kids:

Lots of online tutorials on crafts, drawing, games and quizzes about Tate Paint and street art, discovery stories about artists, videos about styles in art history, and a gallery of pictures drawn by kids and sent to the museum.

**Conclusion:** Sure we can't compare a railway museum with an art museum but still in times of Covid-19 we like that they have such a big offer of activities online. For us it would not be an option to do it like this but it gave us an inspiration to also offer something on our museums website which makes them curious about our museum.



Figure 5: The Tate Modern Museum in London, England

### 3.2.5 Railway Museum Madrid, Spain

The most similar museum that we have found is the Railway Museum of Madrid. This museum is located at the Delicias station in Madrid and is over 140 years old. It is an international reference for other museums related to trains with more than 100.000 visitors every year. As the Railway museum of Catalonia, this museum also is included in the Railway Spanish foundation, so both of them are strongly related. [17]

This museum offers a wide variety of activities for all kinds of visitors, but we mainly focus on an activity for families named Marco Topo.

This activity has the same objective as the project we have developed, entertain children with an interactive set of missions that have to be completed while families discover the museum. Families use their smartphones to enter a web page that has all the activities available and receive a physical map with stickers. A little story is used to involve children in the game and missions have a specific order.

Basically, children go to a specific part of the museum, complete a little mission and then they have to answer some questions on the phone, if they answer correctly they are given one point, and when they have completed all the activities, the game ends. When they complete one activity they also receive a sticker. The stickers are glued on the map, and children end up with a map full of stickers. This activity is the most similar to our project that we have found. [18]

However, even if this sounds very similar to our approach to the project there are major differences. The first difference is that Marco topo is focused on children from 6 to 12 years old, while we have a wider range, from



Figure 6: Railway Museum Madrid, Spain

4 to 13 years old. Another difference is that we consider that the smart-phone is not essential for families, so we do not make families use their tech devices as much as Marco Topo does. The last difference is that Marco Topo has a price of 1,25€, and our “game” is free.

**Conclusion:** We really like this concept of activity. The collaboration between family members and the interaction between children and the museum ease the educational experience. They also bring back home a giveaway, and this, from our point of view, is a big “plus”, because this element will help children to remember their day at the museum and the concepts learnt. However, there are two weak points of this activity. The first one is that a smartphone with internet connection is required. Secondly, even if the activity is only 1,25€, we think that all educational activities must be free, so we think that this is a big disadvantage.

3



Figure 7: Railway Museum Madrid, Spain



## 4. Project process

4

After the analysis and the research made related to children and other museums, we have to create our own activity from scratch, logically, taking into account all the knowledge learned in point number 3. We also used other museum's activities as inspiration, always considering the advantages and the disadvantages of their activities.

To be able to create a game from scratch, we firstly did a brainstorming to come up with several ideas. With the help of our company supervisor, many options were discarded due to lack of adaptability to the current situation or an excessive necessity of a smartphone.

These are the two concepts that we were left with:

### 4.1 Initial concept 1

The first idea we had was the "Build your own train" concept. The idea is that children build their own train in cardboard during their visit at the museum. When the families arrive at the museum, they receive a booklet with many missions to accomplish in different locations around the entire museum. The missions could be everywhere in the museum and on every subject about trains. The aim is to make families learn about trains but in an entertaining way. That is why we had the idea of a cardboard train they could build while completing the activity. After each accomplished mission, they would receive a piece of cardboard that is already pre-cut to form a carriage. They can personalise their carriages with colors, drawings, glitters... After several missions, they will be able to hook the wagons to each other and form their train. The more missions they accomplish, the longer their train is. At the end of the day, they will be able to bring their cardboard train at home to play with it or to decorate their room. That will act as a souvenir for them and maybe the beginning of their passion about trains.

Also, they can choose to stop the activity whenever they want because the missions are independent. They can come back to the museum to do the missions they did not accomplish the previous time. This solution avoids the problem of frustration when they have to stop in the middle of a game to go back home, for example. The only exception is the first mission : they have to do it first to build the cardboard locomotive and be able to start their train. This mission will be about rules in the museum because every-

body has to learn about it if they want to have a pleasant visit.

Another idea really similar to this one is to build 1 train/mission instead of 1 wagon/mission. In the museum, they have different train collections so the children could build a different train at each mission to reproduce the museum at home!

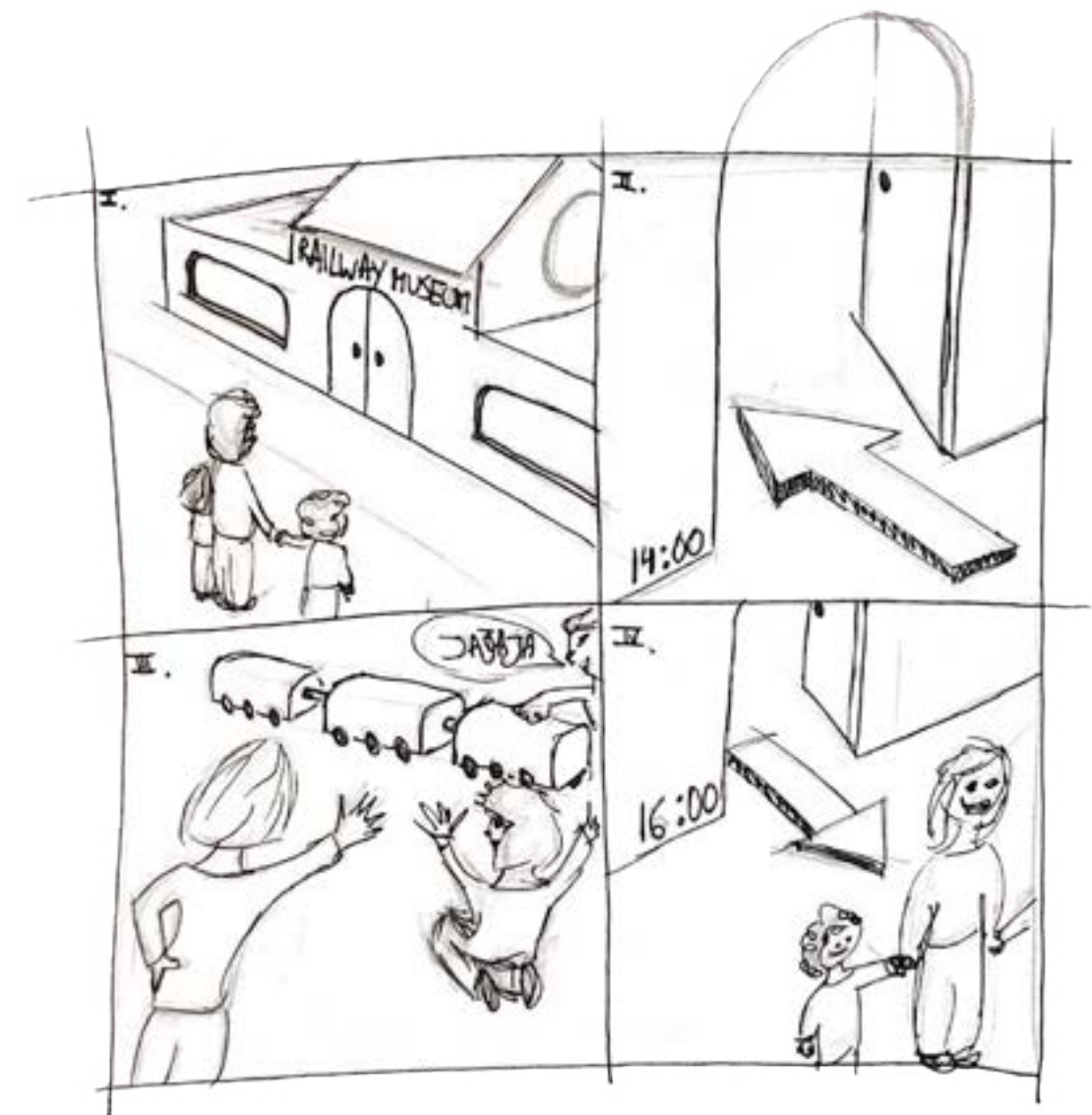


Figure 8: Sketch of museum visit

## 4.2 Initial concept 2

With this concept, we let the child be a mechanic or other character related to the trainworld. When the family enters the museum, the kid is given a suitcase with all the tools he needs for the game. He is told that he is the mechanist and before his train can leave, he has to fix a bunch of problems, which are the missions that will lead him through the museum. In his suitcase are a map of the museum and a lot of tools that can help him to accomplish the missions. The intention of this concept is to let the child feel like he is a part of the trainworld and in this way make an interactive experience for families with the museum.

In families with more children, each member of the family can be given a role like a traveler, a mechanic, the conductor and they all help to achieve the missions.

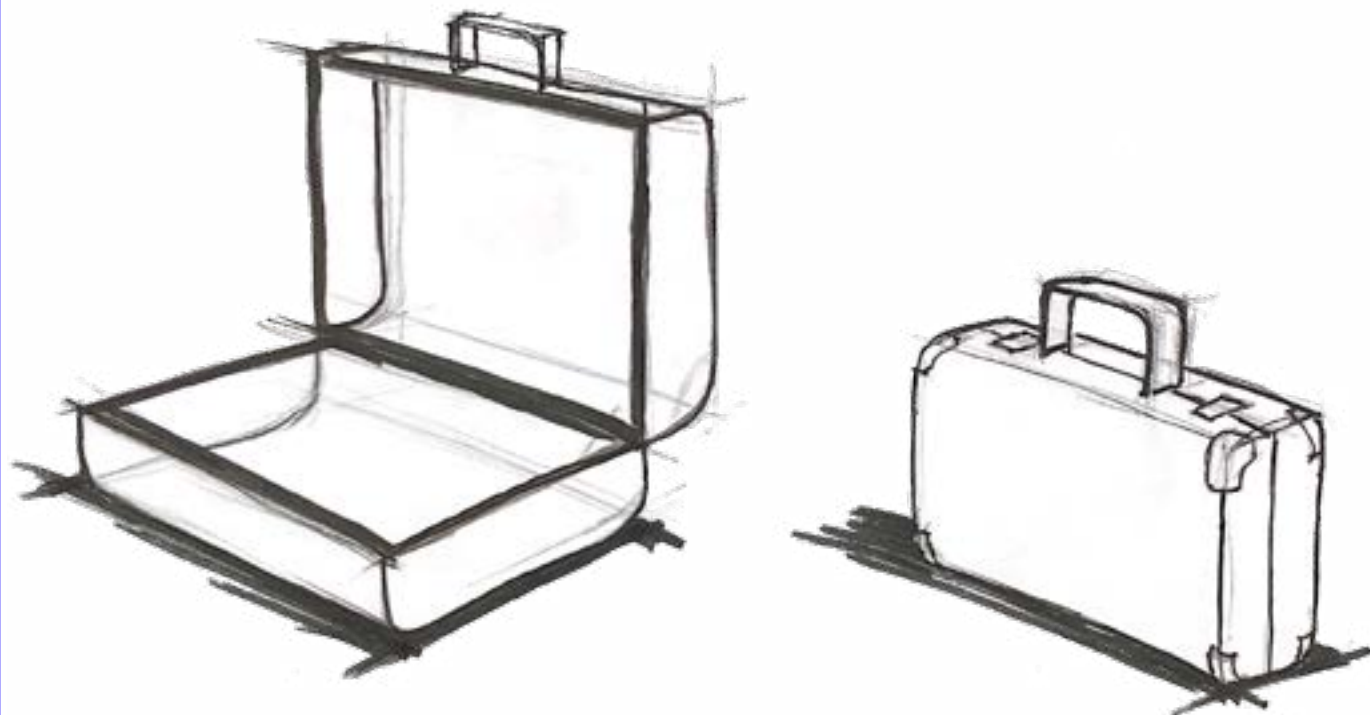


Figure 9: Sketch of suitcases

## 4.3 Comparing concepts

### 4.3.1 Comparison based on trade-off

We made a trade-off to compare our two concepts and decide with which one we will go on. First we decided the criteria and their weight on what we will evaluate the concepts. Entertaining and educative are the criteria with the most importance because they are our main goals. Concept 1 and 2 both have equal educative points, because they would have the same content. For entertaining, concept 1 and 2 score high, it's challenging for the children if their goal is to "repair a train", they feel like they're a part of the train family as for concept 1 it's entertaining because they'll build a train and be able to customize it afterwards. Therefore concept 2 scores a little better on interactive than concept 1.

In times of Covid-19 you have to think about adapting things to a Covid friendly alternative. Concept 1 is more covid friendly, because with concept 2 they use suitcases that will be passed on to new visitors. For this we can provide an online alternative. With concept 1 this is more possible. We can let the kids print the pattern at home, while solving the missions. With concept 2, only the book with missions can be put online and you lose the fact of being the mechanic that's running around to repair the train.

Both concepts are affordable, but concept 1 will be cheaper, because here we only need to print the patterns of the wagons. With concept 2 there's a one time investment of the suitcases.

At the end of the trade-off concept 1 comes out better with a score of 100 in comparison with 93 of concept 2. These points are calculated by multiplying the weight of a certain criteria with the corresponding score, do this for all the criteria and adding this up.

We decided to go on with this first idea that has better points. But we do not want to lose some ideas of the other concept, we can integrate the feeling that they have to repair or search something in the museum in the first idea.

### 4.3.2 Trade-off

	WEIGHT	CONCEPT 1	CONCEPT 2
ENTERTAINING	5	5	5
INTERACTIVE	4	4	5
EDUCATIVE	5	4	4
COVID FRIENDLY	2	3	2
ADAPTABLE ONLINE	3	3	2
AFFORDABLE	3	4	3
INNOVATIVE	3	4	3
		<b>100</b>	<b>93</b>

Table 1: Trade off



## 4.4 Risk management

With the aim of controlling the risks of our project, we also made a table listing all the identified risks. We indeed need to identify as many as possible, measure their probability and impact and prepare a response, in order to be prepared when any of them occurs and limit the impact on the conduct of the project. For each of these risks, we defined a potential cause and impact. In order to see which ones are the most important to fight, we gave them a subjective score for their probability of happening as well as for their impact on the project. The risk score is a multiplication of these two scores (between 1 and 10) for each risk. The higher it is, and the more important it is to have an effective response to the risk. The owner of the risks should also be identified, to know who has to deal with it. Each risk will also be classified in a category. Finally, a response able to counter each risk must be written to prevent these risks from happening or to minimize, if not erase, their impact.

### 4.4.1 List of risks

The first risk is that a member of the team catches the COVID-19. This finds its cause in the current pandemic, and would have for impact that this person would not be able to participate in the meetings. We assigned it a probability of 3 and an impact of 3; relatively low because the person would still have access to what happened in the meetings. The risk score is therefore 9, and the risk owners is the entire group. It is part of the general group organization category. The response is to adapt to these conditions through online work and workload sharing.

The second risk is that, due to the current crisis, companies would refuse to invest in the project, and therefore would not fund the projects as sponsors. Probability is 4, impact is high: 7. The risk score is 28. The owners are Maximilian and Matteo, who are in charge of finding sponsors. It belongs to the budget category. A way to respond is to be realistic as for our demands and to offer good promotion in exchange.

Another risk is that the final game is not adaptable to children which would not make the children like it, and therefore the museum would just not use the activities. The probability is 4, and the impact 9; which bears the risk score to 36. The owner is the whole group, and it is part of the experience category. Our response is to carry out a usability test at the museum, to anticipate and to adapt our activities to the feedback obtained.

The next risk on the list concerns the paper train: it could be too difficult to build, which means that some children could not be able to fold the train properly and then, the children will not have a souvenir from the museum. We gave it a probability of 5 and an impact of 5, and so a risk score of 25. The risk owner is the designer of the train, Sophie, and we put it in the experience category. To counter it, we can just make the paper train with a clear and simple way to fold, where the parents could help.

Fifth risk is also related to COVID-19. The pandemic could lead to new measure and visitors would not be allowed, and so people would not come and participate in the activities. Its probability is 8, and its impact 5 for a risk score of 40. The risk owner is the government, deciding the measures to take, and it is identified in the visitors category. The response we can give it is to adapt the activities online, and make the families want to wait for the reopening of the museum to come.

Second-to-last identified risk is in the implementation category. The museum may indeed change the positioning its elements inside and this would impact the implementation of our activities, and might even make them unadaptable. The probability is 6 and impact 5, for a risk score of 30. The owner is the museum, which chooses its own disposition. The response is to make flexible activities, able to adapt to new arrangements or to change easily to become adaptable.

The last risk of the list is very specific on the activities. As part of them, a map has to be designed and add a new risk: it may be confusing or unclear to the players, who would not be able to find places in the museum and therefore could not answer. The risk owner is Zinke, the designer of the map, and it is part of the experience category. Probability is 4 and impact is 8, therefore the risk score is at 32. To respond that, the map has to be designed in a child-friendly way.

### 4.4.2 Probability and impact scale

Now, we need to evaluate all these risks. The total risk score, which is the sum of all risk scores, is 200 on a maximum risk of 700. This maximum risk is the sum of all risk scores at their maximum: 7 times a risk of 10 probability times 10 impact. The probability & impact scale is therefore calculated to be at:  $200/700 \times 100 = 28,6\%$

This score is ranked as medium-high, very close to 30%. This means that we will have to take care and watch every risk, and have an effective response to every one of them.

# 5. Final concept

5

## 5.1 Museumgame

### 5.1.1 Missions

Thanks to our psychological research and benchmarking (part 3.1 and 3.2), we tried to create the best missions possible. We created 10 missions for our activity. Those missions have different difficulty levels to be accessible to as many children as possible. These difficulty levels are clarified by circles at the side of each mission. The amount of coloured circles indicates the difficulty level of the game. For each mission, children have to find the answers in the museum. The missions are very varied : they have to search, to ask, to solve some quiz and crossword puzzles, to recognize trains with a picture or a drawing, to fill sentences and train ID cards. We tried to diversify as much as possible to not bore the audience.

We also decided that they have to fill some information in the booklet so at home they can keep learning with it. For example, they have to fill in explanations about water tanks or ID cards of trains (name, date, country, energy used). That makes the activity even more interactive because they have to read the information in the museum, to write it down and they can read them again at home. Besides, we decided to do independent missions so they can choose what they want to do. They can skip a mission if it is too hard or too easy for them. In this way, the activity is really flexible.

What was really important for us was the accessibility of our activity. We created the missions while taking into account that it has to be accessible for everybody. First, the activity is accessible to disabled people because they don't have to use stairs to complete it. Indeed, the museum is already really accessible because everything is on the ground floor and mostly outside so there is space to move freely. Moreover, we wanted to make the booklet as easy as possible. The text is written in big letters so it is easy to read for most children. Also, the booklet has a lot of colors to make it more attractive but it is not necessary to see the colors perfectly, it is just for the visual design. Finally, we did the activity in English and Spanish and the museum is going to adapt it in Catalan so the activity will be accessible for a huge amount of people. All the explanations of the museum are provided in audio and

text format, so people can choose how to learn the details of the elements displayed at the museum.

### 5.1.2 Booklet

The booklet, filled with missions, is one of the main parts of this project. After creating all of the missions they needed a place to shine and be solved. The booklet has to be attractive so children want to play and to use it. As you know, this little booklet contains 10 missions each with its own difficulty. On the top of each page, you can see the difficulty of the mission from 1 to 3. It is symbolised by 3 dots that are filled with colors or not. The design is created with simplistic shapes and pop colors. Those colors give dynamism to our activity and the minimalist shapes help to don't busy the page too much. To also incorporate the train rails, we made circle rails and not only straight lines. They are integrated in a more subtle way. The idea of trains is here but in a minimalist approach. In the booklet we also added an introduction that explains our project with the link to the railway museum website. The whole booklet can be read in the appendix.

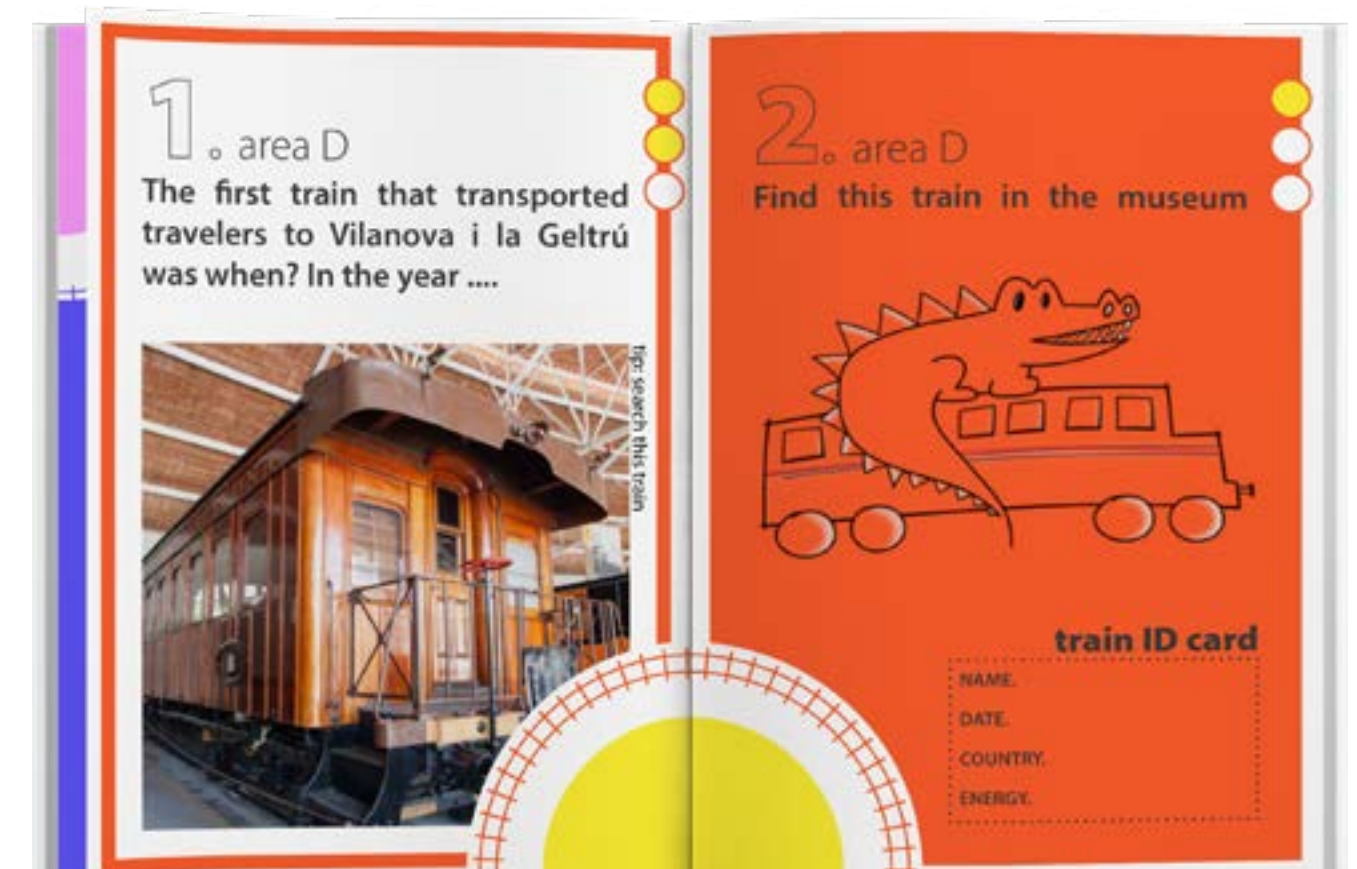


Figure 10: 2 pages of the booklet



### 5.1.3 Map

An important part of the booklet is the map. This will be used by the children and families during the whole visit of the museum. So it has to be clear, easy and intuitive. (see figure 10)

For the design of the map we wanted something very easy and still matching with the design of the booklet. The map is made up of basic shapes that represent the buildings and train lines in the museum. The colorcode is the same as the rest of the booklet and hereby also the report. Later we divided the map into zones or areas and gave them a letter as name. In the booklet each mission refers to the specific zone where the mission can be solved which can be a clue.

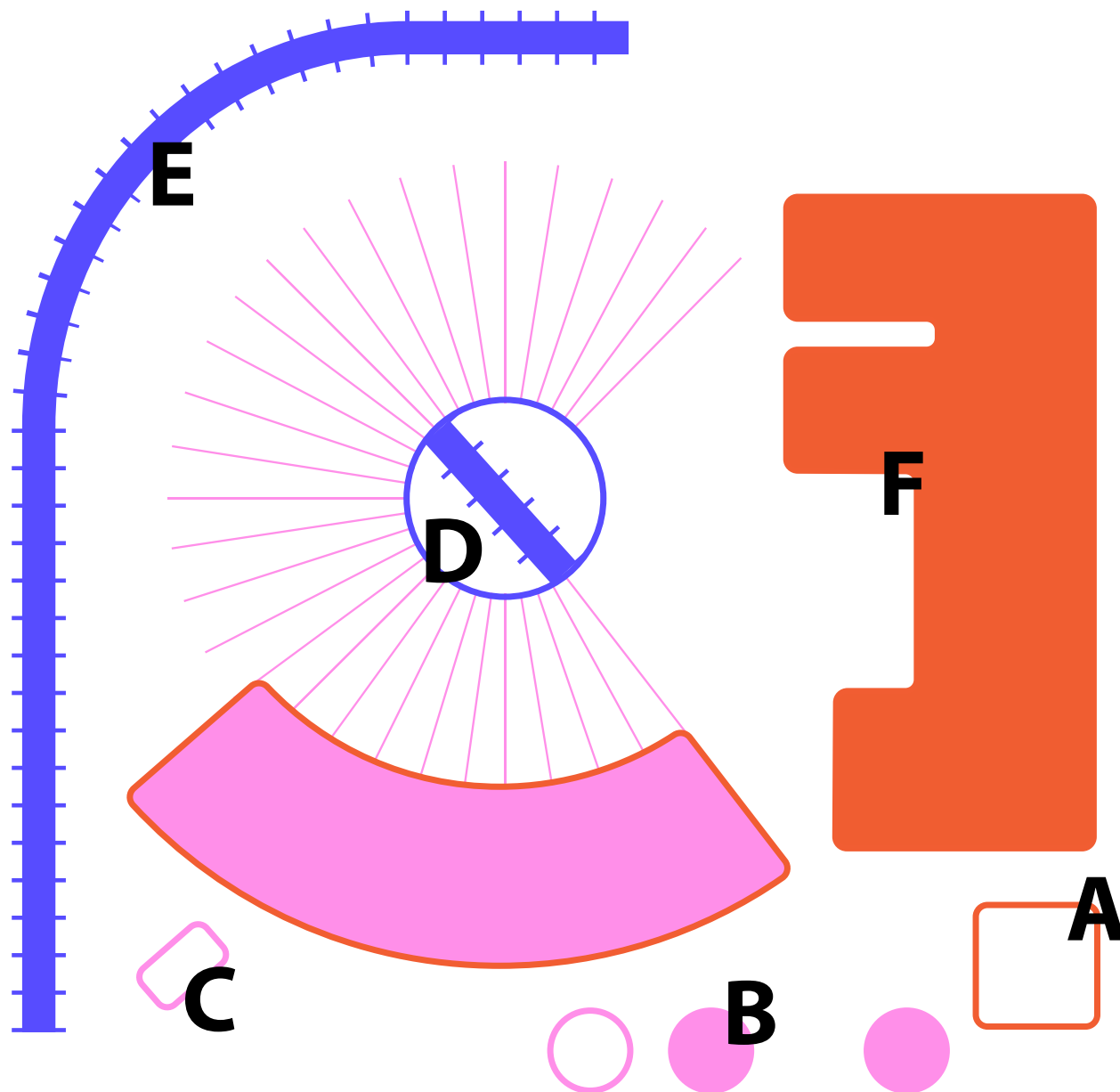


Figure 11: Map of the museum

### 5.1.4 Cardboard train

At the end of the activity, we want to give the kids a reward. After many ideas, we decided to give them a train made of cardboard that they can build themselves. The fact that they will build the train themselves makes kids more interested in their task. The train has to be easy to fold for children. We decided to create a locomotive and carriages that they can connect together to build their train. Also, the train could be decorated with painting, color pens or glitters at home. It is a memory they can keep in their bedroom and they will remember their visit at the Railway Museum of Catalonia for a long time.

Besides, we don't want to just give them a gift at the end, they have to deserve the cardboard train. For that, we created a plot that is explained at the beginning of the booklet: "a train has been stolen during the night and they have to accomplish the missions to help the museum find the stolen train". Then the cardboard train they receive at the end has been earned and not just won.

The train pattern has been designed on a packaging software called Pica-dor [19] where we can choose lines that will be folded or cut (figure 12). We can also visualise the final aspect of the train in 3D (figure 13 & 14). The cardboard pattern is cut and pre-folded with a laser cutter. We did some tests with the laser cutter at school (figure 14). These trials helped us to check if the train was easy to build and to check every little problem. Thanks to those tests, we modify the size of the wheels to be sure that the train can

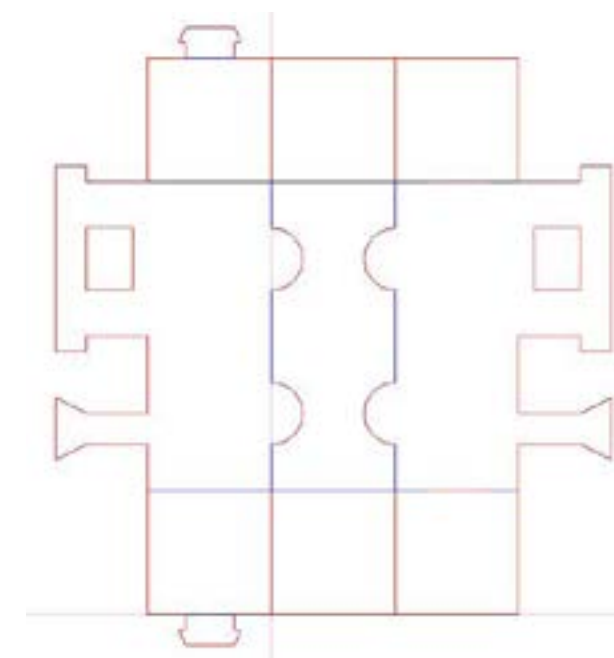


Figure 12: Pattern blue and red



Figure 13: Flat cardboard

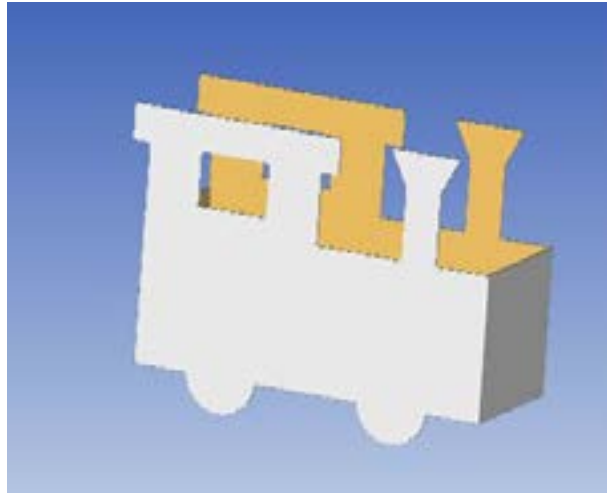


Figure 14: 3D train

stand on a table. We also decided that we are adding 2 holes on the bottom of the train and on the top of the carriage so we can connect them together with a string at home to create a real train (picture D). After those modifications, the cardboard train was ready.

We wanted to print the cardboard with a color train design before laser cutting it but we really liked the aspect

of the train after the tests. Indeed, the visual with natural cardboard color is really nice. It is also more eco-friendly to don't print a design on it. Finally, it is funnier to decorate an empty train at home than an already colored train.

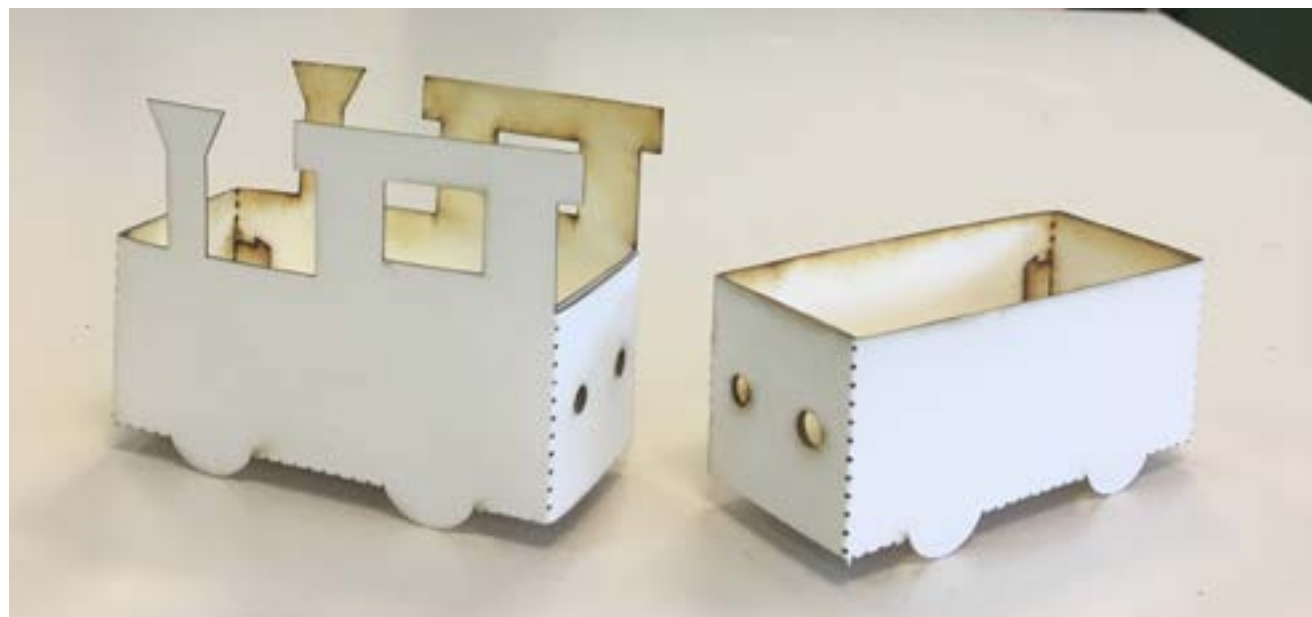


Figure 15: 3D train



Figure 16: Group when testing



Figure 17: Group when testing

### 5.1.5 Test

When the design of the booklet and the missions were ready, we wanted to test our activity. The aim of this test is to see if the missions we created are too hard or too easy for children and how long would it take to do all the missions in our booklet. On Sunday, the 23rd of May we tested our activity (the cardboard train was not ready yet). We invited three families at the museum to be the first to enjoy our activity. The group was composed of 4 children between 6 and 10 years old and 4 adults. The group played together as a team. They had to help each other to find the answers to all the missions. They were free to ask us questions during the activity if something was not clear enough. We gave them the booklet, some pencils and the map. They were ready to try our activity and the children were excited to begin.

After one hour, they finished the activity. Children and parents were really happy and they learnt a lot about trains. We noticed that the time was long enough because after the 9th mission, the kids were starting to be distracted. At the end, we asked some questions to children and parents and we collected their answers :

CHILDREN:

Did you like the activity? YES, a lot.

What was the best part? To go in a real old train.

Which mission was boring? None :)

PARENTS:

Was it long enough? It was the perfect time because the children were getting distracted at the end.

Would you pay to do the activity? No, it is better if it is part of the entrance price

What should be modified? You should add "casa de trenes" on the map, put the map inside the booklet and the mission with flags is hard to do if you don't have color pens.

Was the support good? Yes, a booklet on paper is perfect, we don't need a high-quality booklet and it is easier to write inside.

Would you like to keep the booklet at home? It is not necessary but we can find some information.

We took into consideration their comments to modify some parts of the booklet but on the whole, they really enjoyed the activity and we don't have a lot of things to change in the missions.

We were planning to do 15 missions but we are going to keep 10 missions because it was enough during the test.

We noticed that having one booklet for the entire family is really nice because they have to work all together and everybody is helping each other. If we give more booklets, they will be in competition instead of helping each other and it is not the aim of our activity. That means we can do some savings on the numbers of booklets and that is interesting for our budget part. They told us that a booklet printed on normal paper is actually enough because it is easy to write on it and they don't need a quality booklet. What matters for children is having fun with the missions, the quality of the booklet is secondary. This information is really important for the budget part, that means we don't have to focus too much on the quality of the printing. Also, it is more ecological to use recycled papers for example than a coated paper (more expensive and more polluting).

The test was a really useful and helpful experience for our project. It was an accomplishment to see families enjoying our activity.



### 5.1.6 Budget

The biggest disadvantage of the idea selected is that the elements included in the package that families would receive for the game, are not free. Our initial idea was to create a free set of activities, since one requirement of the museum was that the games must be available for everyone. After discussing the different possibilities, the team and our company supervisor decided that the best thing we could do is to try to find a company willing to fund, the entirety or a part, of each package given to a family at the museum. In exchange, we could place their logo in the different elements that families would receive. This would create a beneficial relationship for both sides.

The first step to be able to analyse the situation and to present the project to several companies, is to know the exact price of the different elements, so we know exactly the amount of money that we need. With a known price, we could also combine different funding sources. For an initial order, we decided that 50 packages were a nice amount, so the sponsoring company would not have to spend a big amount of money, and the museum could see if the activities are successful.

The list of elements that we initially wanted to include was:

- \*Booklet (50u)
- \*Cardboard suitcase (50u)
- \*Map of the museum (50u)
- \*3D Train (Locomotive + 3 wagons per pack) (50 Locomotives + 150 Wagons)
- \*Stickers of the company that funds everything (50u)

Initially, we wanted to find a company that could source all the elements together, to avoid ineffective transportation. Unfortunately, none of the companies we contacted could do so. Consequently, we had to split the package in two different orders.

On one hand we had the suitcase, while on the other hand we had the rest of the elements.

**SUITCASE:** The company “Caja de Cartón”, located in Tarragona offered us a price of 1,54€ per unit. This company is located very close to Vilanova (50km), so we could avoid transportation. In addition, the cardboard used is eco-friendly, with renewable materials and with an eco-certification. [20] For the booklet, the map, the 3D train and the stickers we contacted the supplier of the museum. The company is named Triunfo, and is located in

Hospitalet. The price offered was the following:

- Libro (24 paginas) en formato A5. Portada y contraportada en cartulina. Todas las páginas a color	50 unidades
Interiors estucat mate 150g o offset 120g -- portades 300g	
90C (1,80e/u)	
- Mapa medida A4 que se pueda doblar (no sabemos exactamente de que forma nos gustaría que se doblara)	50 unidades
Fulls estucat mate 150g o offset 120g	
40C (0,80e/u)	
- Pegatines (fondo transparente y con logo a color) 10cm x 10cm	50 unidades
impressio a color CMYK en Adhesiu transparent (no hi ha impressió Blanca)	
50C (1,00e/u)	
- Cartulina (A4) troquelada con forma de tren a color	200 unidades
impressio a color CMYK en cartolina blanca	80C (0,40e/u)
model trainwheels 50u	
troquel	120C
troquelatge	70C
model trainwheels 150u	
troquel	95C
troquelatge	70C

Figure 18: Screenshot of mail

We arranged the prices proposed in a document in which we could study the costs easily.

	Quantity	Price per unit	Total
Suitcase	50	1,54 €	77,00 €
Booklet (24 pages) A5	50	1,80 €	90,00 €
Map	50	0,80 €	40,00 €
Sticker	50	1,00 €	50,00 €
		5,14 €	257,00 €
3D train	Print 200 unities	80,00 €	
Locomotive (50u)	die	120,00 €	
	die cutting	70,00 €	
Wagons (150u)	die	95,00 €	
	die cutting	70,00 €	
		435,00 €	
		Price per package	13,84 €
		Total price for 50 packages	692,00 €

Table 2: Price study

The total price per package is 13,84€.

Once we had a total price, we started contacting companies that could sponsor the project. Our initial idea was to contact companies, and based on their willingness to collaborate we could adapt the elements of the package to the money given to us.

At the time of submitting this report, we have not heard back from any of the companies that we contacted, so the following paragraphs are hypotheses of what we could do depending on the amount of money that the museum receives.

Both the team and the company supervisor agree that 13,84€ per package is an expensive price, so probably we will have to reduce the elements included. The elements that we could easily suppress are the stickers and the map. The latter item is already included in the Booklet, so we could remove it without problems. On the other hand, we could also suppress the sticker, since we could also place the promotional logo only on the booklet.

If we still have to reduce costs, we would eliminate the suitcase and reduce the number of wagons in each package. The number of wagons could be reduced from 3 to 1 or 2 (depending on the economic situation).

The most important element, of course, is the Booklet, because without it, children could not do the activities. In addition, we think that a giveaway is important, so we think that a 3D train, with at least the locomotive and 1 carriage is very important to motivate children and to enable them to remember their day at the museum.



## 5.2 Online game

As the COVID-19 is striking us, we must adapt our activities online to make families enjoy them while being away from the museum. The purpose is to make them want to visit it and to participate in the actual activities at the museum. It can also be an extension of the activities at the museum for children who want to keep enjoying the museum while being away from it.

### 5.2.1 Choosing the online platform

In order to design our online activities, the first step is to find an online platform suitable for the type of activities we want to create. As this type of activity is not clearly defined yet, we will therefore evaluate every online platform we find in these investigations, and see which ones are the most usable for us while being able to design suitable games.

The results of these investigations gathered a lot of platforms that include cryengine, unity and stencyl, among others. The criteria we have defined in order to choose one platform over the others are their usability. Indeed, coding is not the specialty of anyone in the team, and we have therefore to find a platform that we can use. The complexity of the platform is also a criterion that is part of usability. The other criteria concern the type of activity that can be made in these platforms. For example, the activities should be simple enough, and there would not be any need for first-person games, as we want to make activities that are small, short games, not the adventure type. The evaluation of these platforms is summed up in the following table:

Platform	Complexity	Type of games
Cryengine ( <a href="https://www.cryengine.com/">https://www.cryengine.com/</a> )	No need for coding skills but quite complex	First-person games and VR
Unity ( <a href="https://unity.com/es">https://unity.com/es</a> )	No need for coding skills but very complex	3D, 2D, VR or AR games, real time games
Stencyl ( <a href="http://www.stencyl.com/">http://www.stencyl.com/</a> )	No need for coding skills but quite complex	Simple childish games
PyGame ( <a href="https://www.pygame.org/news">https://www.pygame.org/news</a> )	Coding in python language	Simple games
Flowlab ( <a href="https://flowlab.io/">https://flowlab.io/</a> )	No need for coding skills, logic building, quite simple	Simple games
Construct 3 ( <a href="https://www.construct.net/en">https://www.construct.net/en</a> )	No need for coding skills but quite complex	Interactive games
Genially ( <a href="https://www.genial.ly/es">https://www.genial.ly/es</a> )	No need for coding skills, diaporama building, overall easy	Simple and interactive mini games, quizzes

Table 3: Online platforms

The platform that we have finally chosen is genially, already used in a previous project. The reasons are that it is amazingly easy to use for non-experts, and that it is very suitable for mini games such as quizzes.

### 5.2.2 Making the activities

The next step is to look for ideas of online activities. The reason why we chose genially, its capabilities, drove us to think of quizzes as well as mini games. These can be easy, short, and educational.

With that aim, we gathered ideas of activities on that platform: [21]

- \* Quizzes on the audioguides available on the museum's website, to learn about the audioguides' information.
- \* Questions of knowledge, while progressively giving clues. The information necessitated would also be available in the audioguides.
- \* Board games: a race of trains (used by several players), using dice. Specific events can be used, such as machinery events, to slower or accelerate the trains.
- \* Games where a list of train features is displayed, and the player has to guess what train's, between two, the feature is. This would make them learn about the different trains in the museum.
- \* Chronological order: with a list of events, such as inventions, the player has to locate them in a timeline.
- \* Memory card game: pairs of cards of the different trains in the museum.
- \* A game where the player has to find what object is not at its place. For example, a person on a level crossing; this would make them understand better what the use of an object is, and in the example cited, what is dangerous.
- \* A sequence where the player has to place different parts of a process to recreate its functionment. It could also be the evolution of a typical train, with the successive inventions.
- \* Word search: a simple word game that makes you learn the vocabulary of the museum.

### QUIZ

After trying a few different templates we found the "Image QUIZ" template. It seemed very easy to adapt for our purpose and the learning effect for kids is given. In this template there is a question and two images with an answer on it. When the user clicks on the right answer he or she will turn to the next question and when the wrong answer is selected, the user will

have to choose an answer again. The good points at this template are that it is very simple and therefore also suitable for little children, there are pictures in it which we made at the museum to make it more visible for them so they really want to come to the museum in real, they can learn much stuff about the museum in a challenging way that makes them more interested.

Now we chose the best template for our work and the next step is to find the content for the questions. At the beginning we were looking on the website of the museum and in other articles of the museum on the internet and we found very interesting content about the museum's history and exhibition, as well as about the history of railways in catalunya in general. There is so much information on the internet, but after some moments of thinking we realized that small kids are not able to research the whole internet about the answer of the question even if it would be very challenging and bring a huge learning effect. We remembered the museum's audio guide that we listened to at the beginning of the EPS to get some information about the museum before we visited it the first time and we thought it would be perfect to make a quiz about this guide. Reasons for that are:

- \* the audio guide tells about the different objects in the museum so we can make questions about these and it provides the best content
- \* it makes the people very curious about the museum
- \* they don't have to do intensive research in the internet to find the solution and the audio guide website is very to use even for small kids in the quiz I can make a link which leads directly to the right part of the audio guide
- i\* f they have a question to answer they will listen much more attentive to the guide than without
- \* the audio guide already exists in catalan, french, spanish and english so we can easily adapt the quiz in this languages also to reach as many people as possible

### MINI GAMES

Aside from the quizzes, it is necessary to add some fun mini games. While evaluating the listed ideas, the first activities chosen were Chronological order and Correct group.

The first one can be used to teach about both the history of trains and of the museum, by teaching the kids to be able to place the main events in

a timeline. The events chosen are the innovations, like the inventions of the different types of trains (coal-powered, diesel, electric) and the events that concern the museum, such as the construction of the swing bridge. The exact aim in the game is to take the images corresponding to these events, and to place them correctly in a timeline where the exact dates are already placed. The purpose of this is to make the kid understand the order of events, and to teach him these dates in a fun way, that he would not necessarily remember if he only had to read it.

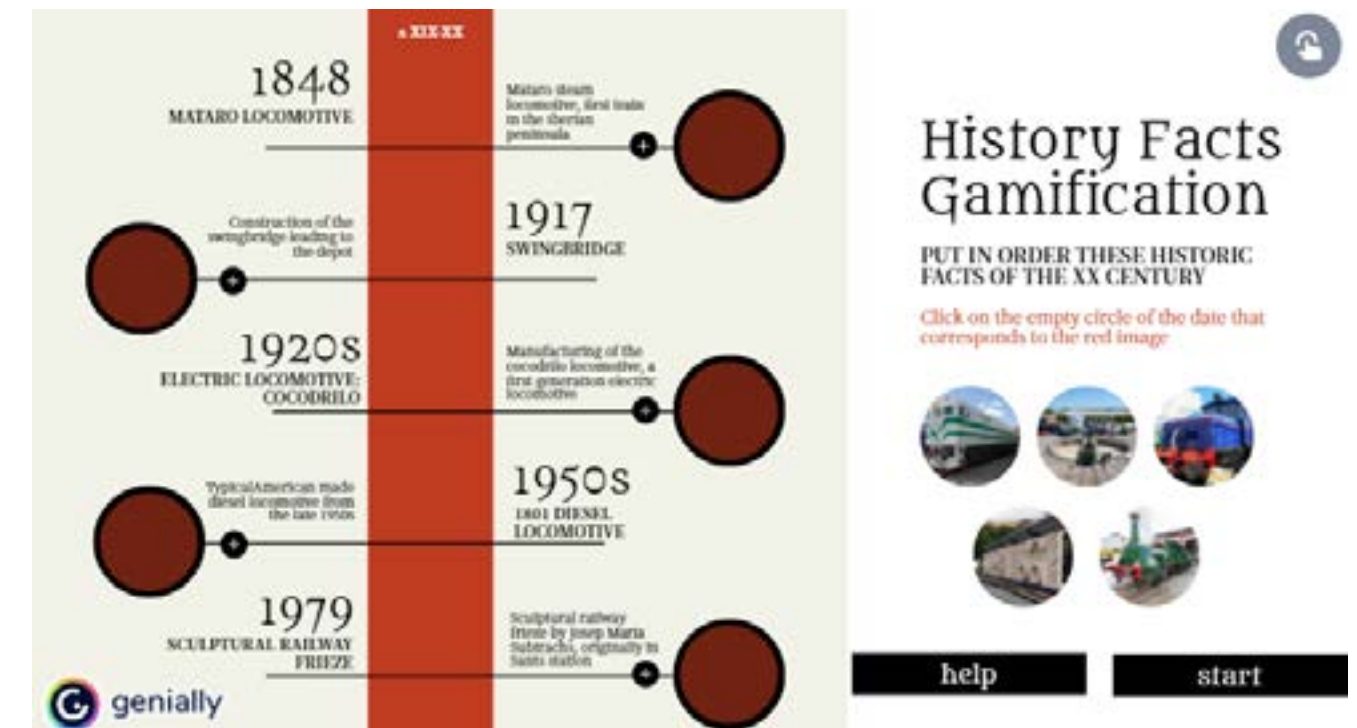


Figure 19: Screenshot of online game

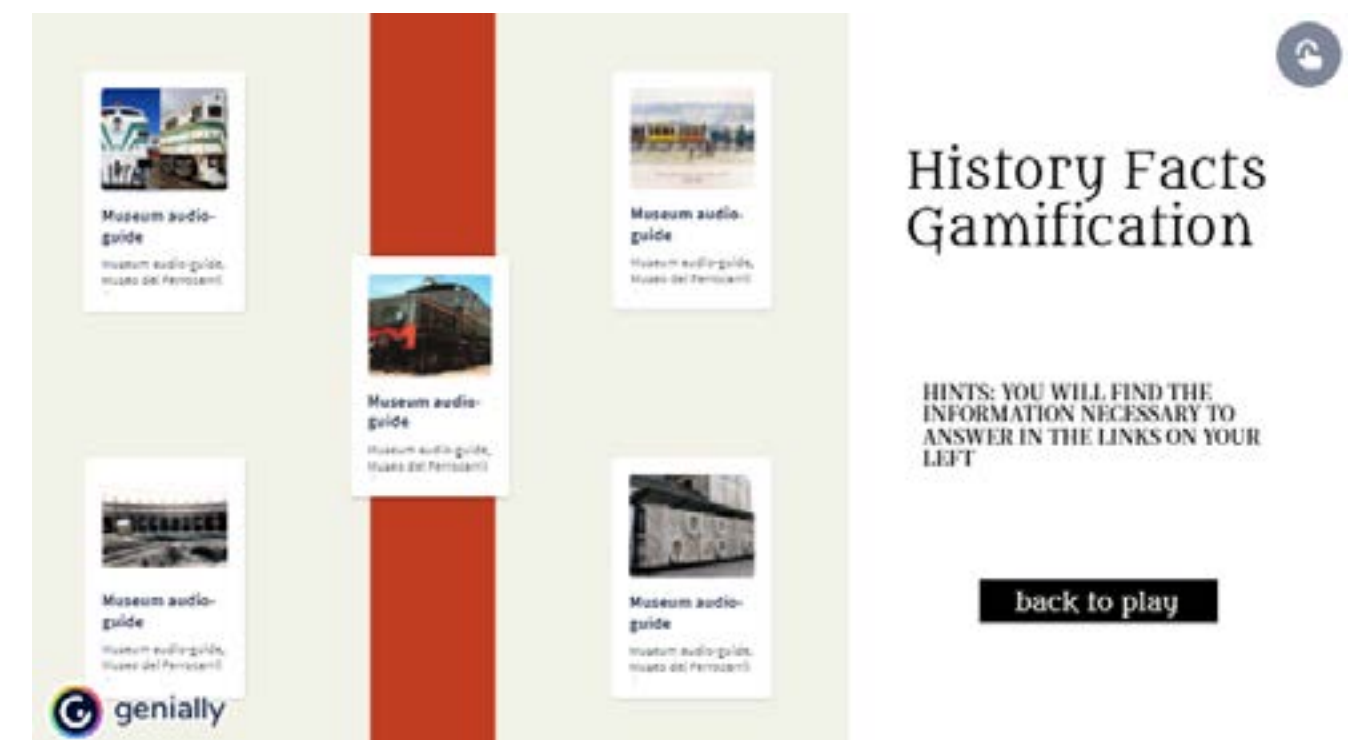


Figure 20: How the audio guides are made part of the game



The principle of the second one is to give back to each train its characteristics: two different trains are displayed, along with a list of characteristics; the player has to choose which train each of them belongs to. This would allow the children to learn information about several trains of the collection in an entertaining way. This teaches about the different types of trains, their associated period, ... and about the trains themselves.

5

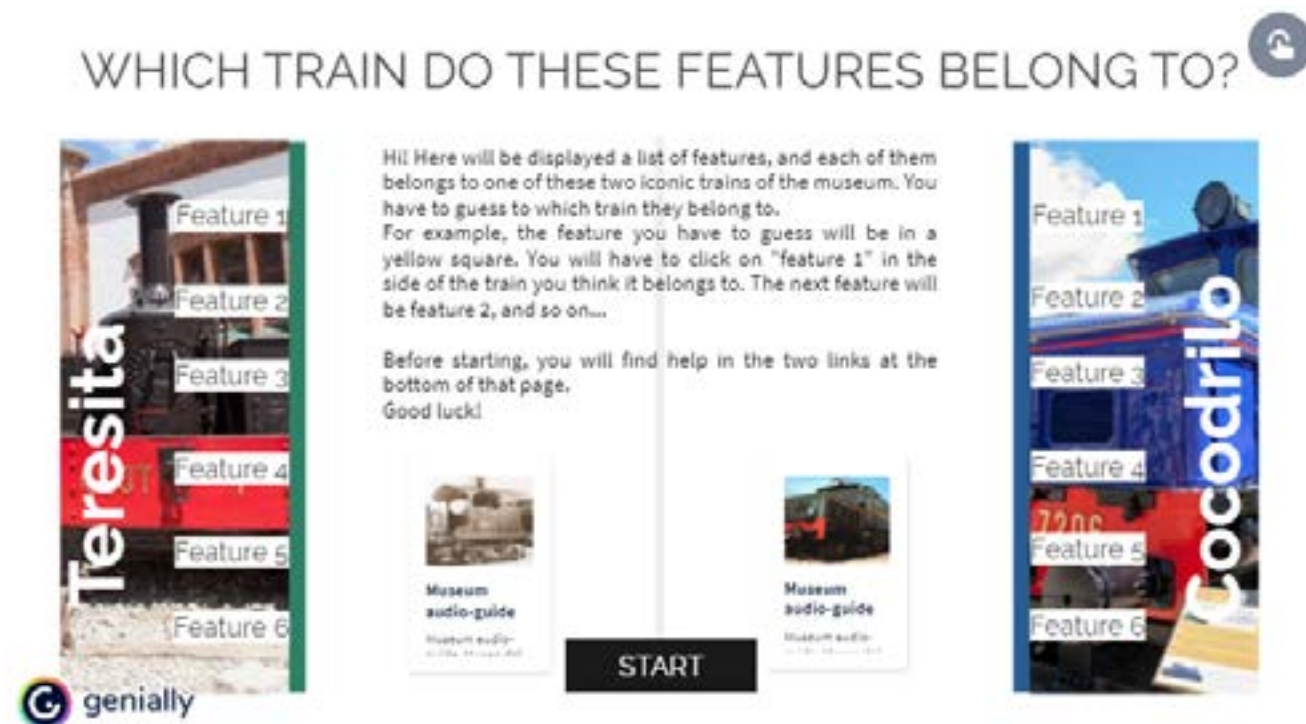


Figure 21: Presentation of the second game

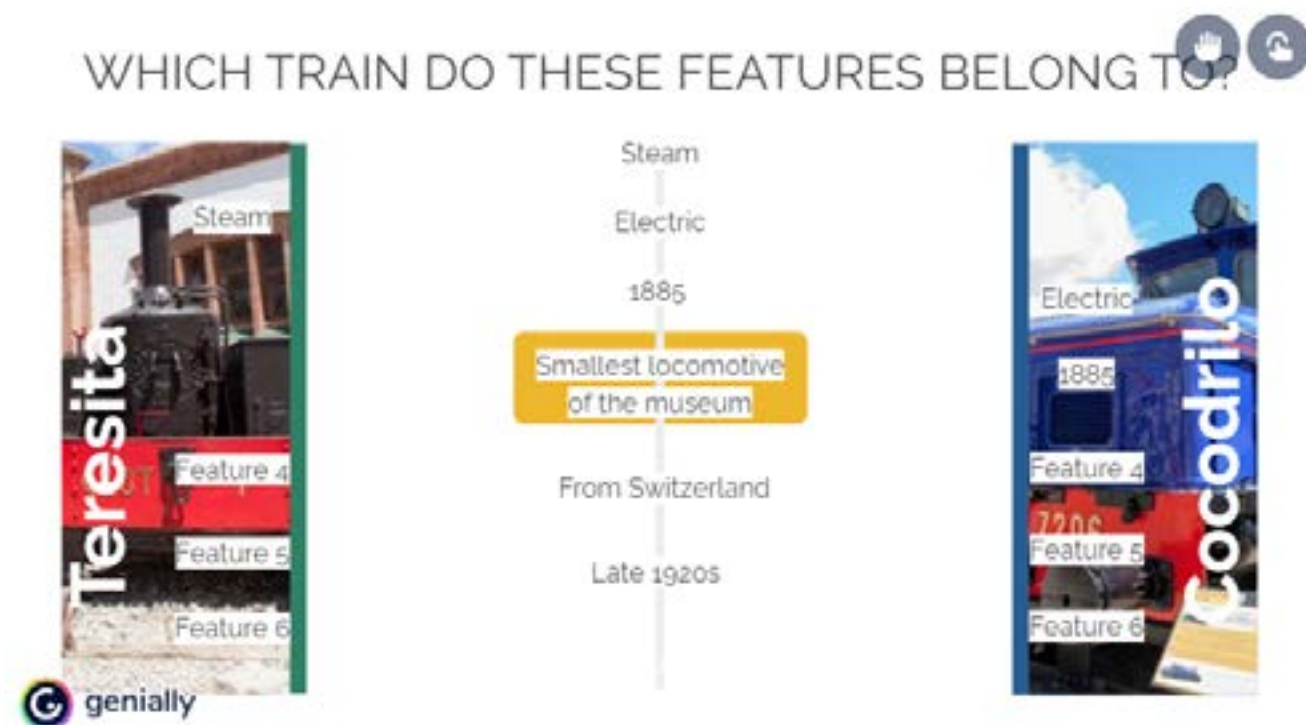


Figure 22: Screenshot of an ongoing game

Other activities are a board game, in the form of a train race; a word search (PREMIUM TEMPLATE) and a find the pairs game.

The board game would be inspired by goose games, but representing a train race. This is a familial game, with the purpose of making a first interactive game that gets the children into the trains in general, making them interested and want to learn more about trains through the museum.

The word search would be a classical word search game, with a typical train and railway lexical field, in order to get the children familiar with the vocabulary they would encounter at the museum.

The find the pairs game works as such: cards represent the train collection of the museum by pairs, and one card of each pair is face downward. The children have to find them with their memory skills. This is a classical kid game that would give the children an idea of the collection of the museum before visiting it.

### 5.2.3 Accessibility

In order to make our activities accessible to everyone, sober colors should be used, with a contrast good enough for the text to be readable. That is what has been done, and it covers most visual disabilities. Completely blind players would have their family to accompany them in the games, just like armless children. No sound is paramount for the activities, so that deaf people can play; and as an online game, it can naturally be played by children with mobility issues. In general, we also count on the fact that, whatever the disability is, the playing kids would be accompanied by their families. However, the possession of a computer or a cellphone is necessary for the children to play, as well as good network; but this is for any and every on-line activity, and we do not have a lever to counter this.

### LINKS TO THE ONLINE GAMES

<https://view.genial.ly/60b399682f81820d4130940b/interactive-content-copy-historic-acts-game>

<https://view.genial.ly/60b135a7191a770d3055d4fd/interactive-content-copy-definitive-correct-group>

<https://view.genial.ly/60b13bf840b4c20da5cb1836/interactive-content-copy-game-of-the-geese>

<https://view.genial.ly/60b13bfb12fede0d9eae740b/interactive-content-copy-find-the-pairs>

<https://view.genial.ly/60a7dd0a3e6fed0d4bab9b46/in>

<https://view.genial.ly/60be439bec9f2a0d461e94bf/interactive-content-copy-images-quiz>

<https://view.genial.ly/6099359756354b0d9ca98465/interactive-content-images-quiz>

## 6. Conclusion

6

There are several points that can be concluded after completing this project.

The first main conclusion is that it would seem to be the case that there is much educational value in using interactive activities with children in the context of the railway museum. After the research was done, we were almost sure that interactive games were going to be successful, but it was not until the test that we could not check it in a practical manner. The test was very successful. The families that participated really liked the missions we created and they learnt a lot of important concepts. The test also helped us to improve the activities and to clarify some concepts of the booklet. In general, the activities created were considered “very entertaining and educational” and with a perfect duration. We would have liked to test the activities with many more families, but the museum limited the number of families to test the activities. However, the museum will receive all the documentation, so if they want to change or add a mission, they will be able to do it. The activities are going to be completely implemented in the next weeks, so anyone that goes to the museum will be able to complete them.

Another important point that has to be stated is that at the moment of writing these conclusions, we have not received any response by the possible sponsors for the activities. As it has been explained in the budget section, to be able to offer these activities for free, the museum needs a sponsor. We helped the museum to contact the companies, and depending on their willingness to collaborate the package given to families will have to be adapted. Since companies have not responded before the deadline of the submission of the entire project, the museum may eliminate the less important elements (as we have stated in the budget part) to adapt the cost of packages to the money received.

Moreover, there are also other steps that have to be made by the museum. We offered our time to translate the booklet to catalan, but they decided that it would be better if they translated it. As we already clarified, the museum will receive all the documents, so they will be able to translate it easily with the design created by us.

One important point of the project is the accessibility of the activities to everybody. We have considered several aspects while creating the missions, and we have made sure that our missions are accessible to almost everyone. However, there is one specific collective, blind people, that is not able to participate in our activities. For this reason, we suggest to the museum to create another specific activity for them or to try to adapt our booklet to the Braille Alphabet.

The project was also affected by the current situation. Covid-19 has changed everyone's life, and we had to adapt to the restrictions imposed by the government. This was an added difficulty. However, we managed to adapt to it quite well. To adapt to the restricted mobility, we created an online game activity for children, so they can play while they have to stay at home or they can't come to the museum. In addition, this activity serves as an appetizer of the museum. If someone does the activity it attracts the people that do the activity.

During our project, each one of us also had the opportunity to collaborate with other international students with different backgrounds. We got to learn how to develop a professional project, dealing with the stakeholders and carrying it out in general. As part of this, we learned about every step of it, sometimes going beyond our respective specialties. We also had the chance to develop our communication skills, and learned from each other through this intercultural exchange.

In general, the project has had a successful outcome and it has been very beneficial for both the students and the institutions involved. The project is very innovative and proposes effective solutions for the problems stated in the introduction. The goals of the project have been achieved and the missions created are going to be implemented in the museum in the next weeks, so everyone that goes there, will be able to complete them. This is very satisfactory, because we can see that our work is used in the real world and people will enjoy the game created by us.

# 7. Acknowledgements

First of all, we would like to express our gratitude to the Railway Museum of Catalonia for providing us the opportunity to take part in a real-life project. We are truly thankful for their support, and the effort they made to carry out the project even if the situation was not favourable. We are especially grateful to Ana Grande Jiménez, head of communication and education of the museum, for her help and her collaboration to make sure the project had a successful outcome.

We would also like to thank the EPSEVG for hosting the EPS and accommodating students from all around Europe. We know that this year has been particularly difficult to organize due to the current pandemic situation, and this . Lastly, we would like to state that we are especially grateful to Joseph Edward Barr, our supervisor from the UPC, for assisting us throughout the process of developing the project and for providing us guidance.



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# 9. Appendix

9

## Appendix A.

### Links online games

<https://view.genial.ly/60b399682f81820d4130940b/interactive-content-copy-historic-acts-game>  
<https://view.genial.ly/60b135a7191a770d3055d4fd/interactive-content-copy-definitive-correct-group>  
<https://view.genial.ly/60b13bf840b4c20da5cb1836/interactive-content-copy-game-of-the-goose>  
<https://view.genial.ly/60b13bfb12fede0d9eae740b/interactive-content-copy-find-the-pairs>  
<https://view.genial.ly/60a7dd0a3e6fed0d4bab9b46/in>  
<https://view.genial.ly/60be439bec9f2a0d461e94bf/interactive-content-copy-images-quiz>  
<https://view.genial.ly/6099359756354b0d9ca98465/interactive-content-images-quiz>

## Appendix B.

### Links to audioguides

#### Activity 1 (historic acts game)

<https://audioguia.museudelferrocarril.org/eng/19eng.asp>  
<https://audioguia.museudelferrocarril.org/eng/11eng.asp>  
<https://audioguia.museudelferrocarril.org/eng/18eng.asp>  
<https://audioguia.museudelferrocarril.org/eng/05eng.asp>  
<https://audioguia.museudelferrocarril.org/eng/22eng.asp>

#### Activity 2 (correct group)

<https://audioguia.museudelferrocarril.org/eng/03eng.asp>  
<https://audioguia.museudelferrocarril.org/eng/18eng.asp>

### Quizz

<https://audioguia.museudelferrocarril.org/ENG/04ENG.ASP>  
<https://audioguia.museudelferrocarril.org/ENG/06ENG.ASP>  
<https://audioguia.museudelferrocarril.org/ENG/10ENG.ASP>  
<https://audioguia.museudelferrocarril.org/ENG/11ENG.ASP>  
<https://audioguia.museudelferrocarril.org/ENG/13ENG.ASP>  
<https://audioguia.museudelferrocarril.org/ENG/14ENG.ASP>  
<https://audioguia.museudelferrocarril.org/ENG/15ENG.ASP>  
<https://audioguia.museudelferrocarril.org/ENG/18ENG.ASP>

## Appendix C.

Map of the museum where we based our children map on.

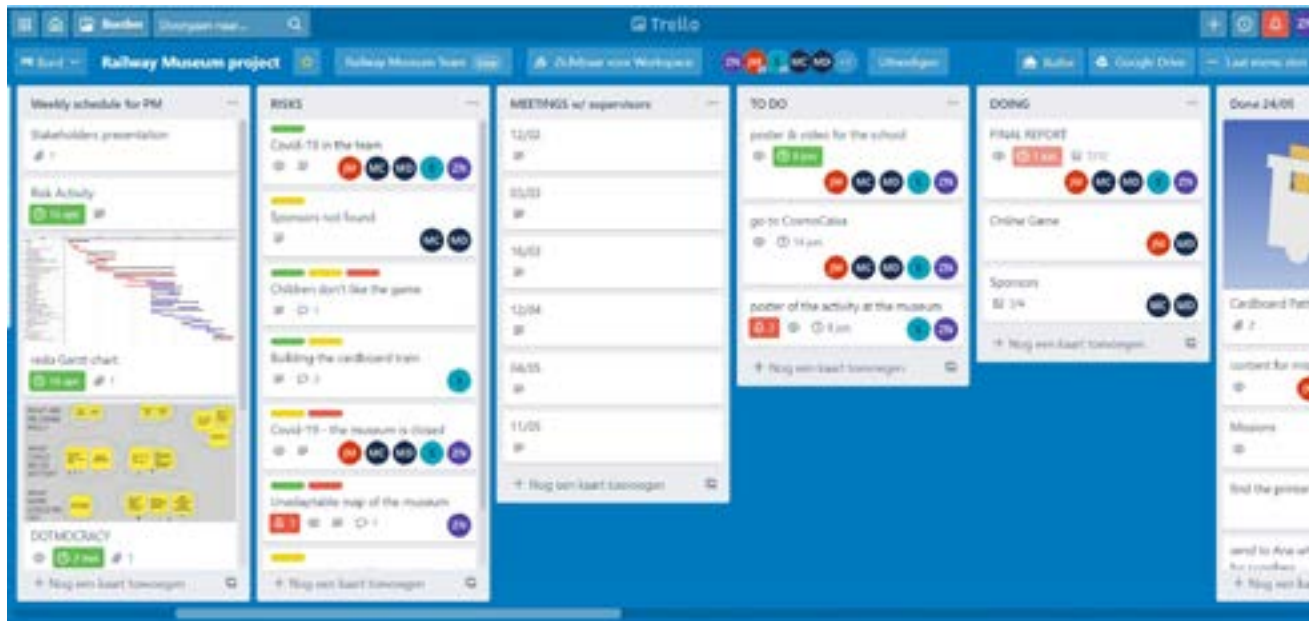


## Appendix D.

## Project management

# Trello

<https://trello.com/b/YIVbG687/railway-museum-project>



Gantt chart  
see page 61

## Appendix E.

The booklet that is designed for the museum starts on the page number 62.

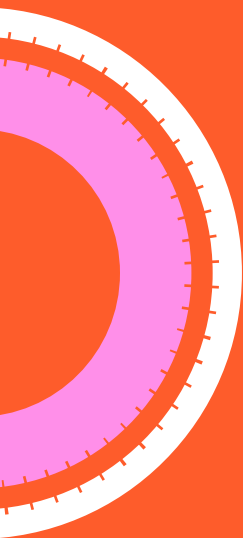
## Gantt chart



# CATALONIA RAILWAY MUSEUM

VILANOVA I LA GELTRÚ

**activity for the whole family**





# WELCOME

Welcome to the Railway Museum of Catalonia! We are happy to meet you and that you chose to do our family activity. This activity has been developed by 5 international students & they hope you are going to have a lot of fun today! This booklet is your activity support and you will need it all day long so do not lose it! ENJOY!



**MUSEU  
DEL FERROCARRIL  
DE CATALUNYA  
VILANOVA I LA GELTRÚ**

---

MUSEU DE LA CIÈNCIA  
I DE LA TÈCNICA DE CATALUNYA

Sophie, Zinke, Matteo, Max & Joanes

# THE STOLEN TRAIN

Welcome to the Railway Museum of Catalonia!  
We are happy to meet you and that you chose to do our family activity.

This activity has been developed by 5 international students & they hope you are going to have a lot of fun today! This booklet is your activity support and we will need it all day long so do not lose it!

ENJOY!

A train was stolen yesterday night in the museum! We need help from you and your family to find it! In this booklet, you have several missions to accomplish to win pieces of the train.

With a piece of rope, you can connect your pieces together to build your own train! You can also decorate it with color pens, paint, glitters or stickers to put it in your bedroom at home.

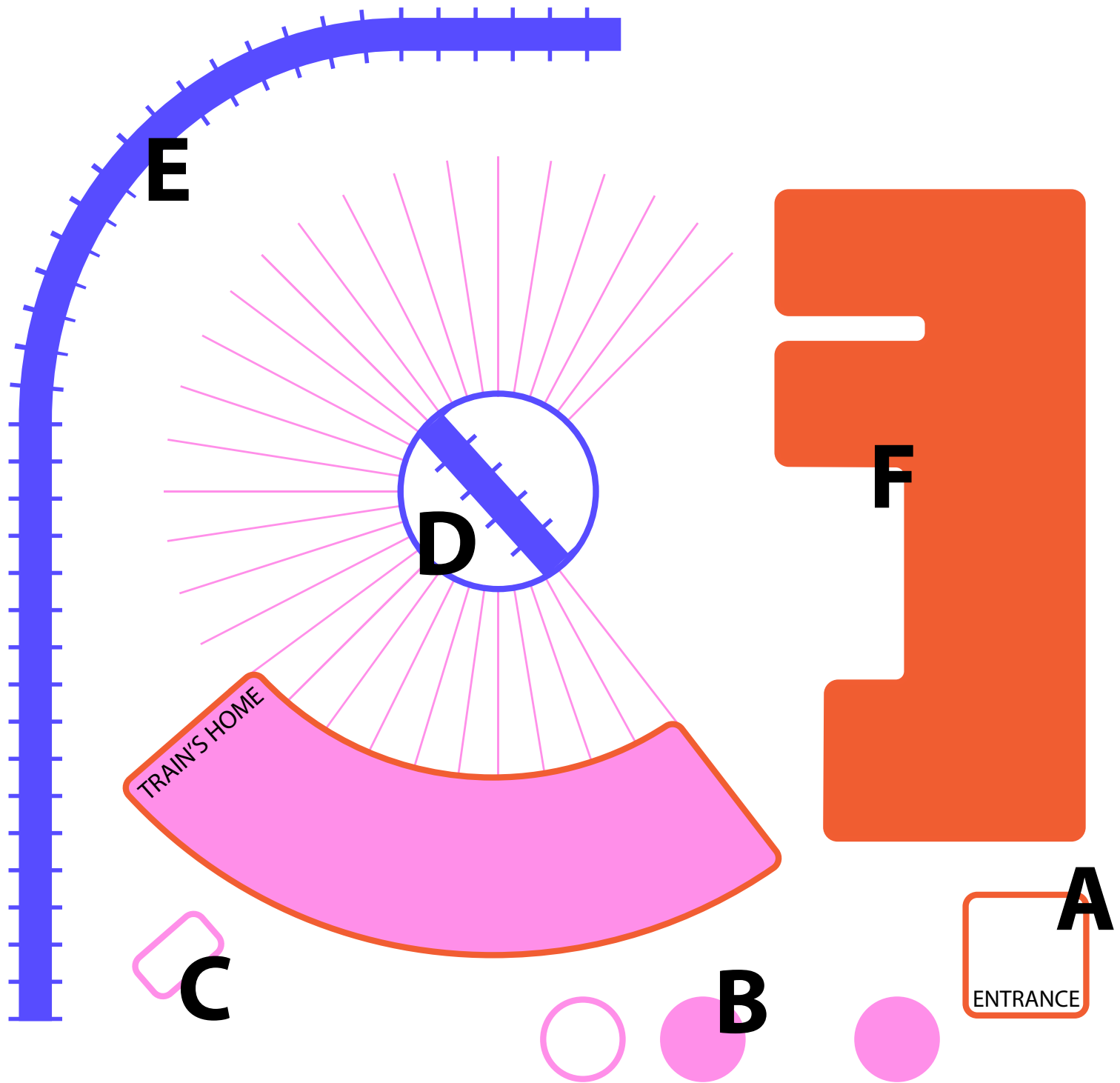
You can choose the missions you want to do, they are all independent from each other. So if you don't find the answer because it is too hard or if you are bored because it is too easy, you can

just skip this mission! On the top of each page you can see the difficulty of the mission. You can also stop the activity whenever you want if you are tired. :)

Finally, if you have to go back home and you didn't finish the missions, don't worry you can always come back! Also an online game is available on our website :

<https://www.museudelferrocarril.org/>

# FLOOR PLAN





1. area D

The first train that transported travelers to Vilanova i la Geltrú was when? In the year ....



tip: search this train

2. area D

Find this train in the museum



**train ID card**

NAME.

DATE.

COUNTRY.

ENERGY.

3. area D

Circle all of the colours that  
you can see on the "Mataró"  
locomotive



**train ID card**

NAME.

DATE.

COUNTRY.

ENERGY.



# 4. area D

Connect the trains with the right information

Ripoll

•

•

steam

•

•



•

• 1929 •

• oldest of the museum

Talgo 354

•

• electricity •

•



•

• 1854 •

• train that took you to the ski station

Martorell

•

•

diesel

•

•



•

• 1983 •

• most powerful



5. area D

How many entrances are  
there in the train's home at  
the railway museum of  
Catalonia? ...



6. area B

Find the hidden word in yellow  
and complete the sentence

A	W	O	Q	A	W
B	A	Z	U	T	C
X	R	T	B	P	E
R	A	E	T	Y	O
D	A	X	U	N	V
M	S	K	N	N	S

The locomotives came to these \_\_\_\_\_  
to drink water when they arrived from a  
long journey.

7. area E

Why are these vehicles so important?



8. area E

Fill in the missing words of the sentence

I'm very \_\_\_\_\_ to everyone's \_\_\_\_\_. I avoid that no one \_\_\_\_\_ the track when a \_\_\_\_\_ passes.



9. area A

Put the pictures in the right order



sit properly on your seat



validate your ticket



buy a ticket



let travelers leave  
before entering the train



check when  
your train leaves



# 10. area A

Decode these 2 words and find the written object in the museum

□ ◯ ∇ ⊥ ◯ ◯ ⊏ ⊐ □ ◯ □

∇ ⊏ ◯ □ ⊥

AB	CD	EF
GH	IJ	KL
MN	OP	QR

UV	ST	WX
	YZ	

Here is a hint for decoding the sentence :)



CEREA Matteo  
DEBUS Maximilian  
DUBIAU Sophie  
IBARLUCIA-MARTICORENA Joanes  
NEYRINCK Zinke

Vilanova i la Geltrú - 2021