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SPICE

Social cohesion, Participation, and Inclusion through Cultural Engagement

# D5.3: Integrated interfaces for citizen curation (v1.0)

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## Project Information

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| 1 | UNIBO | ALMA MATER STUDIORUM - UNIVERSITÀ DI BOLOGNA | Italy |
| 2 | AALTO | AALTO KORKEAKOULUSAATIO SR | Finland |
| 3 | DMH | DESIGNMUSEON SAATIO - STIFTELSEN FOR DESIGN-MUSEET SR | Finland |
| 4 | AAU | AALBORG UNIVERSITET | Denmark |
| 5 | OU | THE OPEN UNIVERSITY | United Kingdom |
| 6 | IMMA | IRISH MUSEUM OF MODERN ART COMPANY | Ireland |
| 7 | GVAM | GVAM GUIAS INTERACTIVAS SL | Spain |
| 8 | PG | PADAONE GAMES SL | Spain |
| 9 | UCM | UNIVERSIDAD COMPLUTENSE DE MADRID | Spain |
| 10 | UNITO | UNIVERSITA DEGLI STUDI DI TORINO | Italy |
| 11 | FTM | FONDAZIONE TORINO MUSEI | Italy |
| 12 | H-FARM | H-FARM SRL | Italy |
| 13 | UH | UNIVERSITY OF HAIFA | Israel |
| 14 | CNR | CONSIGLIO NAZIONALE DELLE RICERCHE | Italy |

# Executive Summary

SPICE is an EU H-2020 project dedicated to research on novel methods for citizen curation of cultural heritage through an ecosystem of tools co-designed by an interdisciplinary team of researchers, technologists, and museum curators and engagement experts, and user communities.

This document describes the interfaces designed to support the citizen curation activities defined in the SPICE project. The interfaces designed in SPICE can serve as inspiration for others building systems to support similar citizen curation activities, and as such have value in themselves. However, our contribution goes further and takes the form of the inSPICE framework, released as open source, which abstracts and generalizes a good part of the interfaces of the SPICE use cases, thus facilitating the construction of similar systems by other museums in the future. In addition to the collection of reusable components, inSPICE provides a collection of “templates for citizen curation activities”, where a user, typically museum personnel, can instantiate and configure a given citizen curation activity.

## Document History

| Version | Release date | Summary of changes | Author(s) - Institution |
|---|---|---|---|
| v0.1 | 1/03/2023 | First draft released | PG |
| v0.2 | 1/04/2023 | Revisions and integration | All partners |
| v0.3 | 24/04/2023 | Internal review | GVAM, UNITO, OU |
| v0.4 | 26/04/2023 | Incorporated comments from internal review | PG |
| v1.0 | 27/04/2023 | Final version submitted to REA | UNIBO |

# Table of contents

# 1 Introduction

The SPICE project builds on the growing trend for museums, rather than providing an authoritative view, to present multiple voices related to their collection and exhibitions. In SPICE, an approach we term citizen curation is proposed as a way of supporting visitors to share their own interpretations of museum objects and reflect on the variety of interpretations contributed by others.

This document describes the interfaces designed to support the citizen curation activities defined in the SPICE project. The main source for these interfaces are the 5 use cases developed in the project (see also D2.5, "Methodological toolkit for citizen curation", and D7.7, "Case studies progress and plan", for more information on the use cases), although some additional interfaces for citizen curation have been developed independently from the use cases and will also be described here.

The interfaces designed in SPICE can serve as inspiration for others building systems to support similar citizen curation activities, and as such have value in themselves. However, our contribution goes further and takes the form of the inSPICE framework, released as open source, which abstracts and generalizes a good part of the interfaces of the SPICE use cases, thus facilitating the construction of similar systems by other museums in the future. In addition to the collection of reusable components, inSPICE provides a collection of "templates for citizen curation activities", where a user, typically museum personnel, can instantiate and configure a given citizen curation activity.

## 1.1 SPICE in a nutshell

SPICE provides scripted support for a range of citizen curation activities (see Figure 1 – the numbers in the description refer to items in the figure) [1]. SPICE proposes a distributed architecture leveraging Linked Data, where each system has access to a number of objects, whether provided by one or more museum content management systems, other repositories, or contributed by citizens (1). Each system has its own autonomy in modelling and managing data, including specific ontologies (2).

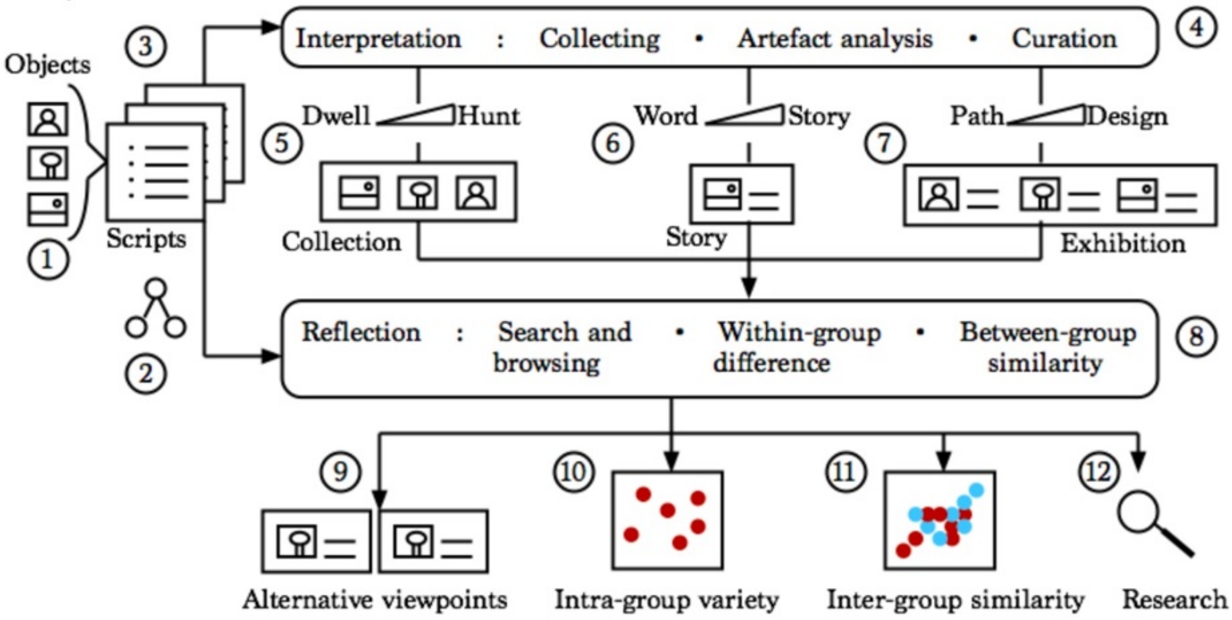


**Figure 1.1:** SPICE in a nutshell.

Systems in SPICE implement "citizen curation scripts" (3). Each script is made up of a combination of interpretation activities (e.g. collecting, artefact analysis) and reflection activities (e.g. search, visualizing similarities and differences). These scripts differ across the systems to fit the specificity of use cases and may organize activities into different orders. For example, the citizen may see an overview of what contributions others have made (i.e. reflection) before and/or after making their own contribution (i.e. interpretation). Interpretation activities have been developed that draw on various curatorial methods related to the study, interpretation and communication of museum objects, such as collecting, artefact analysis, storytelling, and exhibition design (4).

Interpretation activities in SPICE vary depending on the level of involvement required in order to appeal to both casual and engaged visitors:

**Collecting** Activities inspired by collecting enable visitors to produce their own collection (5). Casual activities involve letting the visitor explore the (virtual or physical) museum space and constructing a collection based on their interest. More engaged activities involve the visitor finding objects in response to challenges in a form of treasure hunt.

**Artifact analysis** Activities inspired by artefact analysis enable visitors to offer their own interpretation in response to particular objects (6). Casual activities involve associating a caption or title with an artwork. More engaged activities involve telling a story related to, for example, the characters, setting or theme of the artwork.

**Developing exhibitions** Visitors can also be assisted in developing their own exhibitions (7). Methods are used to lead the visitor through a curatorial design process in which they thematically organize and present a series of objects.

Methods of reflection enable those interpretations to be used to foster mutual understanding and support research (8):

**Searching and browsing previous interpretations** Forms of analysis include the searching and browsing of content and the identification of similarities and differences across contributions. Searching and browsing activities can be used to suggest to the user alternative interpretations of the same object in order to encourage them to recognize and take multiple perspectives (9).

**Community visualization, intra-group variety** Visual analytical tools support the user in understanding more broadly the variety of responses produced by a particular activity (item 10). Visualizations emphasize the variety rather than the popularity or similarity of opinions.

**Community visualization, inter-group similarity** Visual analytical tools also support the investigation of similarities across different groups enabling citizens to identify issues of common concern rather than just emphasize average differences in response (11).

## 1.2 SPICE interfaces

In the SPICE project, a number of interfaces have been developed for different systems and for different purposes. The 5 use cases exemplify different citizen curation scripts, each of which consists of several activities that may or may not be technologically supported. For example, in the case of the Hecht Museum there are 3 fundamental phases in the activity, one, in the school, before the visit to the museum, another during the visit to the museum, and a third one after the visit to the museum, again in the school. In this case, all three activities have technological support, as web applications, although each activity has a specific interface. In contrast, in the case of MNCN, the structure is similar in terms of the 3 phases (school, museum, school) but only the museum visit is technologically supported.

In SPICE, authoring tools are especially relevant because experience authoring is a form of citizen curation, when someone outside the museum staff is able to design an exhibition for others. This is why in several of the use cases, in addition to the experience “consumption” interface, an authoring interface has also been developed to support someone with no previous experience in designing such experiences.

Most of the use cases in SPICE have been implemented for the physical museum space. However, SPICE also includes some interfaces for the virtual museum space, using virtual reality, or for extending the physical visit with augmented reality. In any case, it is important to emphasise that the emphasis of SPICE is not so much the interface of the visit but the interface that supports the interpretation and reflection activities, independently of the way of visiting the museum space.

In addition to the interfaces for the specific activities, this document describes the inSPICE system. inSPICE is the main outcome of WP5 because it brings together a significant part of the interfaces developed in SPICE into a single, modular, reusable and extensible system, designed to make it easier for other museums to implement the citizen curation activity interfaces defined and tested in SPICE, as well as new variants of these activities, at low cost. For the development of inSPICE we have followed a bottom-up approach, from the use case prototypes to the templates and components in the underlying framework. From the individual prototypes, we have identified those interface components that can be integrated into a common framework and implemented them.

The rest of the document runs as follows. Chapter 2 describes the main interfaces related to citizen curation developed in SPICE, except for the community visualization tools that are described in Chapter 3. Chapter 4 introduces the general architecture and common components of the inSPICE system, while chapters 5, 6, and 7 goes into the specifics of the three main script families supported by inSPICE: visual stories, multistage forms and escape rooms, respectively. Chapter 8 includes a more technical description of the underlying inSPICE framework.

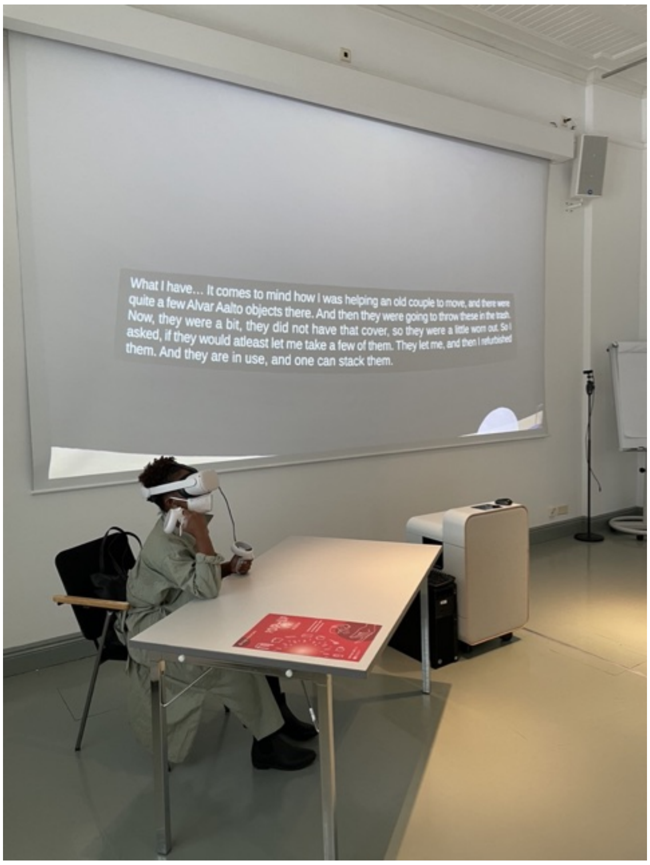
# 2 SPICE Interfaces

This chapter describes the interfaces designed to support the citizen curation activities defined in the SPICE project. These interfaces can serve as inspiration for others building systems to support similar citizen curation activities, and as such have value in themselves.

## 2.1 DMH

In this section, we will showcase the use case of the Design Museum Helsinki (DMH) in Finland, which provides a unique VR immersive experience that allows users to interact with various artifacts from the museum collection through VR glasses. This use case is a classic example of Artifact analysis, which involves the systematic examination of material objects to better understand the culture and history of the people who created and used them. Below, we will present a series of screenshots with captions illustrating the steps involved in using the application and the experience that the user goes through when interacting with these artifacts.

Before a recurring participant from any end-user communities of the Pop-up VR Museum arrives, a user account is set up for them. A user wears the portable VR headset, grabs the controllers, enters the VR environment, and is ready to begin their experience, as shown in Figure 2.1.



What I have... It comes to mind how I was helping an old couple to move, and there were quite a few Alvar Aalto objects there. And then they were going to throw these in the trash. Now, they were a bit, they did not have that cover, so they were a little worn out. So I asked, if they would atleast let me take a few of them. They let me, and then I refurbished them. And they are in use, and one can stack them.

**Figure 2.1:** VR set-up.

At the beginning of the experience, the virtual environment is surrounded by DMH artefacts. Three (3) language options (Finnish, English, and Swedish) are presented for the whole experience and the user has to select a preferred one using the VR controller in one of their hands. After selecting the language, age groups are offered for selection, as shown in Figure 2.2. Once selected, the visitor is ready to enter the experience, as shown in Figure 2.3

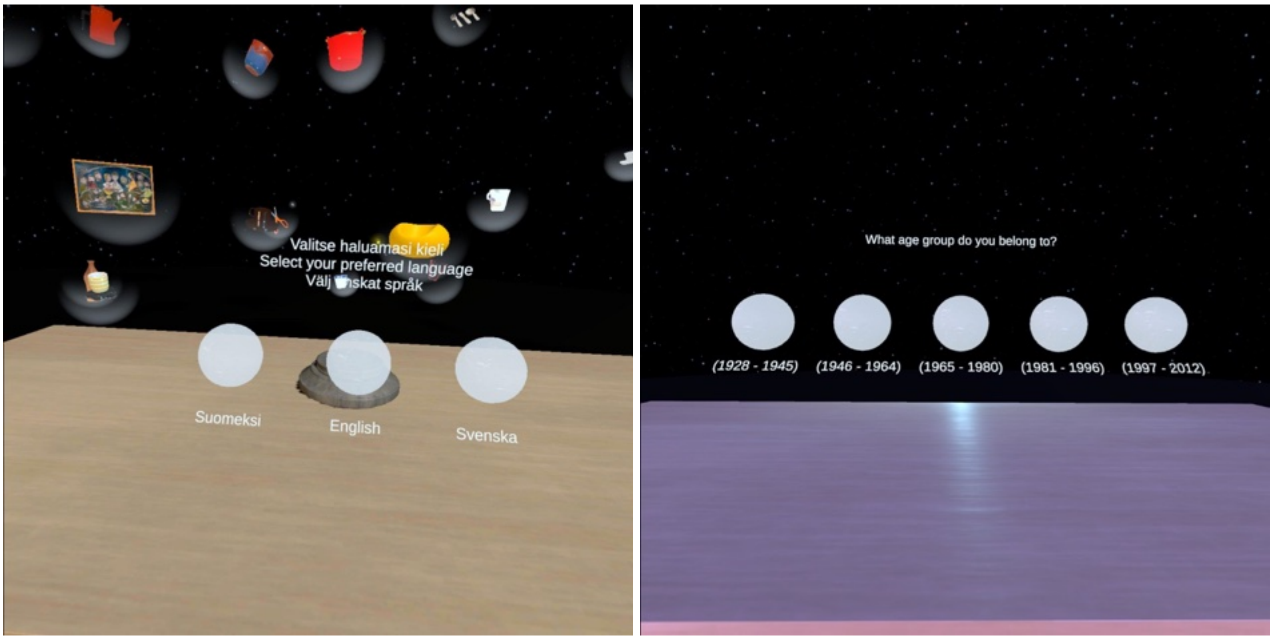


**Figure 2.2:** Language and age selection

Now, in the main scene, users can select their avatar amongst three different DMH artefacts, and once selected, the virtual body transforms into that of the avatar, as shown in Figure 2.4

In the main scene, categories of objects are available for selection, and once a category is selected, different objects from DMH collection belonging to that category are displayed ready for interaction, as shown in Figure 2.5 where the category "chair" has been selected.

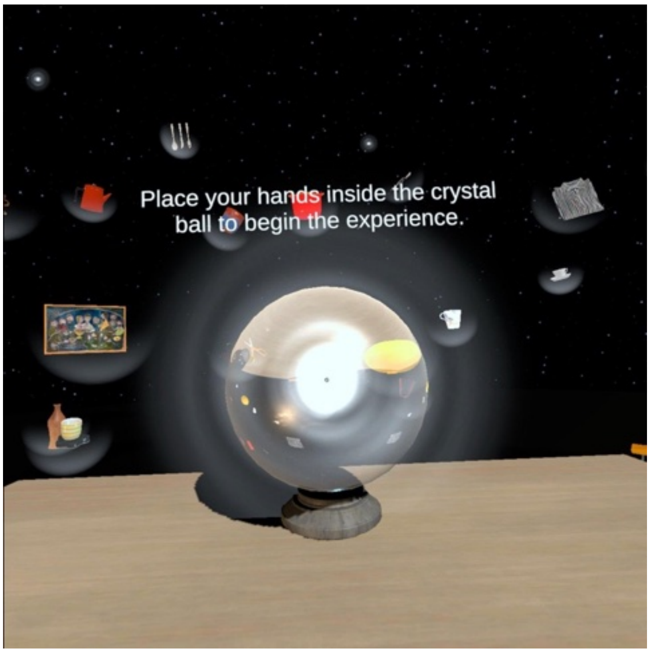
Once a partircular object is selected, options for interaction are presented to users, including: i) Read, ii) Listen, iii) Immerse, or iv) Contribute. Figure 2.6 shows the options for interaction after selecting the Pastille chair.

On selecting "Read", written stories contributed by other users or workshop participants are shown on a book placed on the table. On selecting "Listen", an audio-recorded story along with the transcribed and translated text in the preferred language contributed by other users or workshop participants is presented. Both interfaces shown in Figure 2.7

Upon selecting "immerse", a user receives a different perspective of an artefact, such as going inside it or being surrounded by it, as in the example shown in Figure 2.8

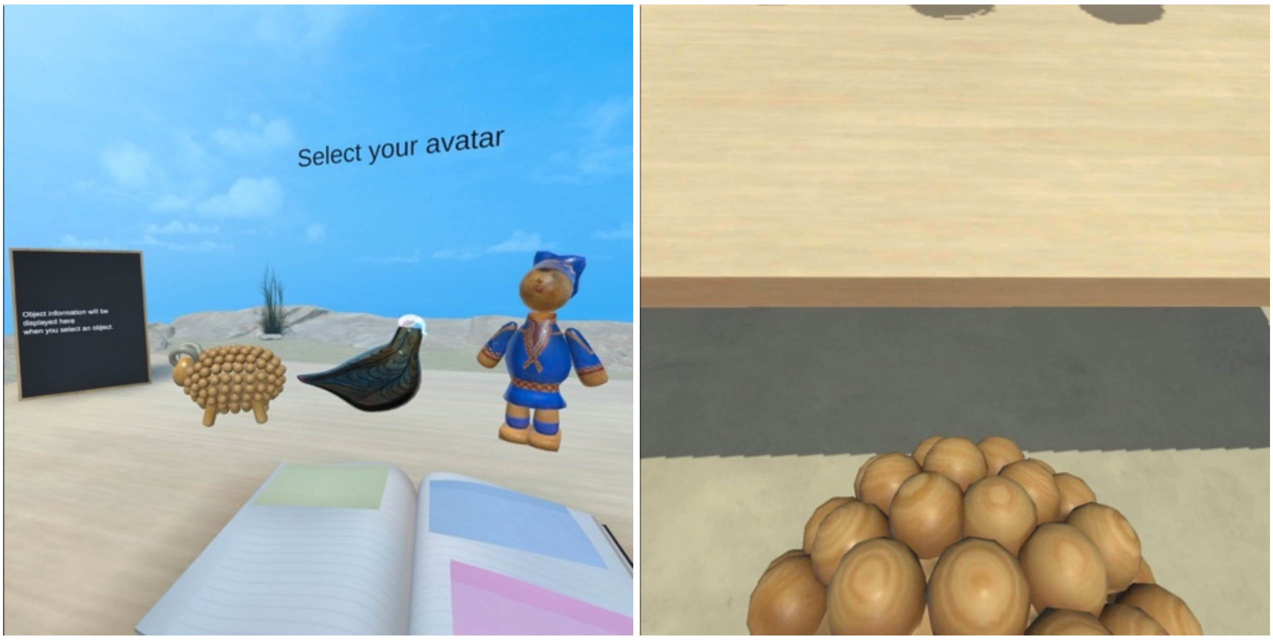
Figure 2.9 shows the interface when selecting "Contribute", where a keyboard pops up in the virtual environment and users can type a short story connected to the selected artifact. In addition, options are presented for selecting DEGARI emotions to describe the feelings inspired by the artefact.

After selecting emotions, the cycle continues again with the categories for object selection.



Place your hands inside the crystal ball to begin the experience.

**Figure 2.3:** Entering the experience.



Select your avatar

Object information will be displayed here when you select an object.

**Figure 2.4:** Avatar selection.

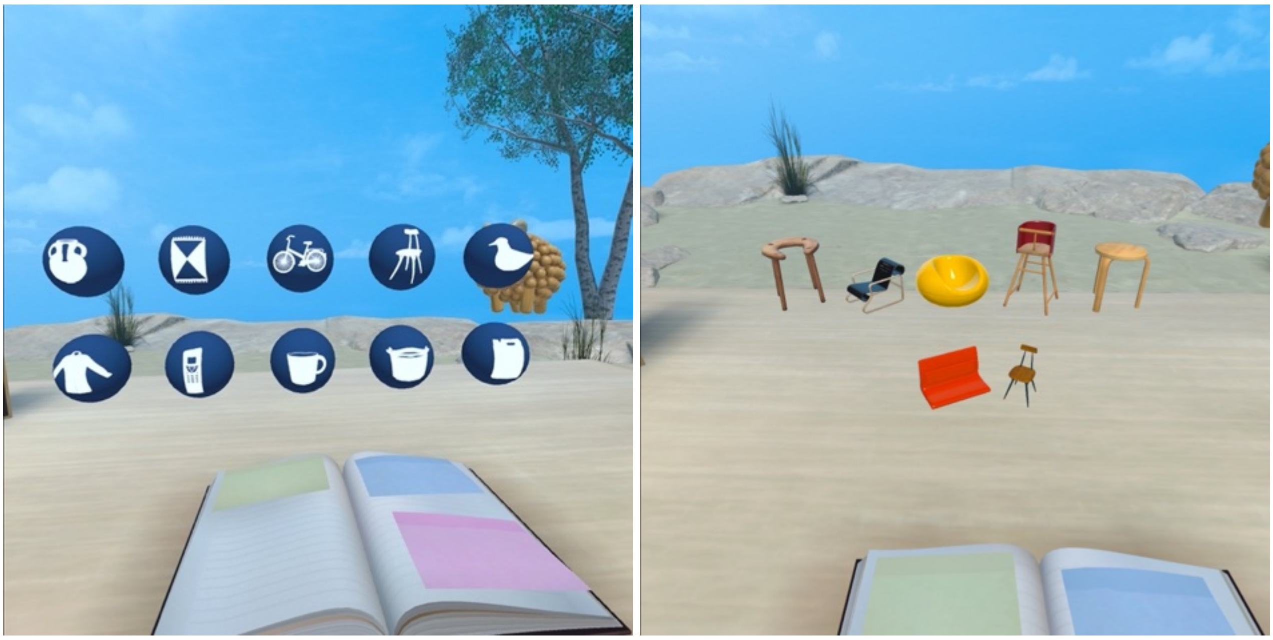


**Figure 2.5:** Category selection.

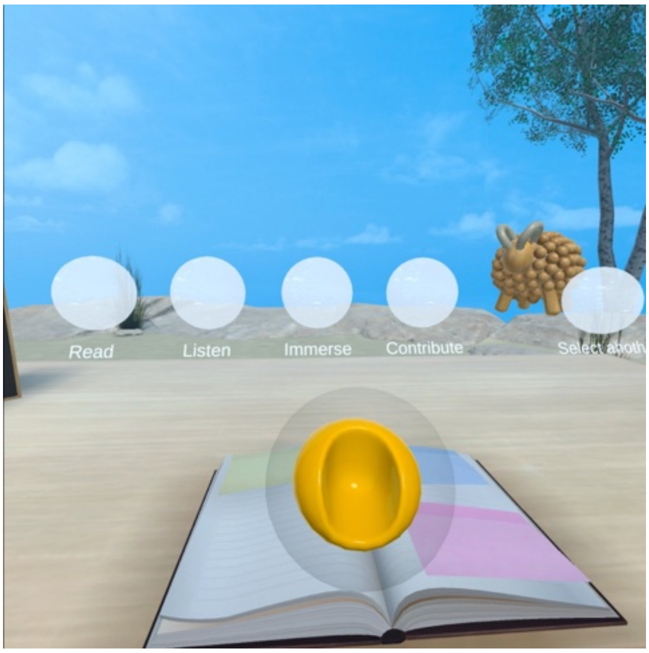
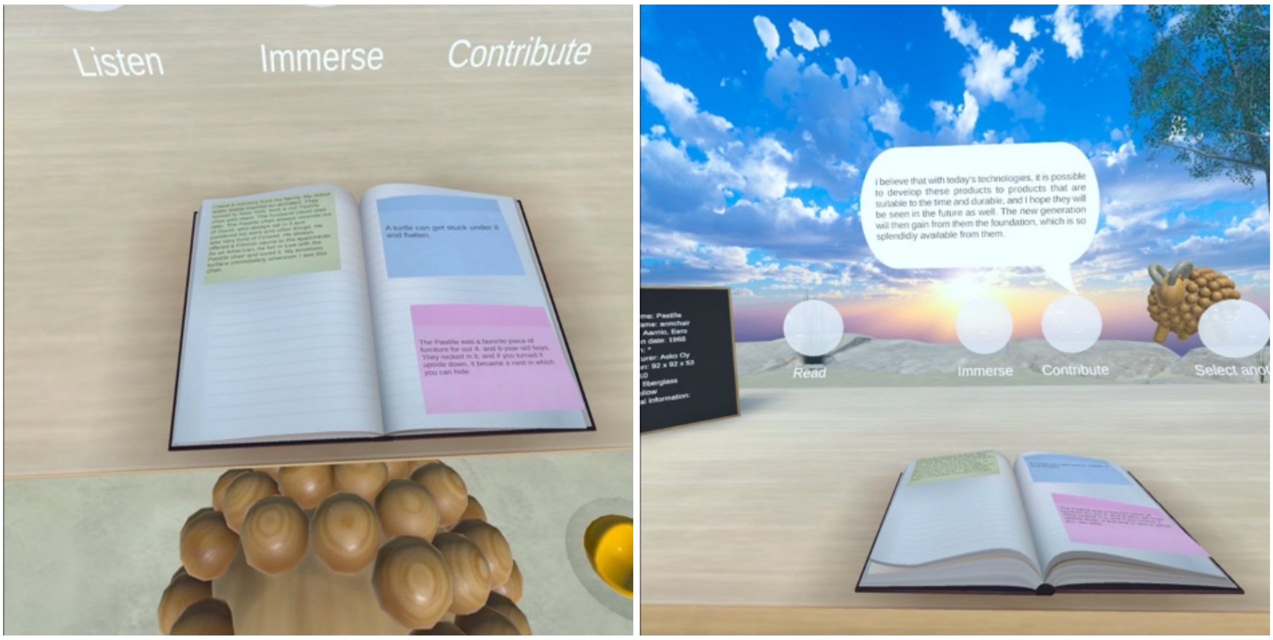


**Figure 2.6:** Options for interaction.

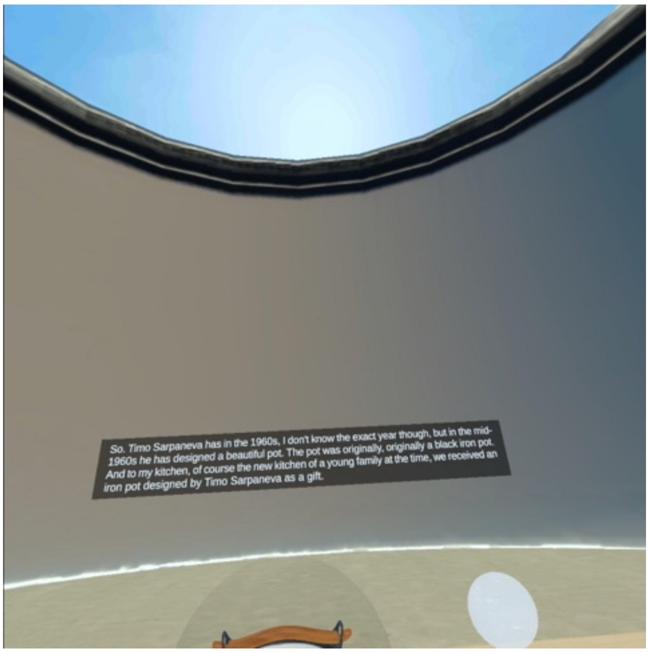


A turtle can get stuck under it and flatten.

The Pastille was a favorite piece of furniture for our 4- and 6-year-old boys. They rocked in it, and if you turned it upside down, it became a nest in which you can hide.

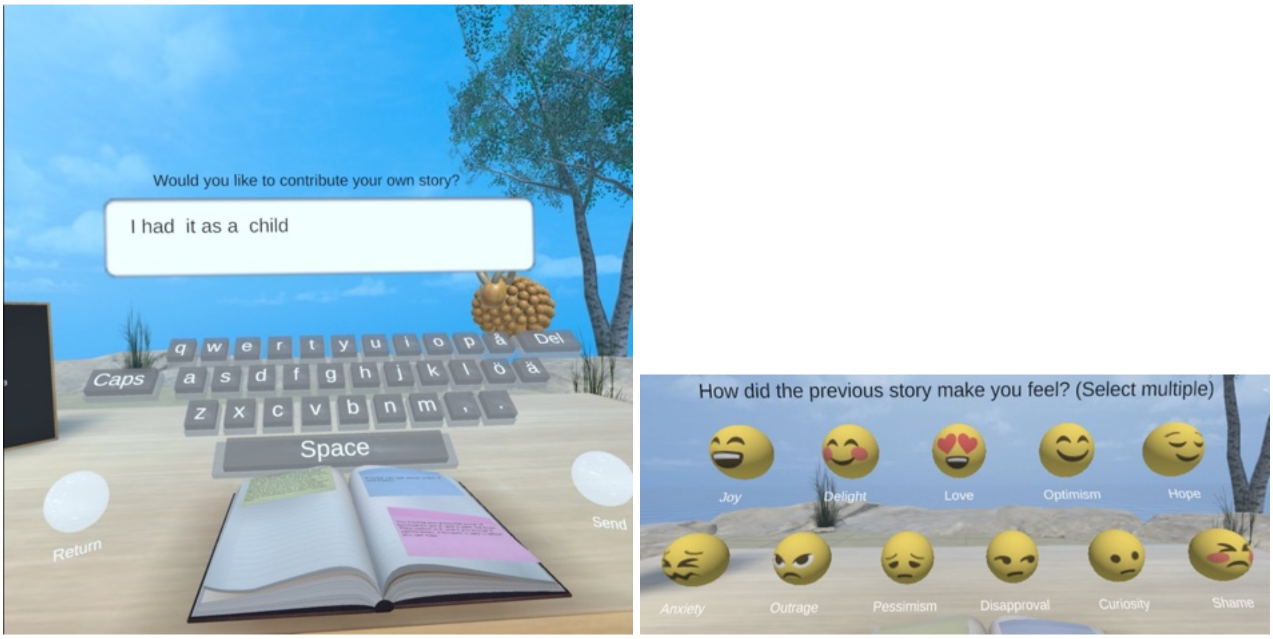
I believe that with today's technologies, it is possible to develop these products to products that are suitable to the time and durable, and I hope they will be seen in the future as well. The new generation will then gain from them the foundation, which is so splendidly available from them.

**Figure 2.7:** "Read" and "Listen" interaction interfaces.



*So. Timo Sarpaneva has in the 1960s, I don't know the exact year though, but in the mid-1960s he has designed a beautiful pot. The pot was originally, originally a black iron pot. And to my kitchen, of course the new kitchen of a young family at the time, we received an iron pot designed by Timo Sarpaneva as a gift.*

**Figure 2.8:** "Immerse" in an artifact.



Would you like to contribute your own story?

I had it as a child

How did the previous story make you feel? (Select multiple)

**Figure 2.9:** “Contribute” interface.

## 2.2 GAM

The GAM Game represents the main use case proposed by the Galleria d'Arte Moderna in Turin, and revolves around the notion of storytelling. Within this activity type, users can create short stories by collecting and sequencing the artworks from the museum collection, and add a personal response to each of the artworks in the story; as such, the GAM Game can be seen as an instance of a collecting and artifact-analysis interpretation activity. Stories can be created at any time before, during and after the museum visit.

Personal responses can consist of simple tags, text comments (created from a catalogue of templates: [the artwork] makes me feel . . . , [the artwork] reminds me of . . . , etc.) and emojis. More than one element per each category (or none) can be added to each artwork in the story. The user can also upload a single image from their device as a response to an artwork.

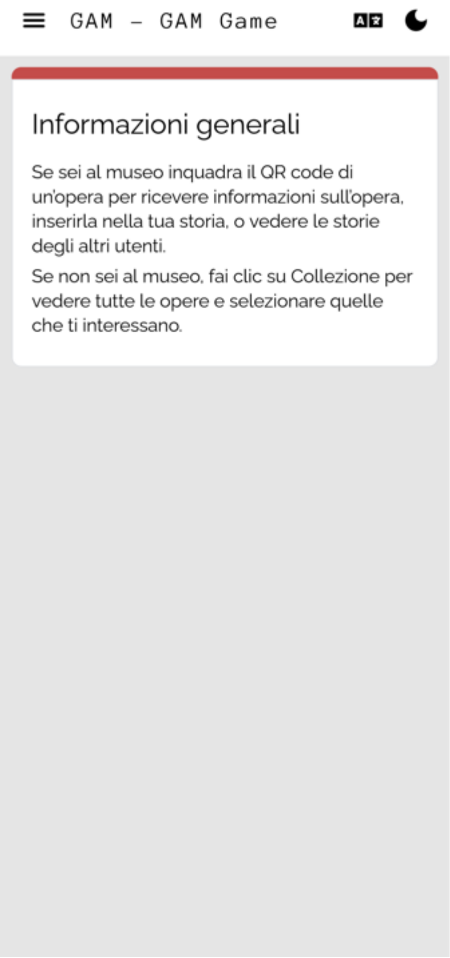
Stories can be saved in the user's personal space associated to their account and later deleted (but not edited). In order to identify them, and also as part of the creative process, users are prompted to give a title to each story as a precondition to saving it.

After creating each story, the user receives a set of recommendations of artworks and other stories based on the emotions assigned by the DEGARI reasoning service from WP4 to the artworks in the story (in turn, these associations are inferred by DEGARI from the text content which accompanies the artwork: artwork description from the collection record, user comments, etc.). Recommendations are of two types: they concern artworks associated with the same or similar emotions, and artworks associated with emotions of opposite polarity. If accepted, a recommended artwork will be attached to the story. In this way, the GAM Game provides methods of reflection based on searching and browsing previous interpretations, emphasizing diffences and simmilarities across the contributions of different users.

Once shared, stories are associated with the artworks in the museum collections, and can be browsed by the other users, who can express their appreciation to them through likes, in the style of social media. With this context in mind, we will now elaborate on each of the application flows in more detail, including screenshots to illustrate their use in a more visual way.

The museum visitor's perspective for the GAM Game activity template is provided via a web application contained within the inSPICE system designed to explore the different works of the collection included in the activity instance and interact both with them and with the contributions of other participants in the game. The application was designed taking into account that the main use case requires the museum visitor to access the activity's website from their mobile device while in the corresponding section of the collection, but it is also adapted to desktop browsers to further allow these types of interactions on a computer after returning home from the visit. All the flows we will show below currently support dark mode as well as toggling between English and Italian as interface languages.

The user's navigation experience in the application starts with a simple welcome screen, where general information and high-level instructions on the various game options are provided. This interface can be seen in figure 2.10. It is worth mentioning here that access to this flow is protected by the login by session name and user ID system described in section 4.3.



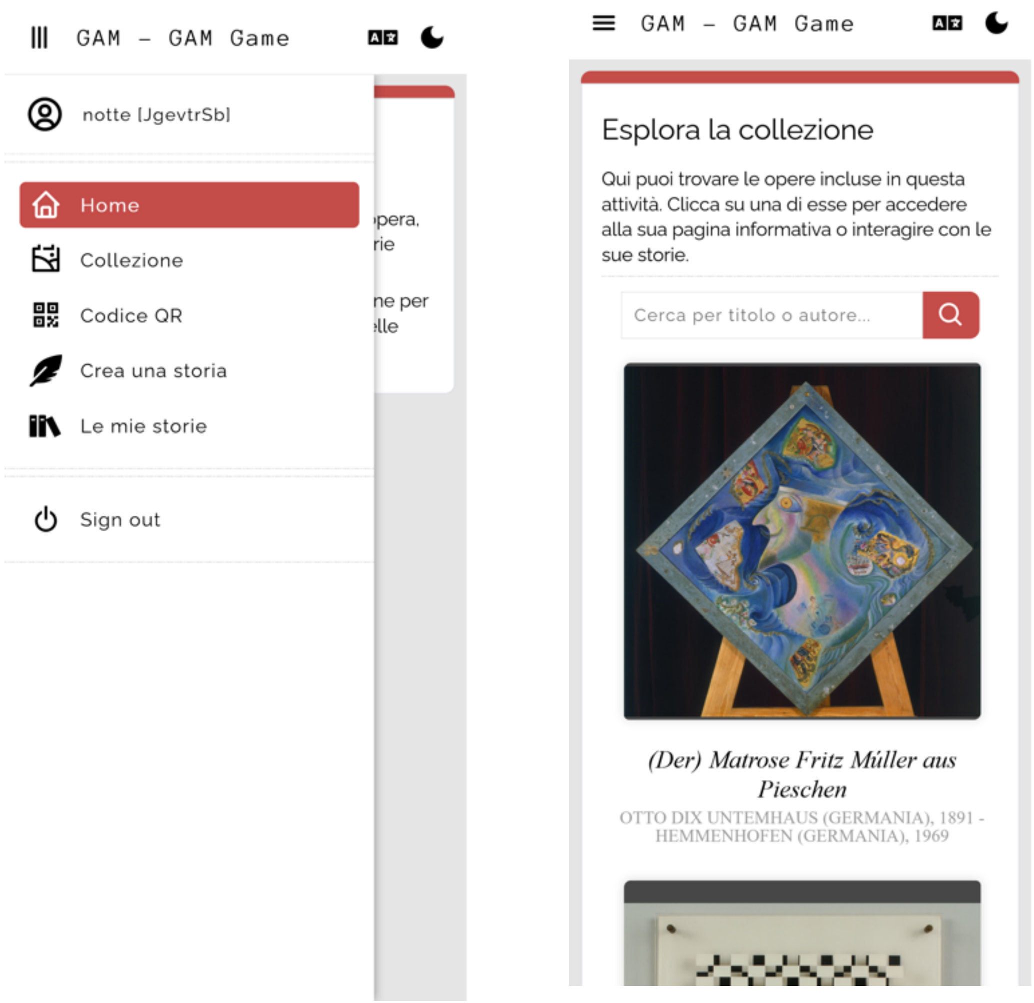
Informazioni generali

Se sei al museo inquadra il QR code di un'opera per ricevere informazioni sull'opera, inserirla nella tua storia, o vedere le storie degli altri utenti.

Se non sei al museo, fai clic su Collezione per vedere tutte le opere e selezionare quelle che ti interessano.

**Figure 2.10:** Home screen for the museum visitor's perspective on an instance of the GAM Game activity.

By clicking on the hamburger icon located in the upper left corner of the application, the user may find navigation links to the different functionalities offered within the game (figure 2.11a): the home screen (`Home`, already mentioned above), collection (`Collezione`, to explore the works included in the activity), QR code (`QR code`, to scan a QR code placed in the museum to directly access the details of the scanned work), create a story (Crea una storia, to start the creation flow of a new story/interaction with the works in the collection) and my stories (Le mie storie, to consult and manage the stories created by the current user). Additionally, in the upper part of the menu it is possible to consult the current session identifier (*notte* in the example) and the active user (*JgevtrSb* in the screenshot), while the lower part of the menu offers the option to log out of the activity (`Sign Out`).



Esplora la collezione

Qui puoi trovare le opere incluse in questa attività. Clicca su una di esse per accedere alla sua pagina informativa o interagire con le sue storie.

Cerca per titolo o autore...

*(Der) Matrose Fritz Müller aus Pieschen*

OTTO DIX UNTEMHAUS (GERMANIA), 1891 - HEMMENHOFEN (GERMANIA), 1969

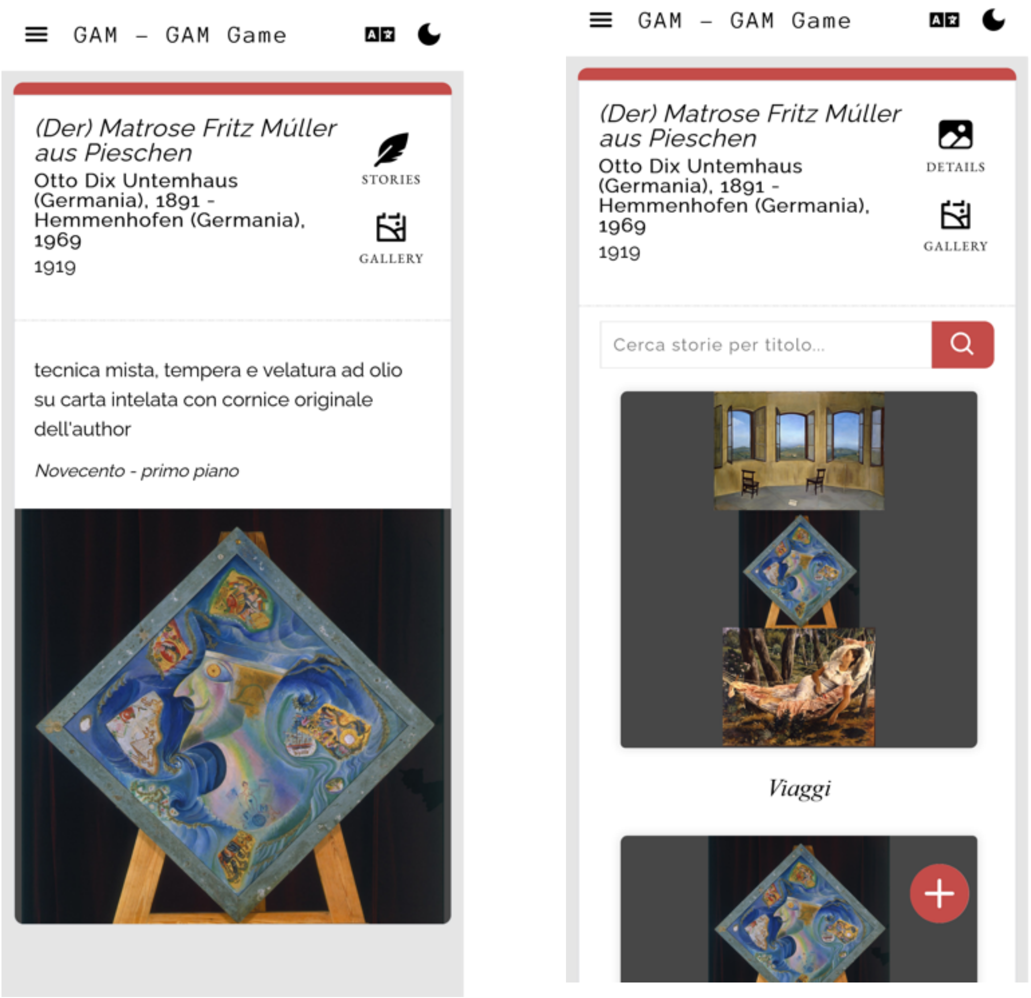
**(a)** Detail of the side navigation menu

**(b)** Browsing interface for the works included in the activity

**Figure 2.11:** GAM Game

Within the collection interface (figure 2.11b) it is possible to browse a list of the works added by the curator to the current activity, including for each work a preview of the associated image, its title, and its author. The user can choose to scroll through the works until they find one that piques their interest, or they may use the search engine at the top of the list to find those works that include the specified text in their title or author fields. Clicking on any of the pieces in the list redirects the user to the artwork detail interface, which will be described below.

The artwork detail interface (figure 2.12a) provides an extended version of the information of the selected artwork where, in addition to its title and author, further information of interest is included, such as the technique used for its creation or the year in which it is dated. It also includes the image associated with the work in higher quality and size, as well as two links in the upper right corner of the card that can be used to explore all the stories that reference the current work (`STORIES`) or return to the gallery view of the activity's works (`GALLERY`), respectively.



GAM – GAM Game

*(Der) Matrose Fritz Múller aus Pieschen*
Otto Dix Untemhaus (Germania), 1891 - Hemmenhofen (Germania), 1969
1919

tecnica mista, tempera e velatura ad olio su carta intelata con cornice originale dell'author

*Novecento - primo piano*

GAM – GAM Game

*(Der) Matrose Fritz Múller aus Pieschen*
Otto Dix Untemhaus (Germania), 1891 - Hemmenhofen (Germania), 1969
1919

Cerca storie per titolo...

*Viaggi*

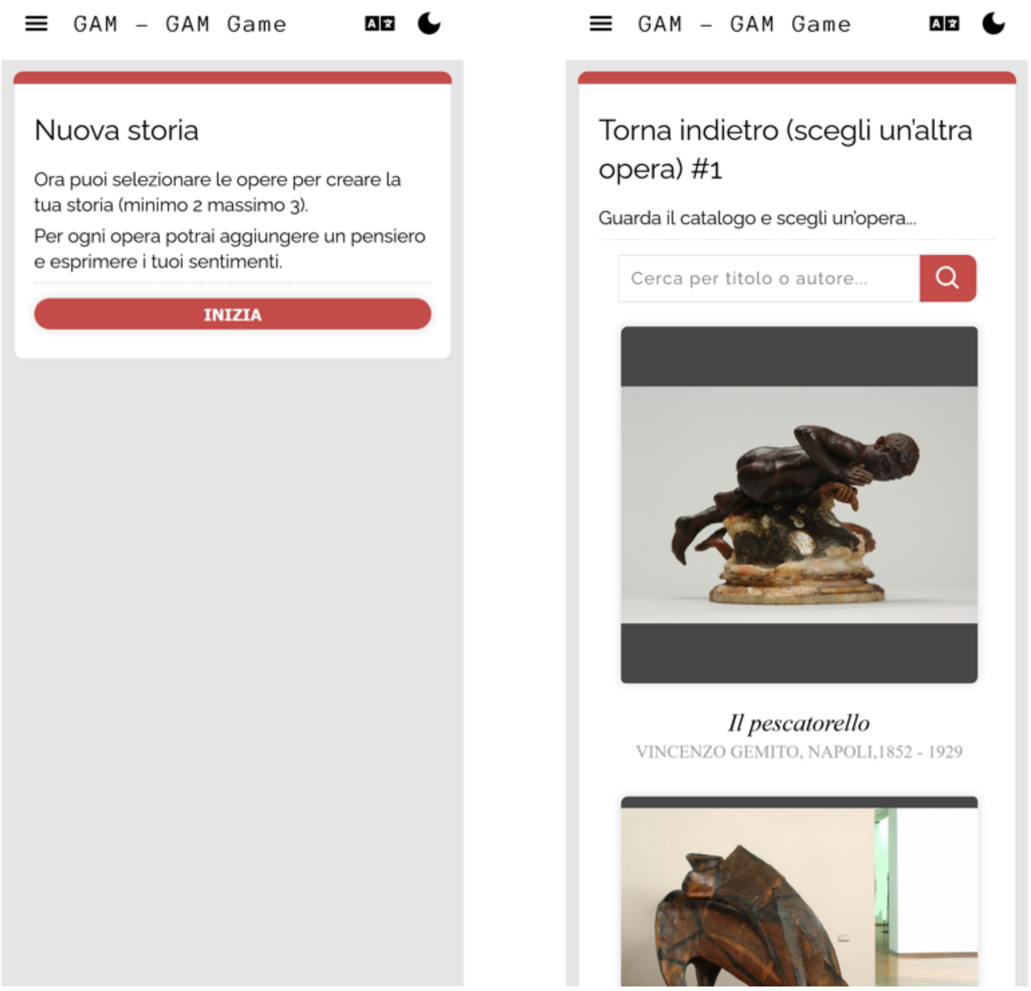
**(a)** Artwork detail interface for selected artwork

**(b)** Story browsing interface for stories that reference the selected artwork

**Figure 2.12:** GAM Game

By clicking on the stories icon it is possible to access an interface allowing the user to explore the stories registered in the application that make use of the selected work at some stage (figure 2.12b). The stories shown in this listing can belong to either the active user or to any other user who has participated in the activity for any given session. For each of the stories in the interface, a thumbnail is displayed including a preview of the images associated with all the artworks referenced throughout the story, as well as the title assigned by the author at the time of creation below that preview. As was the case with the collection section, a search engine is also offered here allowing the stories to be filtered to show only those containing the specified sequence of characters in their title. In terms of navigation, two links to the artwork detail screen and the activity's artifact gallery are provided in the upper right corner of the panel, while a convenience button to initiate the creation of a new story remains fixed to the lower right corner. Clicking on any of the stories redirects the user to the story viewing flow, but we shall defer the details of this flow until later.

As mentioned before, the creation flow of a new story can be accessed through the side menu by clicking on the option to create a new story, or from any interface intended to show a list of contributions, by clicking on the red button located on the lower right corner of the application. This flow begins with the opening interface shown in the figure, where a short introduction is presented as well as the minimum and maximum number of works that the user will have to choose in the creation process. Clicking on the start button (`INIZIA`) leads to the first artwork selection stage.



GAM – GAM Game

Nuova storia

Ora puoi selezionare le opere per creare la tua storia (minimo 2 massimo 3).

Per ogni opera potrai aggiungere un pensiero e esprimere i tuoi sentimenti.

INIZIA

GAM – GAM Game

Torna indietro (scegli un'altra opera) #1

Guarda il catalogo e scegli un'opera...

Cerca per titolo o autore...

*Il pescatorello*

VINCENZO GEMITO, NAPOLI,1852 - 1929

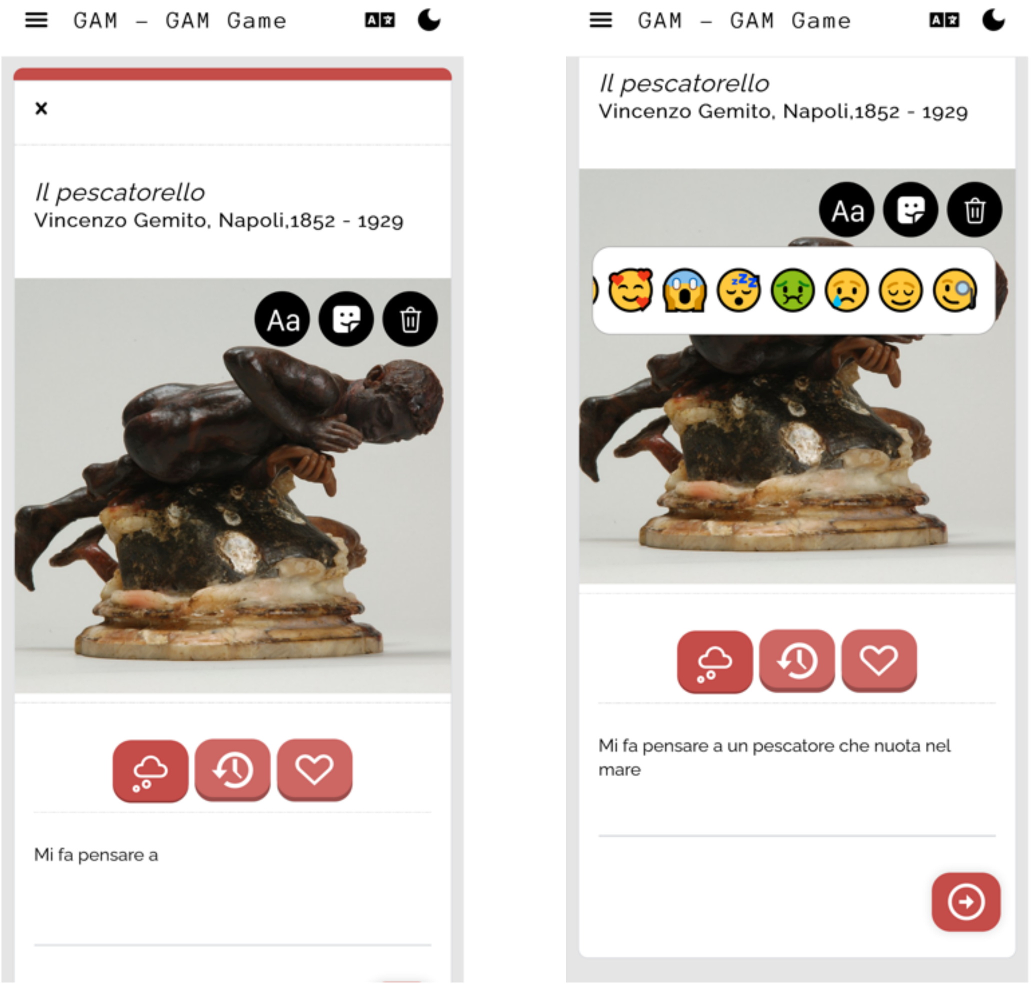
**(a)** Introduction

**(b)** Selecting an artwork from the collection

**Figure 2.13:** GAM Game story creation flow

The story artwork selection stages (figure 2.13b) are closely related to the collection interface, in that they display the artworks available in the activity along with previews of their associated images, title and author, with a search engine for these last two fields, but differ in that clicking on one of the artworks leads to selecting it as the artifact about which the user will make a contribution in the next phase. This occurs after a confirmation window prompts the user if they are sure that the selected work is the desired one, though in the next phase it will be possible to return to this point if the user changes their mind about the chosen work. The artworks shown in this list are randomly ordered, in an attempt to allow the user of the application to discover new artifacts that they may not have seen so far.

Once an artwork has been selected, the application moves on to the interaction phase (figure 2.14a) where the user can choose between different methods to add their own contributions related to the chosen piece. The first of these methods can be seen below the image of the work in the example, and poses three prompts or response starters intended to inspire and motivate users to make their contributions to the work. These prompts are “makes me think of...” (thought cloud icon), “reminds me of...” (rewind in time icon) and “makes me feel...” (heart icon), and the user can complete any of the phrases by clicking on the corresponding icon and filling in their response in the text box. In principle, the user can respond to as many prompts as he/she wishes, and the contributions to each of them are recorded. It is also possible not to respond to any of them, but in the latter case the application will require the user to make a contribution in the form of emoticons or labels, mechanisms that we will discuss below.



*Il pescatorello*
Vincenzo Gemito, Napoli,1852 - 1929

Mi fa pensare a

*Il pescatorello*
Vincenzo Gemito, Napoli,1852 - 1929

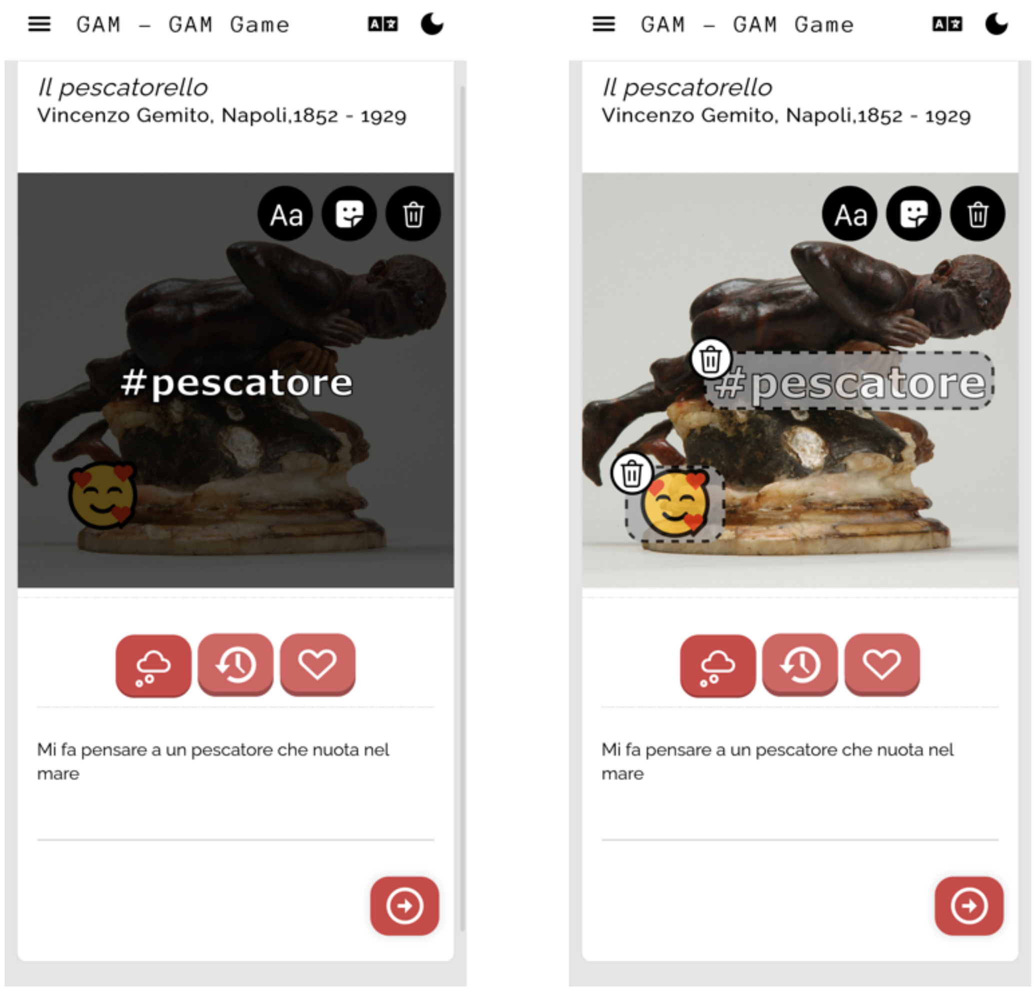
Mi fa pensare a un pescatore che nuota nel mare

**(a)** Adding interactions with chosen artwork **(b)** Add interactions in the form of emojis

**Figure 2.14:** GAM Game story creation flow

The second method of making a contribution can be seen in figure 2.14b and involves the selection and positioning of one or more ”emoticon stickers” over the image of the artwork. These emoticons are chosen so that they can be used to express common emotions such as joy, fear, disgust, amusement or sadness, to name a few examples, in order to make the resulting contributions easily interpretable. To access this type of interaction, the user can click on the sticker icon in the top right corner of the image of the work and select the emoticon they wish to place.

Alternatively, by selecting the icon to the left of the emoji button, it is possible to add contributions in the form of tags placed on top of the image of the artwork. After clicking on the tag button, the user can type in a tag and, after confirming the text, move it to the desired location on top of the image (figure 2.15a). Both emoticons and tags can be deleted at any time by clicking on the bin icon in the top right corner of the image, and then selecting the item to delete as shown in figure 2.15b.



*Il pescatorello*
Vincenzo Gemito, Napoli,1852 - 1929

Mi fa pensare a un pescatore che nuota nel mare

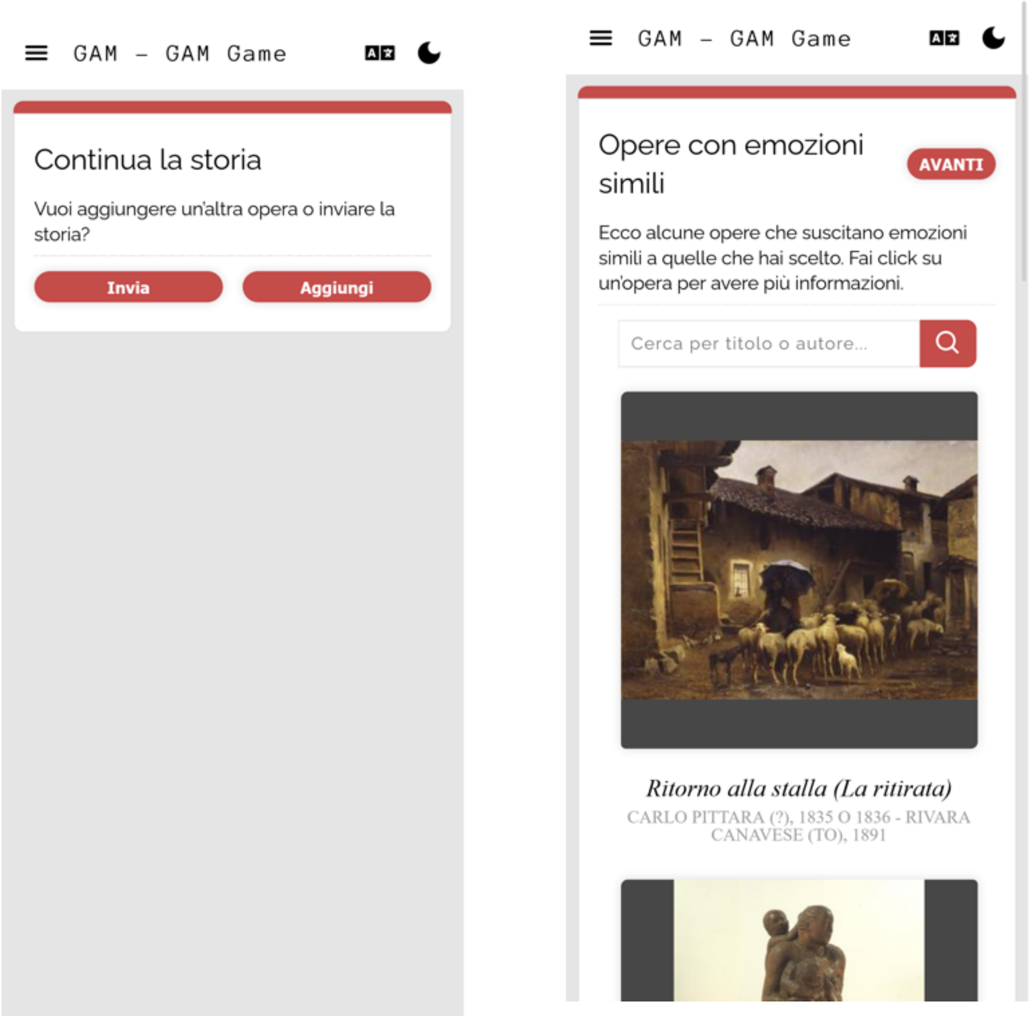
**(a)** Adding interactions in the form of tags

**(b)** Remove tags or emojis

**Figure 2.15:** GAM Game story creation flow

The above process of work selection and interaction will be repeated iteratively as many times as necessary until the user has reached the minimum number of works required to build a story according to the activity configuration. Once this number is reached, however, and assuming that the maximum number of works to be added to the story has not been reached, the user will see a screen like the one in figure 2.16a after finishing each of their contributions. At this transition stage, the user is asked whether they wish to continue with the creation of the story or whether they would prefer to record it as it is at the moment. Choosing the first option launches a new iteration of selection and annotation of works, while the second option leads to the recommendation stages.

Once the user decides to close their story, the application presents them with two complementary stages in which a series of works are listed that evoke similar or opposite emotions to those evoked by the artworks chosen by the user in their story (figure 2.16b and 2.17a). This is done by making a call from the inSPICE server to the Degari reasoner using the artworks included as input for the recommendation. At this point, the user can choose to add any of the artworks shown in their own story, without these counting towards the maximum artwork limit set in the



GAM – GAM Game

Continua la storia

Vuoi aggiungere un'altra opera o inviare la storia?

GAM – GAM Game

Opere con emozioni simili

Ecco alcune opere che suscitano emozioni simili a quelle che hai scelto. Fai click su un'opera per avere più informazioni.

*Ritorno alla stalla (La ritirata)*

CARLO PITTARA (?), 1835 O 1836 - RIVARA CANAVESE (TO), 1891

**(a)** Continue or send story

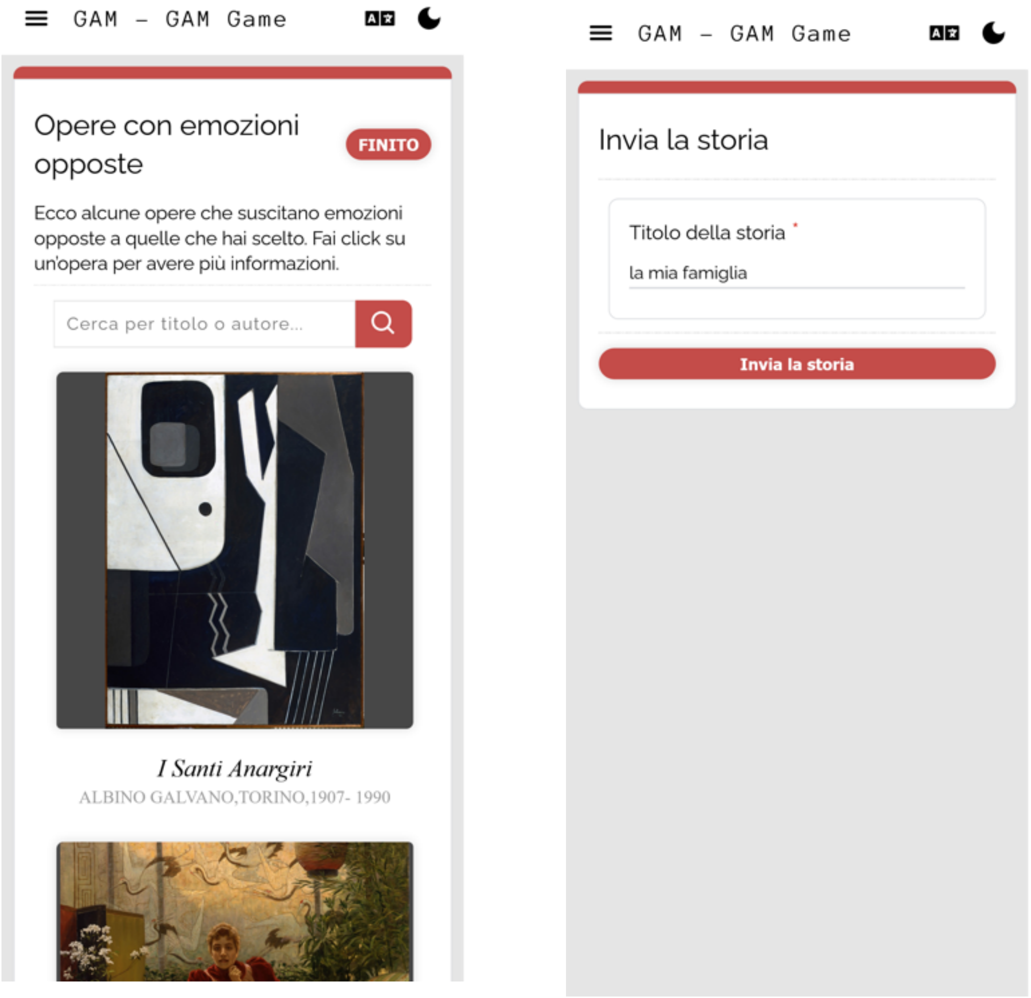
**(b)** Recommendation of artwork with similar emotions

**Figure 2.16:** GAM Game story creation flow

activity. In this way, the museum visitor is given greater exposure to elements both related to and opposed to their original intention. By clicking on the end of creation option (`FINITO` in the example), the last phase of the process proceeds.

Finally, at the story submission stage (figure 2.17b) the user is asked to enter a representative title for their story before it is finally sent to the server by clicking on the submit button (`Invia la storia`).

Once a story has been created, the visitor will be able to consult it under the 'my stories' section of the navigation menu, along with all the other stories that have been created so far (figure 2.18). In this interface it is also possible to delete previous stories that the user does not wish to keep in the system database, by clicking on the recycle bin to the right of the story title.



Opere con emozioni opposte

Ecco alcune opere che suscitano emozioni opposte a quelle che hai scelto. Fai click su un'opera per avere più informazioni.

*I Santi Anargiri*
ALBINO GALVANO,TORINO,1907- 1990

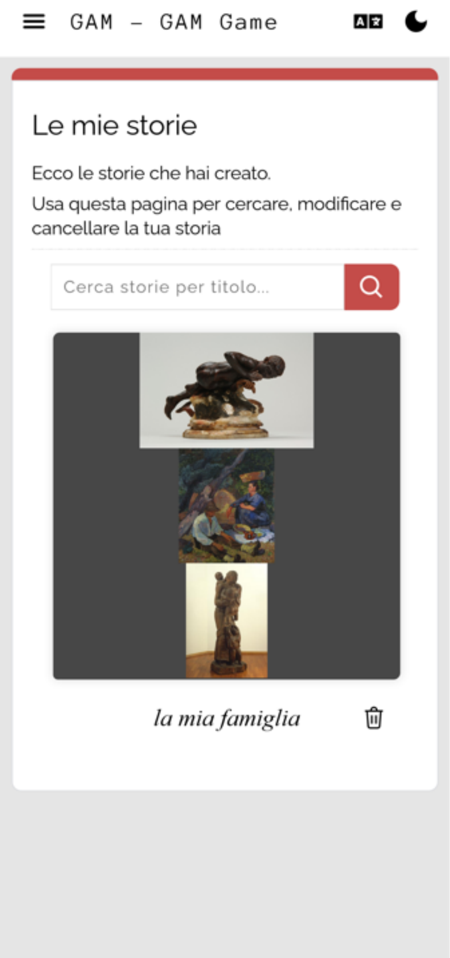
Invia la storia

Titolo della storia *
la mia famiglia

**(a)** Recommending artwork with opposing emotions

**(b)** Story submission

**Figure 2.17:** GAM Game story creation flow



GAM - GAM Game

Le mie storie

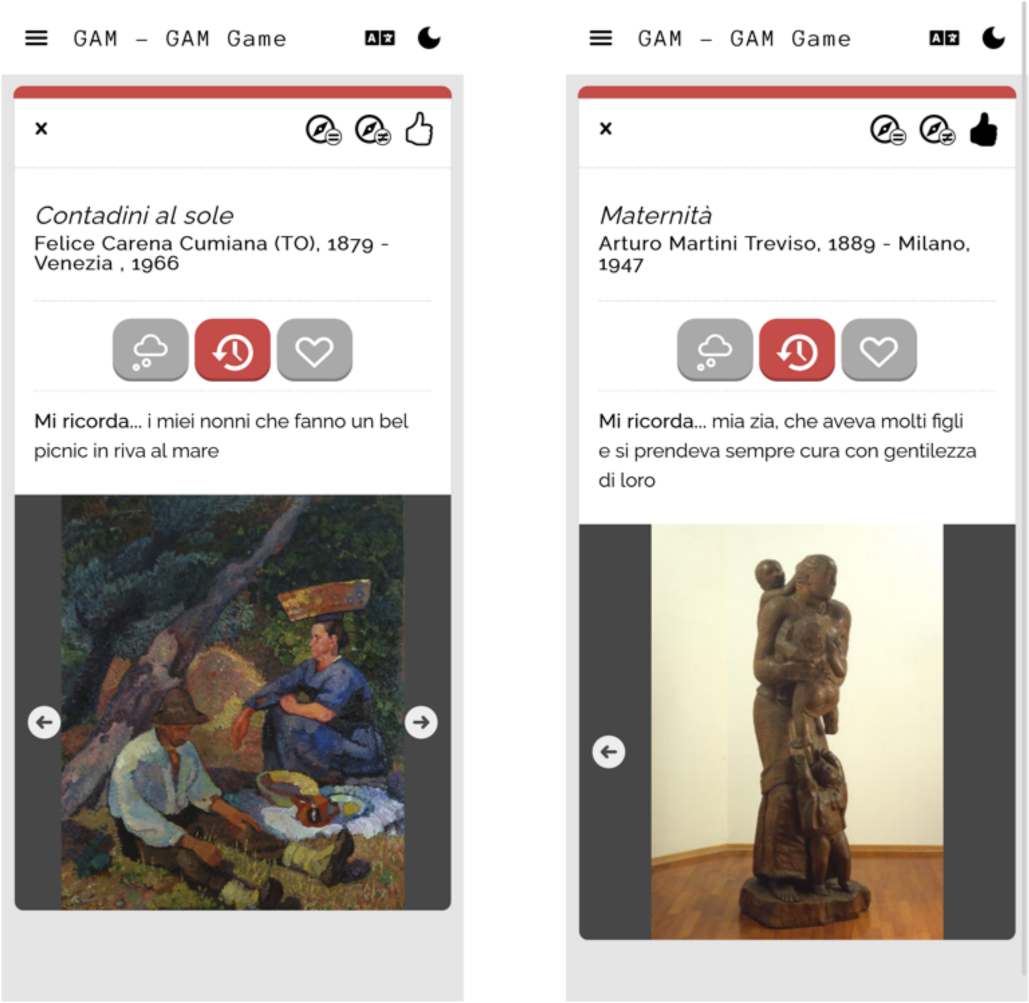
Ecco le storie che hai creato.

Usa questa pagina per cercare, modificare e cancellare la tua storia

*la mia famiglia*

**Figure 2.18:** Management interface of the stories created by the active user.

By clicking on any story in interfaces intended to display lists of interactions, such as those in figures 2.12b and 2.18,the application will display an interface for viewing the corresponding story, as shown in figure 2.19a. Here, the user can consult the responses of the author of the story to each of the prompts mentioned above, by clicking on the corresponding icon (noting here that only the buttons associated with prompts for which the user has provided a response will be available, the others being disabled and greyed out). Navigation between the artworks included in the story takes place by means of the directional arrows located to the left and right of the image associated with each artwork, and the emoticons and labels placed on the image in the creation mode will also be shown here, assuming the user has included any of them. As for the actions at the top of the viewing panel, it is worth mentioning that the user can return to the previous screen by clicking on the "x" button in the top left corner, specify that they like the story they are viewing with the "thumbs-up" icon in the top right corner, and explore similar or opposing stories to the one selected by making use of the compass icons to the left of the like button. The exploration of similar and opposite artworks also makes use of the Degari reasoner, making in this case the inference not on singular artworks, but on relations between stories, allowing to find contributions with semantic relations to the selected one. Finally, clicking on the like icon alternates between the filled and unfilled finger icon as a way of identifying whether the user has already clicked on the like button or not (see figure 2.19b).



*Contadini al sole*
Felice Carena Cumiana (TO), 1879 - Venezia , 1966

Mi ricorda... i miei nonni che fanno un bel picnic in riva al mare

*Maternità*
Arturo Martini Treviso, 1889 - Milano, 1947

Mi ricorda... mia zia, che aveva molti figli e si prendeva sempre cura con gentilezza di loro

**(a)** Story **(b)** User liked story

**Figure 2.19:** GAM Game story display interface

## 2.3 Hecht

The Hecht museum use case offers a series of activities related to the theme of rebellion, both before, during, and after visitors' museum visits. The first activity is a multi-stage form that visitors complete before their museum visit. The form consists of questionnaires on history relevance, demographics, and more, as well as a series of questions prompted by media such as videos and texts. The questions include a variety of question types, including text highlighting, multiple-choice, ordering of lists, and likert scales, and visitors are encouraged to reflect upon their responses and consider their own perspectives on the topic of rebellion.

During the museum visit, visitors participate in a similar multi-stage form that includes their responses from the first questionnaire. The questions in this form challenge visitors to reevaluate their initial perspectives on the topic of rebellion and provide an opportunity for deeper reflection and learning.

After the museum visit, visitors take part in an activity that involves collecting a series of items from different sets, including furniture, coins, weapons, Jewish life, governance, temple and symbols, Jewish rebellion, and Jewish society. This activity allows visitors to delve further into the topic of rebellion and gain a deeper understanding of the historical context surrounding it. The activities can then be understood as a form of artifact analysis and collection, depending on the stage of the visit they are done at.

In order to gain a better understanding of the user experience during the Hecht Museum activities, we will now take a brief walkthrough of the process, starting with the activity that users see before their visit to the museum.

From the home page, the Hamburger icon allows the user to navigate between different applications in a seamless and user-friendly way. By clicking on the icon, a menu will appear with a variety of options to choose from, making it easy to switch between different pages or sections of the application (figure 2.20).

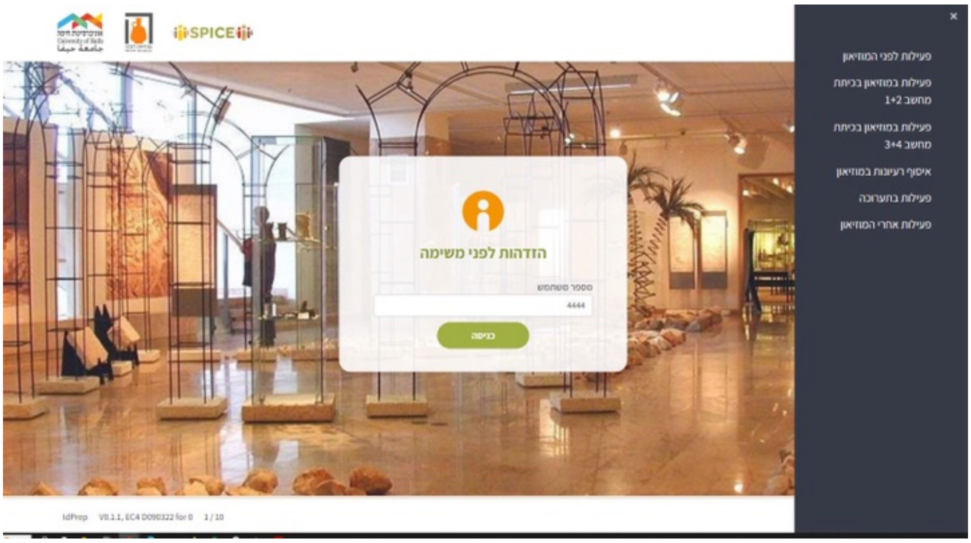


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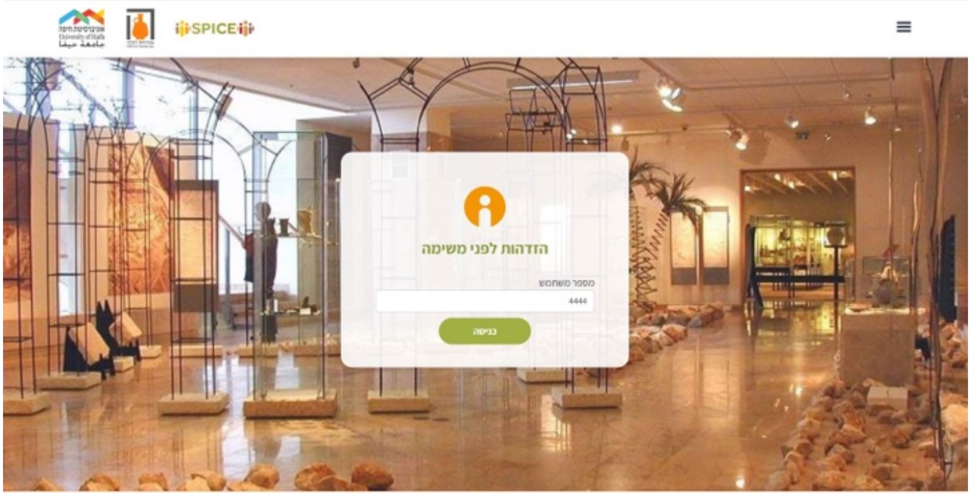
**Figure 2.20:** Logging in to the web application.

The login page is a critical component of any application, as it serves as the gateway for users to access their accounts and begin using the application's features. It includes fields for users to enter their login credentials in the form of username and password (figure 2.21).

Demographics is a crucial part of any user research study, as it provides valuable information about the background and characteristics of the participants. In a multiple choice format, fields may be required for users to fill out, including questions related to age, gender, education level, and more. The first line includes the title of the survey, while the second line provides instructions and the third line allows users to leave comments. The survey concludes with a submit button, followed by a screen that displays the screen name, version number, screen number, and a box that allows users to navigate to a particular screen (figure 2.22).



הזדהות לפני משימה

מספר משתמש

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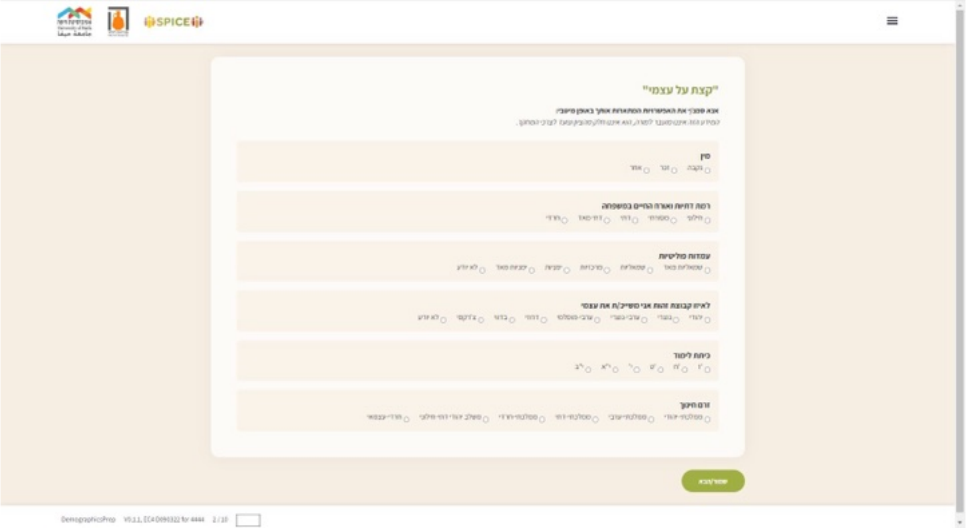
כניסה

**Figure 2.21:** Entering user credentials.



"קצת על עצמי"

אנא סמנ/י את האפשרויות המתארות אותך באופן מיטבי

המידע הזה אינו משמש לזהות, הוא אנונימי ומשמש לצרכי המחקר.

מין
○ נקבה ○ זכר ○ אחר

רמת דתיות ואורח החיים במשפחה
○ חילוני ○ מסורתי ○ דתי ○ דתי מאוד ○ חרדי

עמדות פוליטיות
○ שמאלנית מאוד ○ שמאלנית ○ מרכזית ○ ימנית ○ ימנית מאוד ○ לא יודע

לאיזו קבוצת זהות אני משייכ/ת את עצמי
○ יהודי ○ נוצרי ○ ערבי-נוצרי ○ ערבי-מוסלמי ○ דרוזי ○ בדואי ○ צ'רקסי ○ לא יודע

כיתת לימוד
○ ז' ○ ח' ○ ט' ○ י' ○ י"א ○ י"ב

זרם חינוך
○ ממלכתי-יהודי ○ ממלכתי-ערבי ○ ממלכתי-דתי ○ ממלכתי-חרדי ○ משלב יהודי דתי חילוני ○ חרדי-עצמאי

שמור/הבא

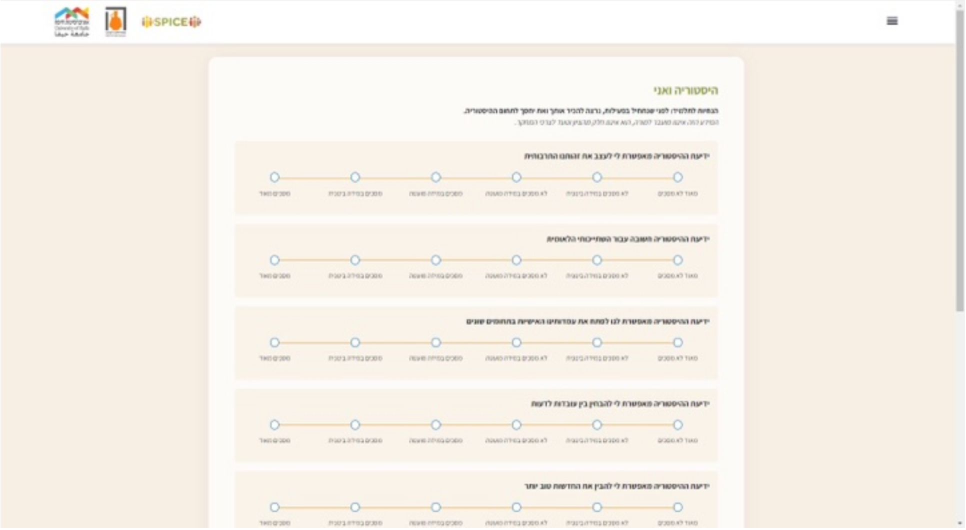
DemographicsPrep V5.1.1, EC4 D89322 for 4444 2/10

**Figure 2.22:** Demographics form.

The RHMS (History Relevance Questionnaire Likert Scale) is an important tool for measuring the relevance of historical events to contemporary audiences. Participants are asked to rate their level of agreement with a series of statements on a scale of 1 to 6, with 1 indicating strong disagreement and 6 indicating strong agreement. This data can then be used to better understand the perceived relevance of historical events and how they are interpreted by different audiences (figure 2.23).

The AOT (Openness Questionnaire) is a questionnaire that assesses an individual's level of openness to new experiences and ideas. Participants are asked a series of questions related to their willingness to try new things, their curiosity, and their level of imagination. This questionnaire can provide valuable insights into an individual's personality and may be used for research or self-reflection purposes (figure 2.24).

Media followed by Questions with at least 30 Characters (figure 2.25): This part of the activity involves presenting participants with a piece of media, such as a video or text, followed by a series of questions that require thoughtful responses of at least 30 characters. This format encourages participants to engage more deeply with the material



היסטוריה ואני

הנחיות לתלמיד/ה: לפני שנתחיל בפעילות, נרצה להכיר אותך ואת יחסך לתחום ההיסטוריה.

[illegible]

ידיעת ההיסטוריה מאפשרת לי לעצב את זהותי התרבותית

○ מאוד לא מסכים ○ לא מסכים במידה בינונית ○ לא מסכים במידה מועטה ○ מסכים במידה מועטה ○ מסכים במידה בינונית ○ מסכים מאוד

ידיעת ההיסטוריה חשובה עבור השתייכותי הלאומית

○ מאוד לא מסכים ○ לא מסכים במידה בינונית ○ לא מסכים במידה מועטה ○ מסכים במידה מועטה ○ מסכים במידה בינונית ○ מסכים מאוד

ידיעת ההיסטוריה מאפשרת לנו לפתח את עמדותינו האישיות בתחומים שונים

○ מאוד לא מסכים ○ לא מסכים במידה בינונית ○ לא מסכים במידה מועטה ○ מסכים במידה מועטה ○ מסכים במידה בינונית ○ מסכים מאוד

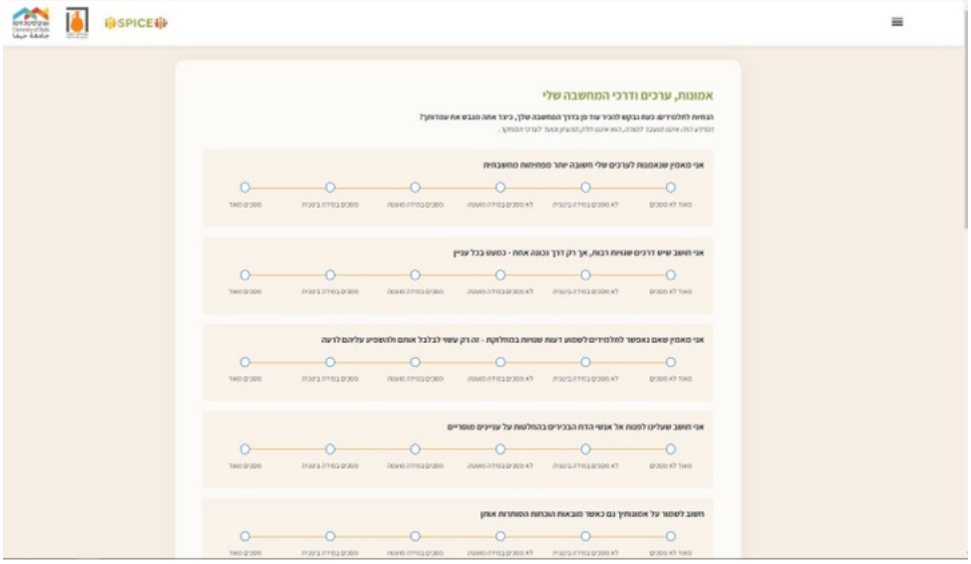
ידיעת ההיסטוריה מאפשרת לי להבחין בין עובדות לדעות

○ מאוד לא מסכים ○ לא מסכים במידה בינונית ○ לא מסכים במידה מועטה ○ מסכים במידה מועטה ○ מסכים במידה בינונית ○ מסכים מאוד

ידיעת ההיסטוריה מאפשרת לי להבין את החדשות טוב יותר

○ מאוד לא מסכים ○ לא מסכים במידה בינונית ○ לא מסכים במידה מועטה ○ מסכים במידה מועטה ○ מסכים במידה בינונית ○ מסכים מאוד

**Figure 2.23:** RHMS to measure the relevance of historical events to contemporary audiences.



אמונות, ערכים ודרכי המחשבה שלי

הנחיות לתלמידים: כעת נבקש להכיר עוד קצת בדרך המחשבה שלך, כיצד אתה מגבש את עמדותיך?

[illegible]

אני מאמין שנאמנות לערכים שלי חשובה יותר מפתיחות מחשבתית

○ מאוד לא מסכים ○ לא מסכים במידה בינונית ○ לא מסכים במידה מועטה ○ מסכים במידה מועטה ○ מסכים במידה בינונית ○ מסכים מאוד

אני חושב שיש דרכים שונות רבות, אך רק דרך נכונה אחת - כמעט בכל עניין

○ מאוד לא מסכים ○ לא מסכים במידה בינונית ○ לא מסכים במידה מועטה ○ מסכים במידה מועטה ○ מסכים במידה בינונית ○ מסכים מאוד

אני מאמין שאם נאפשר לתלמידים לשמוע דעות שונות במחלוקת - זה רק עשוי לבלבל אותם ולהשפיע עליהם לרעה

○ מאוד לא מסכים ○ לא מסכים במידה בינונית ○ לא מסכים במידה מועטה ○ מסכים במידה מועטה ○ מסכים במידה בינונית ○ מסכים מאוד

אני חושב שעלינו לפנות אל אנשי הדת הבכירים בהחלטות על עניינים מוסריים

○ מאוד לא מסכים ○ לא מסכים במידה בינונית ○ לא מסכים במידה מועטה ○ מסכים במידה מועטה ○ מסכים במידה בינונית ○ מסכים מאוד

חשוב לשמור על אמונותיך גם כאשר מובאות הוכחות הסותרות אותן

○ מאוד לא מסכים ○ לא מסכים במידה בינונית ○ לא מסכים במידה מועטה ○ מסכים במידה מועטה ○ מסכים במידה בינונית ○ מסכים מאוד

**Figure 2.24:** AOT Openness Questionnaire.

and express their own perspectives and opinions.

Continuation - Media Collapse/Expand (figures 2.26 and 2.27): This part involves a continuation of the previous activity, with participants given the option to collapse or expand the media to better facilitate their engagement with the material. Additionally, participants may be asked to arrange a list of items in a specific order by dragging and dropping.

Text+Picture followed by open-ended questions (figure 2.28): This section involves presenting participants with a combination of text and images, followed by open-ended questions that allow them to express their thoughts and opinions on the material. This format can be a great way to encourage deeper reflection and critical thinking, as well as providing participants with a creative outlet to express themselves.

Multiple choice with categories (figure 2.29): This section involves presenting participants with a series of multiple

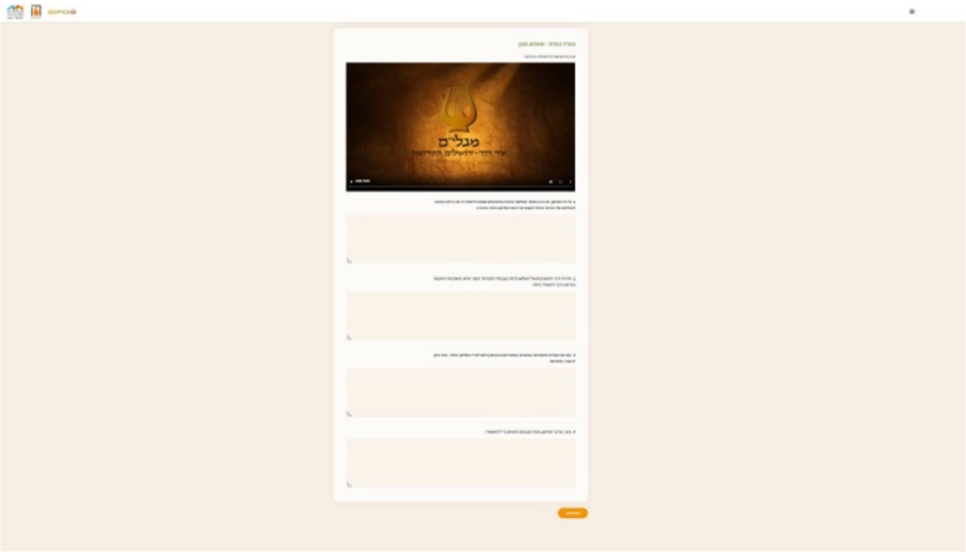


**Figure 2.25:** Media with open-ended questions.

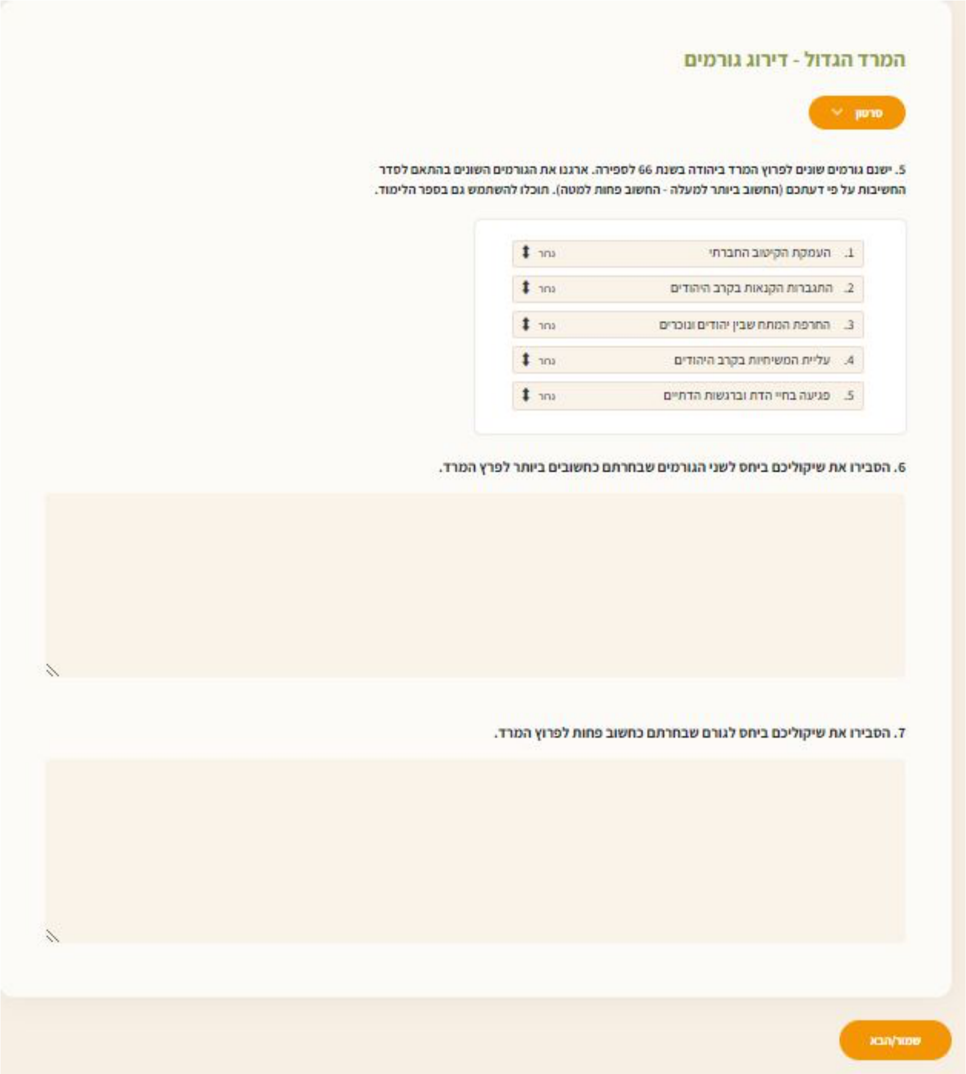
choice questions, organized into categories for ease of use. Participants are asked to rate their level of agreement with statements, or to select the best response from a list of options.

We now move on to showing the stages of the second activity which is done during the users' visit to the museum.

Show previous opinion (from User Model, figure 2.30): This section involves displaying a participant's previous responses to a survey or questionnaire, providing an opportunity for them to reflect on their previous opinions and potentially revise or refine their views.

Next, the user will be presented with their own previous opinion about the topic of rebellion, based on their responses. The user will then be prompted to highlight different parts of the text using colors based on a set of given categories, such as emotions, themes, or key ideas. This activity is designed to help the user reflect on their own opinions and thought processes, as well as to encourage them to consider different perspectives on the topic (figures 2.31 and 2.32).

After this, the user will be presented with a piece of text that they previously highlighted. The text will be displayed in individual boxes, and the user can click on each box to reveal the corresponding word or phrase in the text. As each box is clicked, the text will be gradually revealed, one color at a time. This section is designed to help the user focus on individual words and phrases, and to encourage them to consider the meaning and significance of each element of the text based on their own highlighting (figure 2.33). Once this is done, the user will be shown the entire text with highlighting and asked a set of final questions (figure 2.34).



המרד הגדול - דירוג גורמים

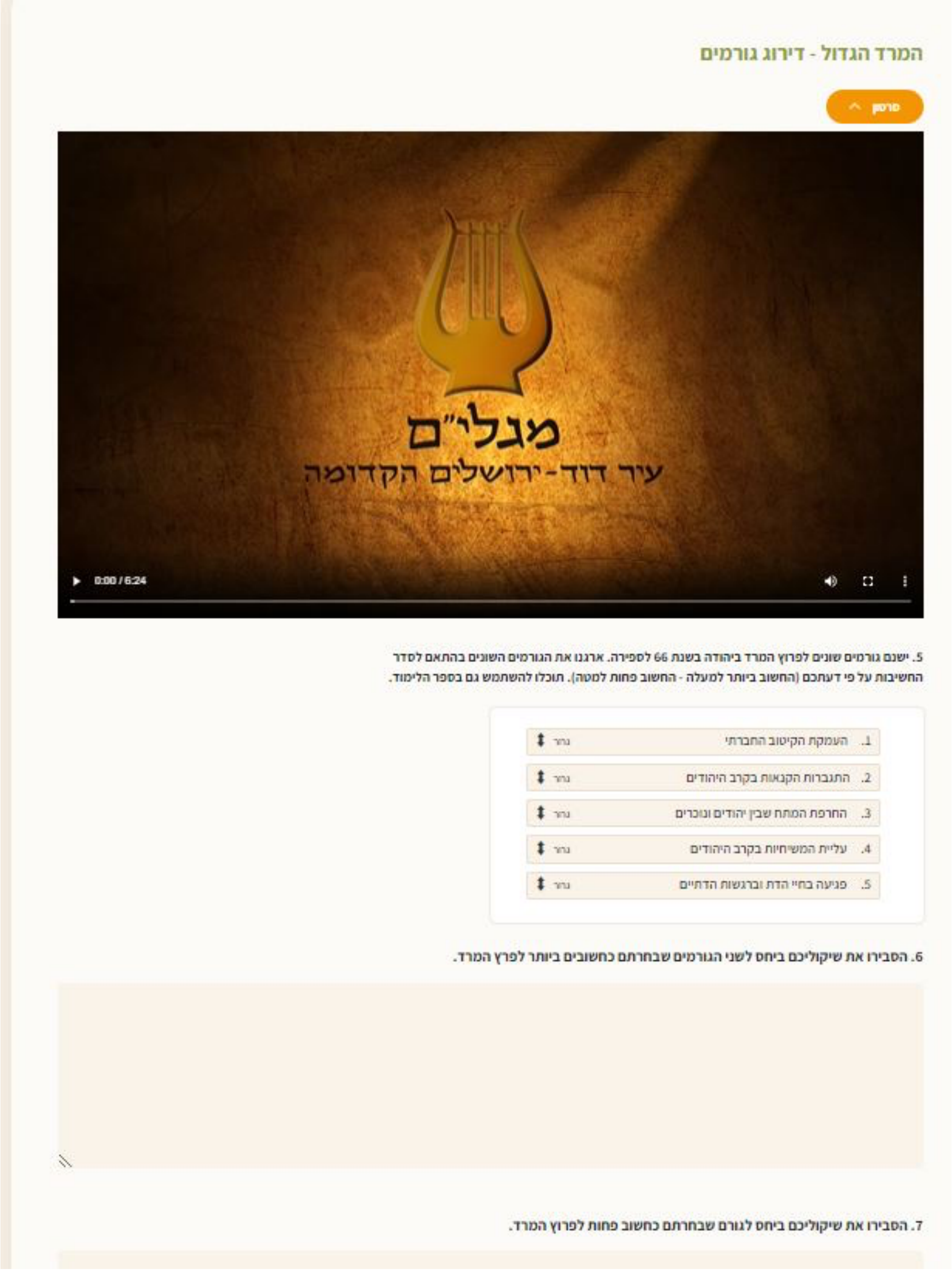
5. ישנם גורמים שונים לפרוץ המרד ביהודה בשנת 66 לספירה. ארגנו את הגורמים השונים בהתאם לסדר
החשיבות על פי דעתכם (החשוב ביותר למעלה - החשוב פחות למטה). תוכלו להשתמש גם בספר הלימוד.

1. העמקת הקיטוב החברתי נחר ⬍
2. התגברות הקנאות בקרב היהודים נחר ⬍
3. החרפת המתח שבין יהודים ונוכרים נחר ⬍
4. עליית המשיחיות בקרב היהודים נחר ⬍
5. פגיעה בחיי הדת וברגשות הדתיים נחר ⬍

6. הסבירו את שיקוליכם ביחס לשני הגורמים שבחרתם כחשובים ביותר לפרץ המרד.

7. הסבירו את שיקוליכם ביחס לגורם שבחרתם כחשוב פחות לפרוץ המרד.

**Figure 2.26:** Reordering items from a list and more open-ended questions.



המרד הגדול - דירוג גורמים

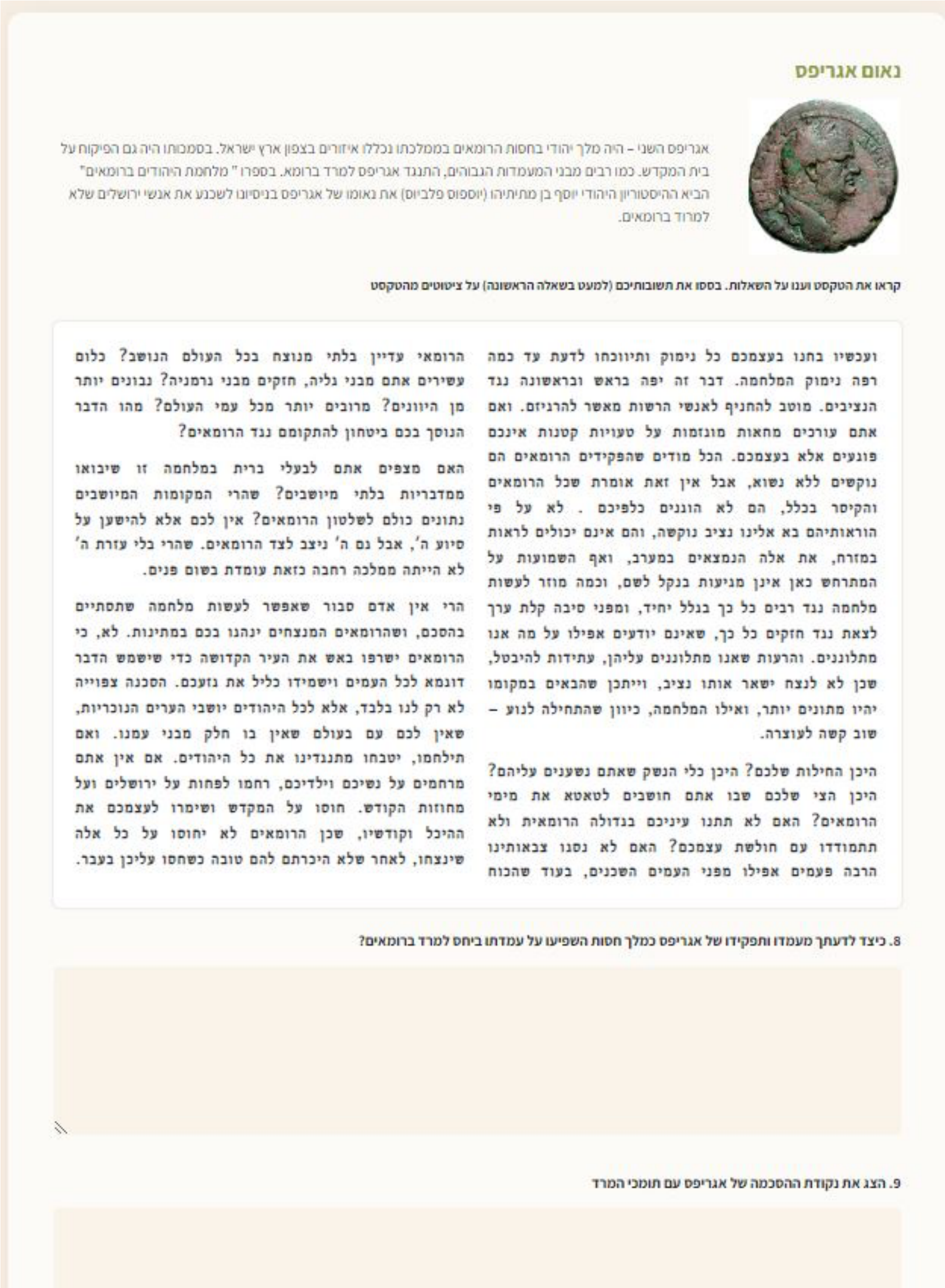
5. ישנם גורמים שונים לפרוץ המרד ביהודה בשנת 66 לספירה. ארגנו את הגורמים השונים בהתאם לסדר החשיבות על פי דעתכם (החשוב ביותר למעלה - החשוב פחות למטה). תוכלו להשתמש גם בספר הלימוד.

1. העמקת הקיטוב החברתי גרור ⬍
2. התגברות הקנאות בקרב היהודים גרור ⬍
3. החרפת המתח שבין יהודים ונוכרים גרור ⬍
4. עליית המשיחיות בקרב היהודים גרור ⬍
5. פגיעה בחיי הדת וברגשות הדתיים גרור ⬍

6. הסבירו את שיקוליכם ביחס לשני הגורמים שבחרתם כחשובים ביותר לפרץ המרד.

7. הסבירו את שיקוליכם ביחס לגורם שבחרתם כחשוב פחות לפרוץ המרד.

**Figure 2.27:** Toggling media on and off.



נאום אגריפס

אגריפס השני – היה מלך יהודי בחסות הרומאים בממלכתו נכללו איזורים בצפון ארץ ישראל. בסמכותו היה גם הפיקוח על בית המקדש. כמו רבים מבני המעמדות הגבוהים, התנגד אגריפס למרד ברומא. בספרו " מלחמת היהודים ברומאים" הביא ההיסטוריון היהודי יוסף בן מתיתיהו (יוספוס פלביוס) את נאומו של אגריפס בניסיונו לשכנע את אנשי ירושלים שלא למרוד ברומאים.

קראו את הטקסט וענו על השאלות. בססו את תשובותיכם (למעט בשאלה הראשונה) על ציטוטים מהטקסט

ועכשיו בחנו בעצמכם כל נימוק ותיווכחו לדעת עד כמה רפה נימוק המלחמה. דבר זה יפה בראש ובראשונה נגד הנציבים. מוטב להחניף לאנשי הרשות מאשר להרגיזם. ואם אתם עורכים מחאות מוגזמות על טעויות קטנות אינכם פוגעים אלא בעצמכם. הכל מודים שהפקידים הרומאים הם נוקשים ללא נשוא, אבל אין זאת אומרת שכל הרומאים והקיסר בכלל, הם לא הוגנים כלפיכם . לא על פי הוראותיהם בא אלינו נציב נוקשה, והם אינם יכולים לראות במזרח, את אלה הנמצאים במערב, ואף השמועות על המתרחש כאן אינן מגיעות בנקל לשם, וכמה מוזר לעשות מלחמה נגד רבים כל כך בגלל יחיד, ומפני סיבה קלת ערך לצאת נגד חזקים כל כך, שאינם יודעים אפילו על מה אנו מתלוננים. והרעות שאנו מתלוננים עליהן, עתידות להיבטל, שכן לא לנצח ישאר אותו נציב, וייתכן שהבאים במקומו יהיו מתונים יותר, ואילו המלחמה, כיוון שהתחילה לנוע – שוב קשה לעוצרה.

היכן החילות שלכם? היכן כלי הנשק שאתם נשענים עליהם? היכן הצי שלכם שבו אתם חושבים לטאטא את מימי הרומאים? האם לא תתנו עיניכם בגדולה הרומאית ולא תתמודדו עם חולשת עצמכם? האם לא נסנו צבאותינו הרבה פעמים אפילו מפני העמים השכנים, בעוד שהכוח הרומאי עדיין בלתי מנוצח בכל העולם הנושב? כלום עשירים אתם מבני גליה, חזקים מבני גרמניה? נבונים יותר מן היוונים? מרובים יותר מכל עמי העולם? מהו הדבר הנוסך בכם ביטחון להתקומם נגד הרומאים?

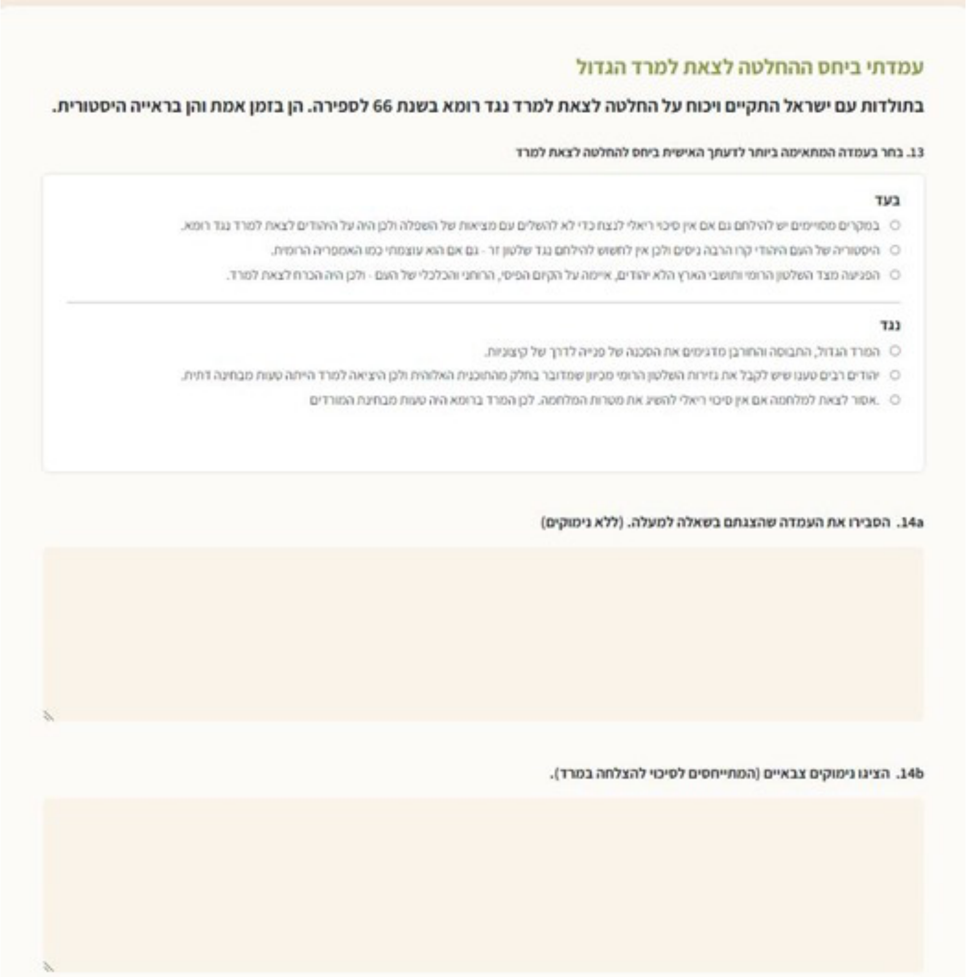
האם מצפים אתם לבעלי ברית במלחמה זו שיבואו ממדבריות בלתי מיושבים? שהרי המקומות המיושבים נתונים כולם לשלטון הרומאים? אין לכם אלא להישען על סיוע ה', אבל גם ה' ניצב לצד הרומאים. שהרי בלי עזרת ה' לא הייתה ממלכה רחבה כזאת עומדת בשום פנים.

הרי אין אדם סבור שאפשר לעשות מלחמה שתסתיים בהסכם, ושהרומאים המנצחים ינהגו בכם במתינות. לא, כי הרומאים ישרפו באש את העיר הקדושה כדי שישמש הדבר דוגמא לכל העמים וישמידו כליל את גזעכם. הסכנה צפוייה לא רק לנו בלבד, אלא לכל היהודים יושבי הערים הנוכריות, שאין לכם עם בעולם שאין בו חלק מבני עמנו. ואם תילחמו, יטבחו מתנגדינו את כל היהודים. אם אין אתם מרחמים על נשיכם וילדיכם, רחמו לפחות על ירושלים ועל מחוזות הקודש. חוסו על המקדש ושימרו לעצמכם את ההיכל וקודשיו, שכן הרומאים לא יחוסו על כל אלה שינצחו, לאחר שלא היכרתם להם טובה כשחסו עליכן בעבר.

8. כיצד לדעתך מעמדו ותפקידו של אגריפס כמלך חסות השפיעו על עמדתו ביחס למרד ברומאים?

9. הצג את נקודת ההסכמה של אגריפס עם תומכי המרד

**Figure 2.28:** Text as media with related questions.



עמדתי ביחס ההחלטה לצאת למרד הגדול

בתולדות עם ישראל התקיים ויכוח על החלטה לצאת למרד נגד רומא בשנת 66 לספירה. הן בזמן אמת והן בראייה היסטורית.

13. בחר בעמדה המתאימה ביותר לדעתך האישית ביחס להחלטה לצאת למרד

בעד

○ במקרים מסויימים יש להילחם גם אם אין סיכוי ריאלי לנצח כדי לא להשלים עם מציאות של השפלה ולכן היה על היהודים לצאת למרד נגד רומא.

○ היסטוריה של העם היהודי קרו הרבה ניסים ולכן אין לחשוש להילחם נגד שלטון זר - גם אם הוא עוצמתי כמו האמפריה הרומית.

○ הפגיעה מצד השלטון הרומי ותושבי הארץ הלא יהודים, איימה על הקיום הפיסי, הרוחני והכלכלי של העם - ולכן היה הכרח לצאת למרד.

נגד

○ המרד הגדול, התבוסה והחורבן מדגימים את הסכנה של פנייה לדרך של קיצוניות.

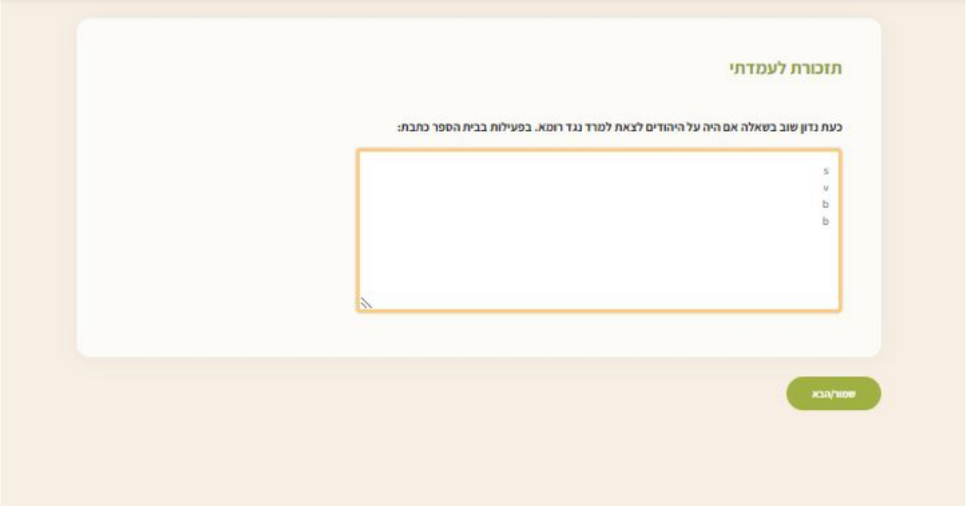
○ יהודים רבים טענו שיש לקבל את גזירות השלטון הרומי מכיון שמדובר בחלק מהתוכנית האלוהית ולכן היציאה למרד הייתה טעות מבחינה דתית.

○ .אסור לצאת למלחמה אם אין סיכוי ריאלי להשיג את מטרות המלחמה. לכן המרד ברומא היה טעות מבחינת המורדים

14a. הסבירו את העמדה שהצגתם בשאלה למעלה. (ללא נימוקים)

14b. הציגו נימוקים צבאיים (המתייחסים לסיכוי להצלחה במרד).

**Figure 2.29:** Multiple choice questions introduced.

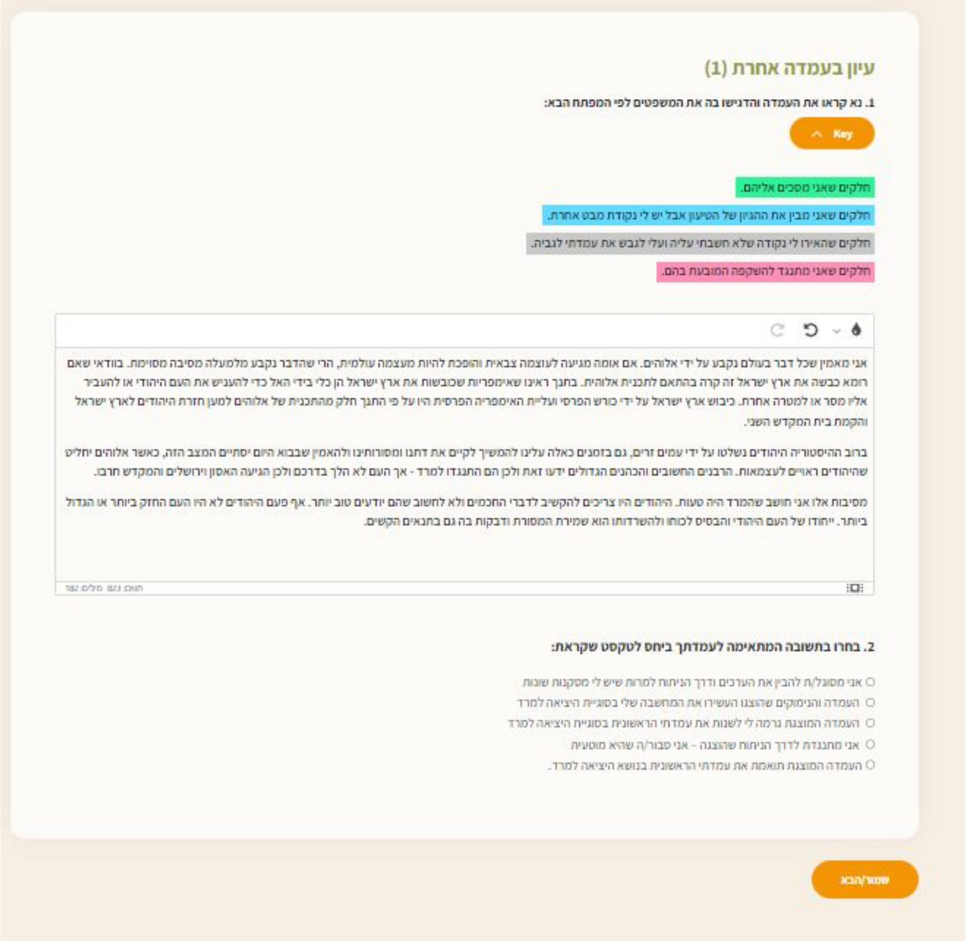


תזכורת לעמדתי

כעת נדון שוב בשאלה אם היה על היהודים לצאת למרד נגד רומא. בפעילות בבית הספר כתבת:

s
v
b
b

**Figure 2.30:** Showing previous opinion from user Model.



עיון בעמדה אחרת (1)

1. נא קראו את העמדה והדגישו בה את המשפטים לפי המפתח הבא:

🟩 חלקים שאני מסכים אליהם.

🟦 חלקים שאני מבין את ההגיון של הטיעון אבל יש לי נקודת מבט אחרת.

⬜ חלקים שהאירו לי נקודה שלא חשבתי עליה ועלי לגבש את עמדתי לגביה.

🟥 חלקים שאני מתנגד להשקפה המובעת בהם.

אני מאמין שכל דבר בעולם נקבע על ידי אלוהים. אם אומה מגיעה לעוצמה צבאית והופכת להיות מעצמה עולמית, הרי שהדבר נקבע מלמעלה מסיבה מסוימת. בוודאי שאם רומא כבשה את ארץ ישראל זה קרה בהתאם לתכנית אלוהית. בתנך ראינו שאימפריות שכובשות את ארץ ישראל הן כלי בידי האל כדי להעניש את העם היהודי או להעביר אליו מסר או למטרה אחרת. כיבוש ארץ ישראל על ידי כורש הפרסי ועליית האימפריה הפרסית היו על פי התנך חלק מהתכנית של אלוהים למען חזרת היהודים לארץ ישראל והקמת בית המקדש השני.

ברוב ההיסטוריה היהודים נשלטו על ידי עמים זרים, גם בזמנים כאלה עלינו להמשיך לקיים את דתנו ומסורותינו ולהאמין שבבוא היום יסתיים המצב הזה, כאשר אלוהים יחליט שהיהודים ראויים לעצמאות. הרבנים החשובים והכהנים הגדולים ידעו זאת ולכן הם התנגדו למרד - אך העם לא הלך בדרכם ולכן הגיעה האסון וירושלים והמקדש חרבו.

מסיבות אלו אני חושב שהמרד היה טעות. היהודים היו צריכים להקשיב לדברי החכמים ולא לחשוב שהם יודעים טוב יותר. אף פעם היהודים לא היו העם החזק ביותר או הגדול ביותר. ייחודו של העם היהודי והבסיס לכוחו ולהשרדותו הוא שמירת המסורת ודבקות בה גם בתנאים הקשים.

2. בחרו בתשובה המתאימה לעמדתך ביחס לטקסט שקראת:

○ אני מסוגל/ת להבין את הערכים ודרך הניתוח למרות שיש לי מסקנות שונות

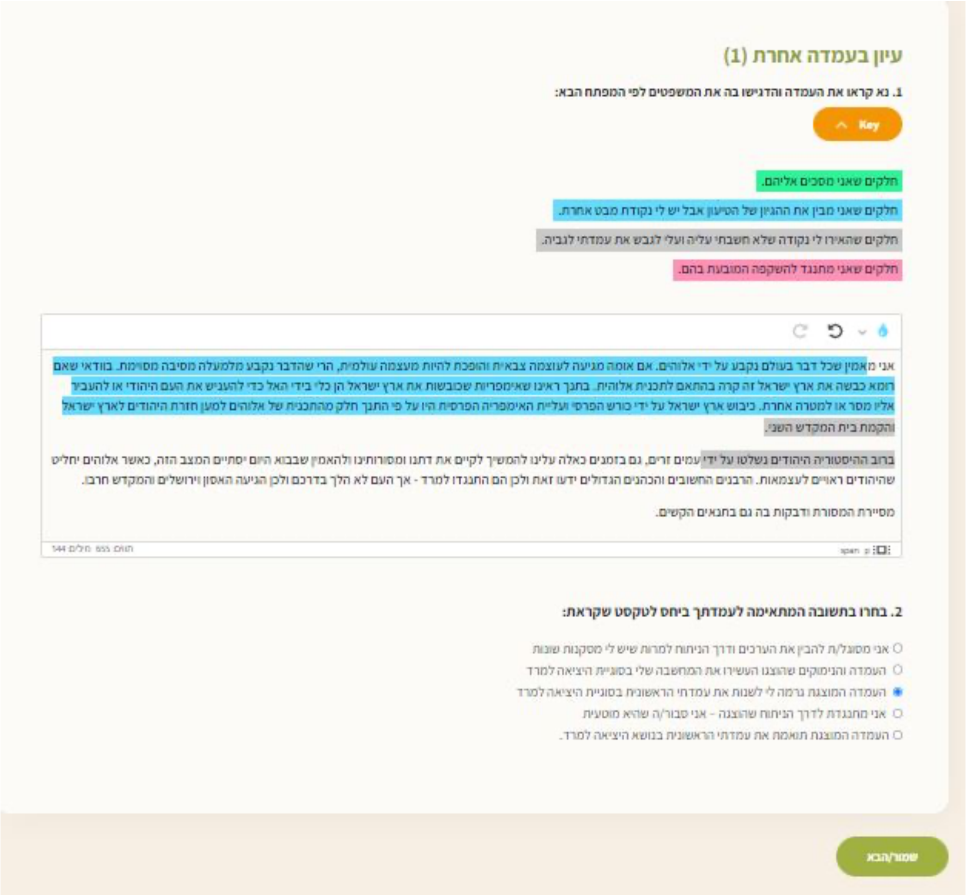
○ העמדה והנימוקים שהוצגו העשירו את המחשבה שלי בסוגיית היציאה למרד

○ העמדה המוצגת גרמה לי לשנות את עמדתי הראשונית בסוגיית היציאה למרד

○ אני מתנגדת לדרך הניתוח שהוצגה - אני סבור/ה שהיא מוטעית

○ העמדה המוצגת תואמת את עמדתי הראשונית בנושא היציאה למרד.

**Figure 2.31:** Highlight prompt from user's previous opinion.



עיון בעמדה אחרת (1)

1. נא קראו את העמדה והדגישו בה את המשפטים לפי המפתח הבא:

חלקים שאני מסכים אליהם.

חלקים שאני מבין את ההגיון של הטיעון אבל יש לי נקודת מבט אחרת.

חלקים שהאירו לי נקודה שלא חשבתי עליה ועלי לגבש את עמדתי לגביה.

חלקים שאני מתנגד להשקפה המובעת בהם.

אני מאמין שכל דבר בעולם נקבע על ידי אלוהים. אם אומה מגיעה לעוצמה צבאית והופכת להיות מעצמה עולמית, הרי שהדבר נקבע מלמעלה מסיבה מסוימת. בוודאי שאם רומא כבשה את ארץ ישראל זה קרה בהתאם לתכנית אלוהית. בתנך ראינו שאימפריות שכובשות את ארץ ישראל הן כלי בידי האל כדי להעניש את העם היהודי או להעביר אליו מסר או למטרה אחרת. כיבוש ארץ ישראל על ידי כורש הפרסי ועליית האימפריה הפרסית היו על פי התנך חלק מהתכנית של אלוהים למען חזרת היהודים לארץ ישראל והקמת בית המקדש השני.

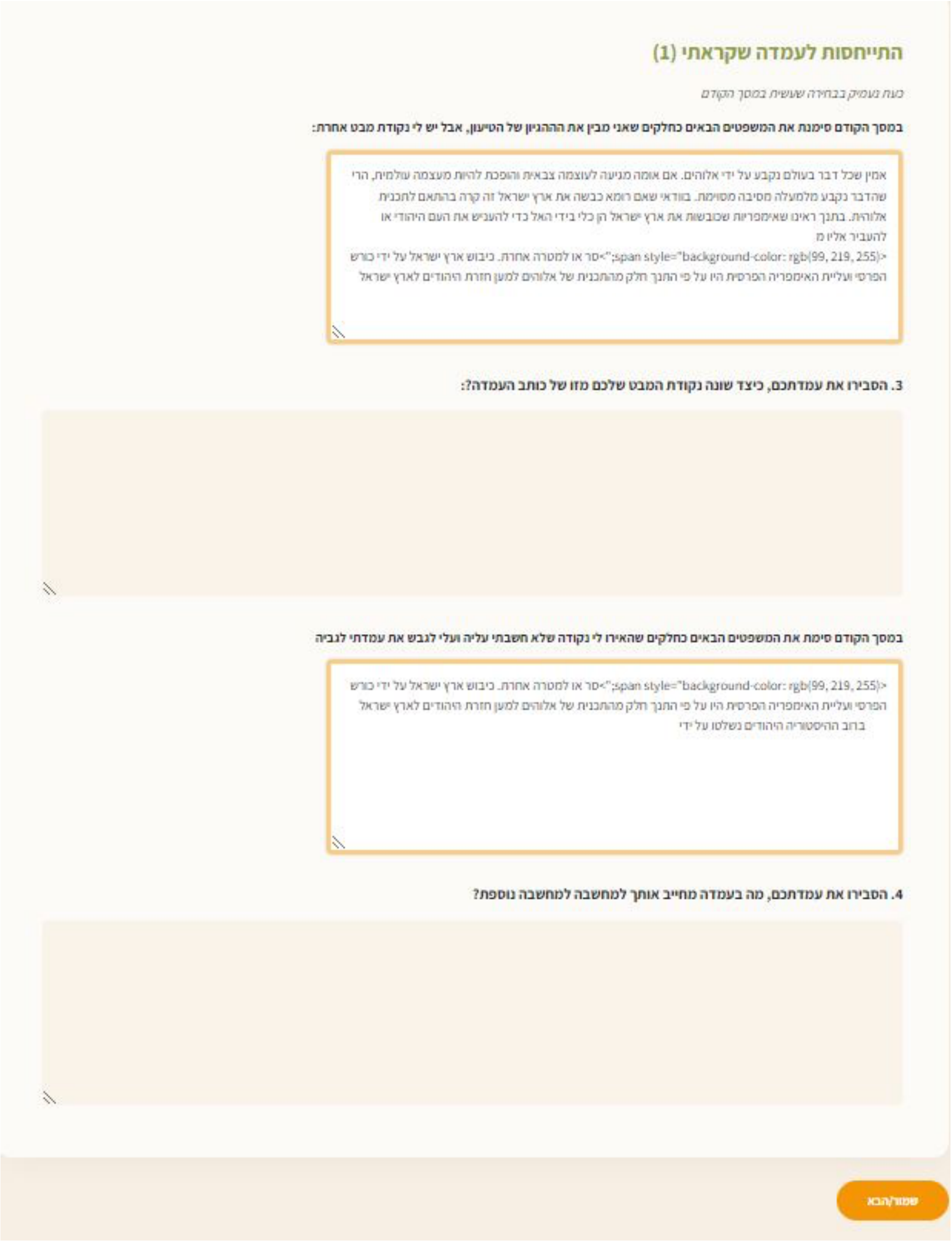
ברוב ההיסטוריה היהודים נשלטו על ידי עמים זרים, גם בזמנים כאלה עלינו להמשיך לקיים את דתנו ומסורותינו ולהאמין שבבוא היום יסתיים המצב הזה, כאשר אלוהים יחליט שהיהודים ראויים לעצמאות. הרבנים החשובים והכהנים הגדולים ידעו זאת ולכן הם התנגדו למרד - אך העם לא הלך בדרכם ולכן הגיעה האסון וירושלים והמקדש חרבו.

מסיירת המסורת ודבקות בה גם בתנאים הקשים.

2. בחרו בתשובה המתאימה לעמדתך ביחס לטקסט שקראת:

○ אני מסוגל/ת להבין את הערכים ודרך הניתוח למרות שיש לי מסקנות שונות
○ העמדה והנימוקים שהוצגו העשירו את המחשבה שלי בסוגיית היציאה למרד
● העמדה המוצגת גרמה לי לשנות את עמדתי הראשונית בסוגיית היציאה למרד
○ אני מתנגדת לדרך הניתוח שהוצגה - אני סבור/ה שהיא מוטעית
○ העמדה המוצגת תואמת את עמדתי הראשונית בנושא היציאה למרד.

**Figure 2.32:** Text highlighting tool with different context markers.



התייחסות לעמדה שקראתי (1)

*כעת נעמיק בבחירה שעשית במסך הקודם*

במסך הקודם סימנת את המשפטים הבאים כחלקים שאני מבין את ההגיון של הטיעון, אבל יש לי נקודת מבט אחרת:

אמין שכל דבר בעולם נקבע על ידי אלוהים. אם אומה מגיעה לעוצמה צבאית והופכת להיות מעצמה עולמית, הרי
שהדבר נקבע מלמעלה מסיבה מסוימת. בוודאי שאם רומא כבשה את ארץ ישראל זה קרה בהתאם לתכנית
אלוהית. בתנך ראינו שאימפריות שכובשות את ארץ ישראל הן כלי בידי האל כדי להעניש את העם היהודי או
להעביר אליו מ
<span style="background-color: rgb(99, 219, 255);">סר או למטרה אחרת. כיבוש ארץ ישראל על ידי כורש
הפרסי ועליית האימפריה הפרסית היו על פי התנך חלק מהתכנית של אלוהים למען חזרת היהודים לארץ ישראל

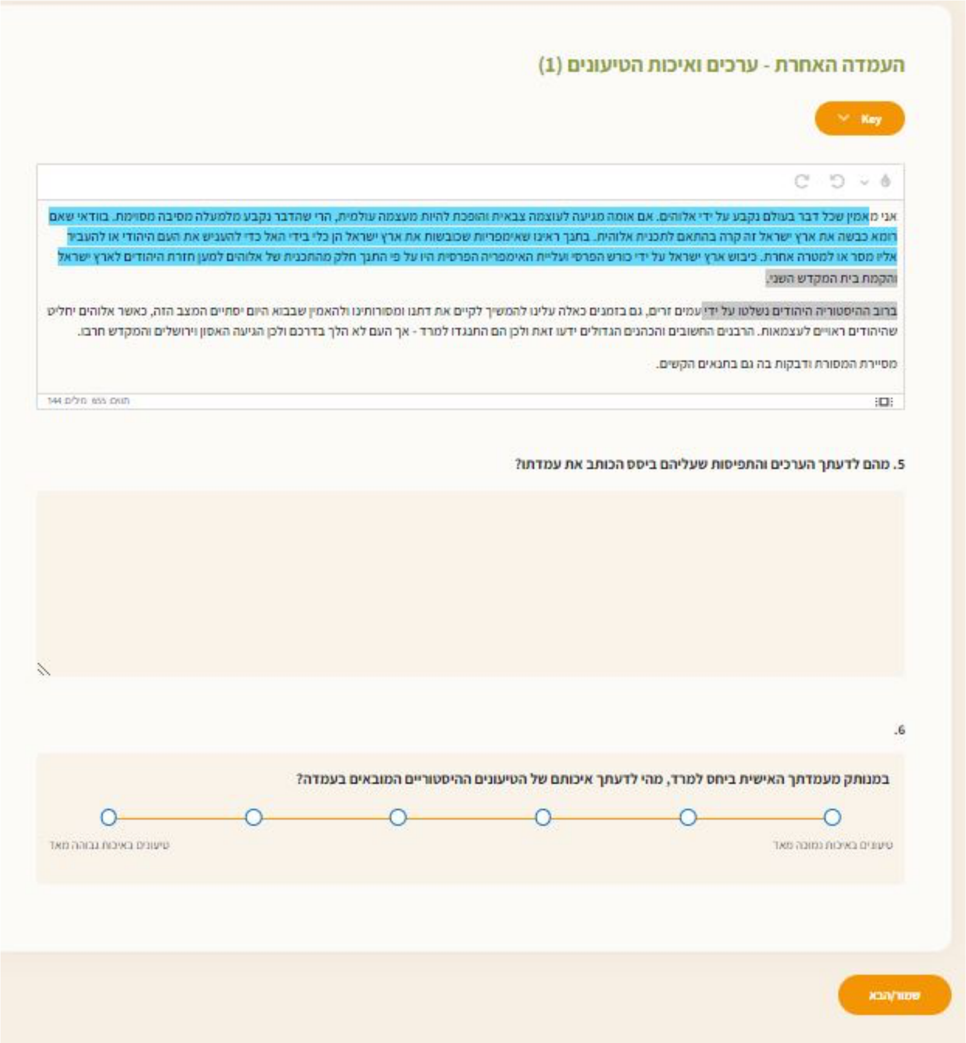
3. הסבירו את עמדתכם, כיצד שונה נקודת המבט שלכם מזו של כותב העמדה?:

במסך הקודם סימת את המשפטים הבאים כחלקים שהאירו לי נקודה שלא חשבתי עליה ועלי לגבש את עמדתי לגביה

<span style="background-color: rgb(99, 219, 255);">סר או למטרה אחרת. כיבוש ארץ ישראל על ידי כורש
הפרסי ועליית האימפריה הפרסית היו על פי התנך חלק מהתכנית של אלוהים למען חזרת היהודים לארץ ישראל
ברוב ההיסטוריה היהודים נשלטו על ידי

4. הסבירו את עמדתכם, מה בעמדה מחייב אותך למחשבה נוספת?

**Figure 2.33:** Displaying separate sections for each of the colors with which user has highlighted their text.



העמדה האחרת - ערכים ואיכות הטיעונים (1)

אני מאמין שכל דבר בעולם נקבע על ידי אלוהים. אם אומה מגיעה לעוצמה צבאית והופכת להיות מעצמה עולמית, הרי שהדבר נקבע מלמעלה מסיבה מסוימת. בוודאי שאם רומא כבשה את ארץ ישראל זה קרה בהתאם לתכנית אלוהית. בתנך ראינו שאימפריות שכובשות את ארץ ישראל הן כלי בידי האל כדי להעניש את העם היהודי או להעביר אליו מסר או למטרה אחרת. כיבוש ארץ ישראל על ידי כורש הפרסי ועליית האימפריה הפרסית היו על פי התנך חלק מהתכנית של אלוהים למען חזרת היהודים לארץ ישראל והקמת בית המקדש השני.

ברוב ההיסטוריה היהודים נשלטו על ידי עמים זרים, גם בזמנים כאלה עלינו להמשיך לקיים את דתנו ומסורותינו ולהאמין שבבוא היום יסתיים המצב הזה, כאשר אלוהים יחליט שהיהודים ראויים לעצמאות. הרבנים החשובים והכהנים הגדולים ידעו זאת ולכן הם התנגדו למרד - אך העם לא הלך בדרכם ולכן הגיעה האסון וירושלים והמקדש חרבו.

מסיירת המסורת ודבקות בה גם בתנאים הקשים.

5. מהם לדעתך הערכים והתפיסות שעליהם ביסס הכותב את עמדתו?

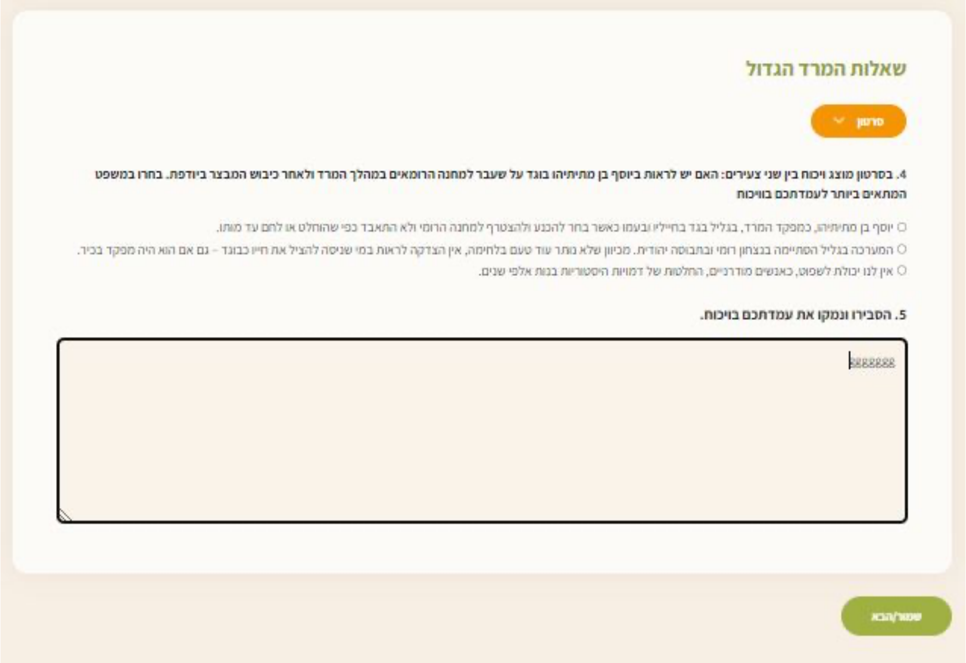
.6

במנותק מעמדתך האישית ביחס למרד, מהי לדעתך איכותם של הטיעונים ההיסטוריים המובאים בעמדה?

○ ○ ○ ○ ○ ○

טיעונים באיכות נמוכה מאד — טיעונים באיכות גבוהה מאד

**Figure 2.34:** Entire text as highlighted by the user.



שאלות המרד הגדול

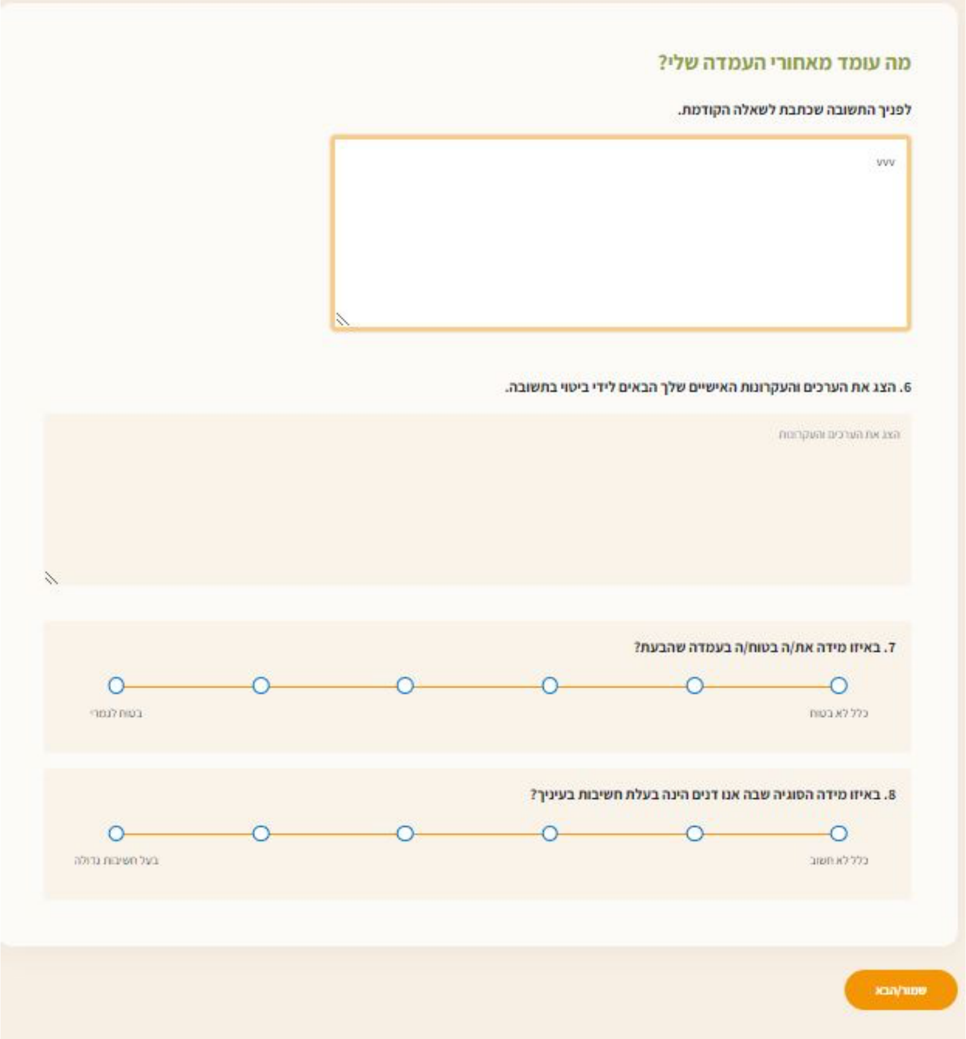
4. בסרטון מוצג ויכוח בין שני צעירים: האם יש לראות ביוסף בן מתיתיהו בוגד על שעבר למחנה הרומאים במהלך המרד ולאחר כיבוש המבצר ביודפת. בחרו במשפט המתאים ביותר לעמדתכם בוויכוח

○ יוסף בן מתיתיהו, כמפקד המרד, בגליל בגד בחייליו ובעמו כאשר בחר להכנע ולהצטרף למחנה הרומי ולא התאבד כפי שהוחלט או לחם עד מותו.
○ המערכה בגליל הסתיימה בנצחון רומי ובתבוסה יהודית. מכיוון שלא נותר עוד טעם בלחימה, אין הצדקה לראות במי שניסה להציל את חייו כבוגד - גם אם הוא היה מפקד בכיר.
○ אין לנו יכולת לשפוט, כאנשים מודרניים, החלטות של דמויות היסטוריות בנות אלפי שנים.

5. הסבירו ונמקו את עמדתכם בויכוח.

ggggggg

**Figure 2.35:** Additional questions - After visit.



מה עומד מאחורי העמדה שלי?

לפניך התשובה שכתבת לשאלה הקודמת.

vvv

6. הצג את הערכים והעקרונות האישיים שלך הבאים לידי ביטוי בתשובה.

הצג את הערכים והעקרונות

7. באיזו מידה את/ה בטוח/ה בעמדה שהבעת?

כלל לא בטוח ○ ○ ○ ○ ○ ○ בטוח לגמרי

8. באיזו מידה הסוגיה שבה אנו דנים הינה בעלת חשיבות בעיניך?

כלל לא חשוב ○ ○ ○ ○ ○ ○ בעל חשיבות גדולה

**Figure 2.36:** Additional questions - After visit (part 2).

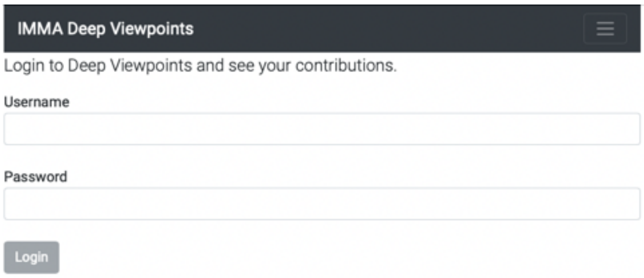
## 2.4 IMMA

The IMMA use case revolves around the concept of "scripts", which are short sequences of images, texts, and open-ended questions. Citizen curators largely configure these scripts to provide a fresh perspective on IMMA's collection and to provoke reflections and responses from new visitors. These scripts take on a form similar to the multi-stage forms found in inSPICE, which will be discussed in chapter 6. However, IMMA's scripts are simpler, utilizing only a few targeted component types, such as image and text display and open-ended questions, and are hosted on their own platform named IMMA Deep Viewpoints.

Once a script is generated using the IMMA script editor (which could be a group of citizen curators), it undergoes moderation and is eventually published on the platform for access by participants. Participants can interact with the script by answering its questions and, after passing through an additional round of content moderation, their responses can be viewed individually on the Deep Viewpoints portal. Consequently, the IMMA use case falls into the category of artifact-analysis interpretation activities, while also providing reflection methods for searching and browsing previous interpretations of other users who have participated in a given script. Since visitors often perform both parts of the activity (creating their own script in relation to one or more museum works they work on in a workshop, for example, and interacting with scripts configured by other users), IMMA Deep Viewpoints also acts as a collection-type activity in its script creation stage.

To provide a better understanding of the user experience through the IMMA Deep Viewpoints platform, we will now take a quick walkthrough of the process.

Before the visiting group arrives, IMMA logs into Deep Viewpoints to set up user accounts (figure 2.37). As the superuser account, IMMA can create and edit user accounts for the group (figure 2.38a). Usually, one account is created for a visiting group of about 4 people, and the museum tablet devices are logged into the new account. Alternatively, the groups may use their own devices with the given login.


IMMA Deep Viewpoints

Login to Deep Viewpoints and see your contributions.

Username

Password

**Figure 2.37:** Logging in to the IMMA Deep Viewpoints platform.

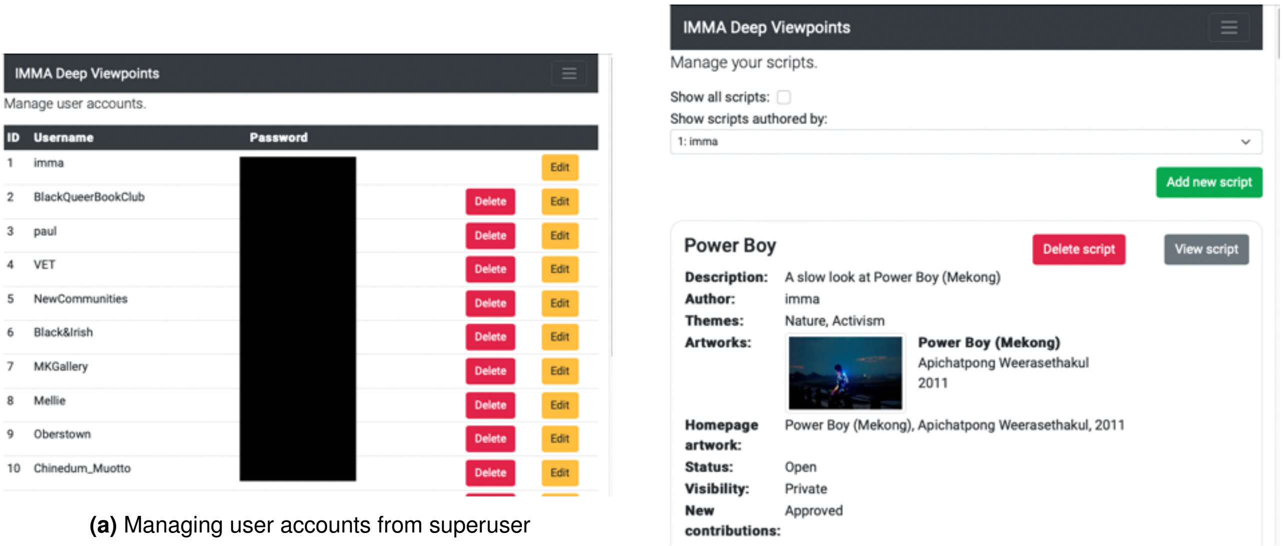
IMMA also selects which scripts will be visible in the interface for the session (figure 2.38b). They can edit and change the visibility of any script by any author as they have the superuser account. The group uses the tablet device to interpret artworks in the exhibition by accessing a set of activities (scripts) on the home page of Deep Viewpoints, which are organized into themes (figure 2.39a).

The group can select and participate in any of the scripts, each consisting of a set of stages containing statements or one or more questions/prompts (figure 2.39b). Artworks from the collection can also be included in any stage of the script. IMMA uses the moderation area of the website to approve new submissions or sets any script to auto-approve new submissions during the session (figure 2.40a).

Using the Other People page (figure 2.40b), the group can view their own responses to the script and those of previous groups. On their login page, the group can access, edit, and delete their own contributions (figure 2.41a).

After a break, the group creates new scripts to give their own impression of the exhibition for future visiting groups. Initially, the groups think about artworks and themes, and the artwork section of the web app allows them to search the IMMA collection and add any artwork to their own group collection (figure 2.41b).

The themes page enables the group to add new themes, which they can edit (figure 2.42a). The group can create



IMMA Deep Viewpoints

Manage user accounts.

| ID | Username | Password | | |
|---|---|---|---|---|
| 1 | imma | [redacted] | | Edit |
| 2 | BlackQueerBookClub | [redacted] | Delete | Edit |
| 3 | paul | [redacted] | Delete | Edit |
| 4 | VET | [redacted] | Delete | Edit |
| 5 | NewCommunities | [redacted] | Delete | Edit |
| 6 | Black&Irish | [redacted] | Delete | Edit |
| 7 | MKGallery | [redacted] | Delete | Edit |
| 8 | Mellie | [redacted] | Delete | Edit |
| 9 | Oberstown | [redacted] | Delete | Edit |
| 10 | Chinedum_Muotto | [redacted] | Delete | Edit |

**(a)** Managing user accounts from superuser

IMMA Deep Viewpoints

Manage your scripts.

Show all scripts: □

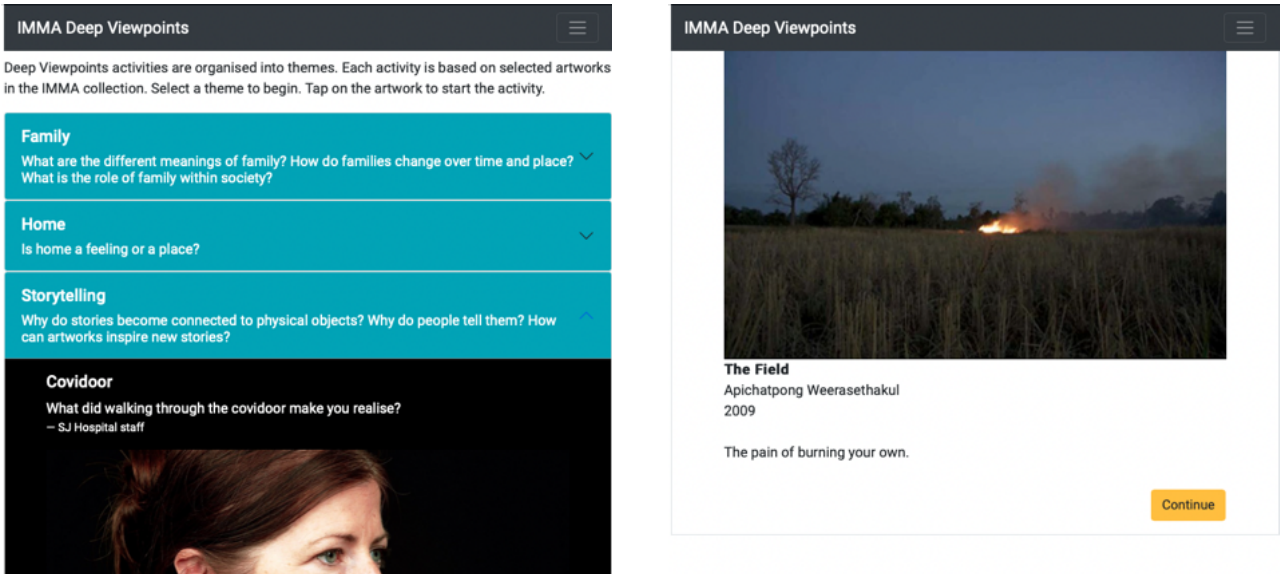
Show scripts authored by: 1: imma

Power Boy

**Description:** A slow look at Power Boy (Mekong)
**Author:** imma
**Themes:** Nature, Activism
**Artworks:** **Power Boy (Mekong)** Apichatpong Weerasethakul 2011
**Homepage artwork:** Power Boy (Mekong), Apichatpong Weerasethakul, 2011
**Status:** Open
**Visibility:** Private
**New contributions:** Approved

**(b)** Managing scripts as a superuser

**Figure 2.38:** IMMA Deep Viewpoints



IMMA Deep Viewpoints

Deep Viewpoints activities are organised into themes. Each activity is based on selected artworks in the IMMA collection. Select a theme to begin. Tap on the artwork to start the activity.

**Family**
What are the different meanings of family? How do families change over time and place? What is the role of family within society?

**Home**
Is home a feeling or a place?

**Storytelling**
Why do stories become connected to physical objects? Why do people tell them? How can artworks inspire new stories?

**Covidoor**
What did walking through the covidoor make you realise?
– SJ Hospital staff

IMMA Deep Viewpoints

**The Field**
Apichatpong Weerasethakul
2009

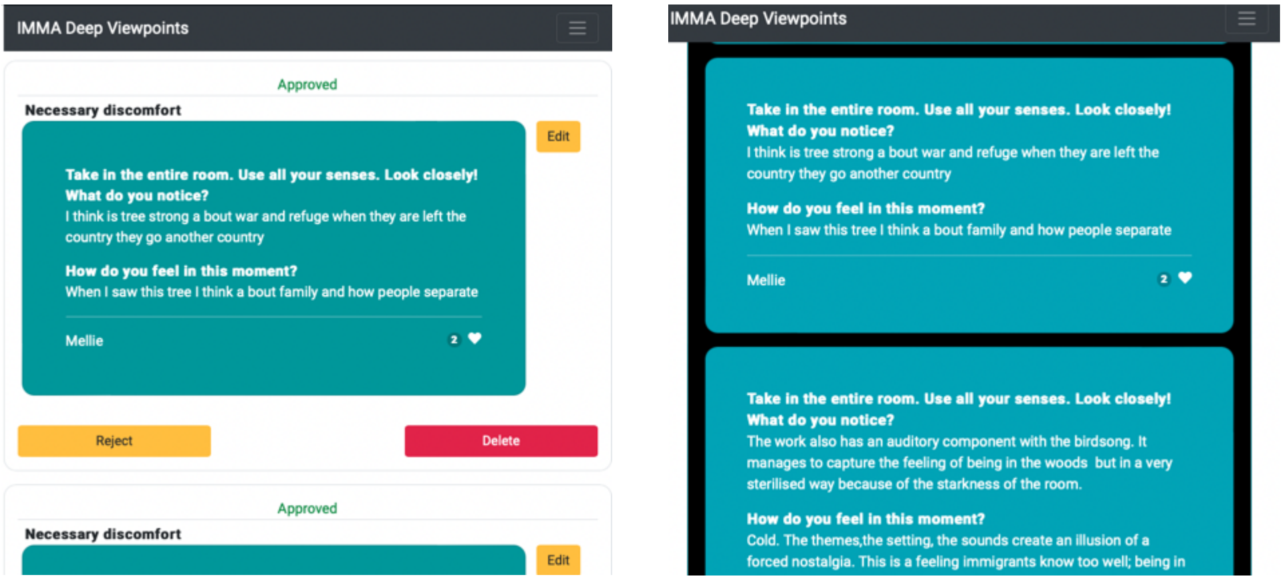
The pain of burning your own.

**(a)** IMMA Home Page **(b)** Starting one of the scripts

**Figure 2.39:** IMMA Deep Viewpoints

new scripts by adding a title, description, one or more themes, and one or more artworks (figure 2.42b). They can use their own themes or themes added by others. The group also adds stages to the script (figure 2.43a), which can be of different types (statement, question, multiquestion, story) and include artworks.

Once the scripts have been authored, the group may test them out themselves and make any final edits before the end of the workshop (figure 2.43b). Sometimes the group are given the login so they can continue to work on the scripts on their own devices after the workshop has finished.


IMMA Deep Viewpoints

Approved

**Necessary discomfort**

**Take in the entire room. Use all your senses. Look closely! What do you notice?**
I think is tree strong a bout war and refuge when they are left the country they go another country

**How do you feel in this moment?**
When I saw this tree I think a bout family and how people separate

Mellie 2

Approved

**Necessary discomfort**

IMMA Deep Viewpoints

**Take in the entire room. Use all your senses. Look closely! What do you notice?**
I think is tree strong a bout war and refuge when they are left the country they go another country

**How do you feel in this moment?**
When I saw this tree I think a bout family and how people separate

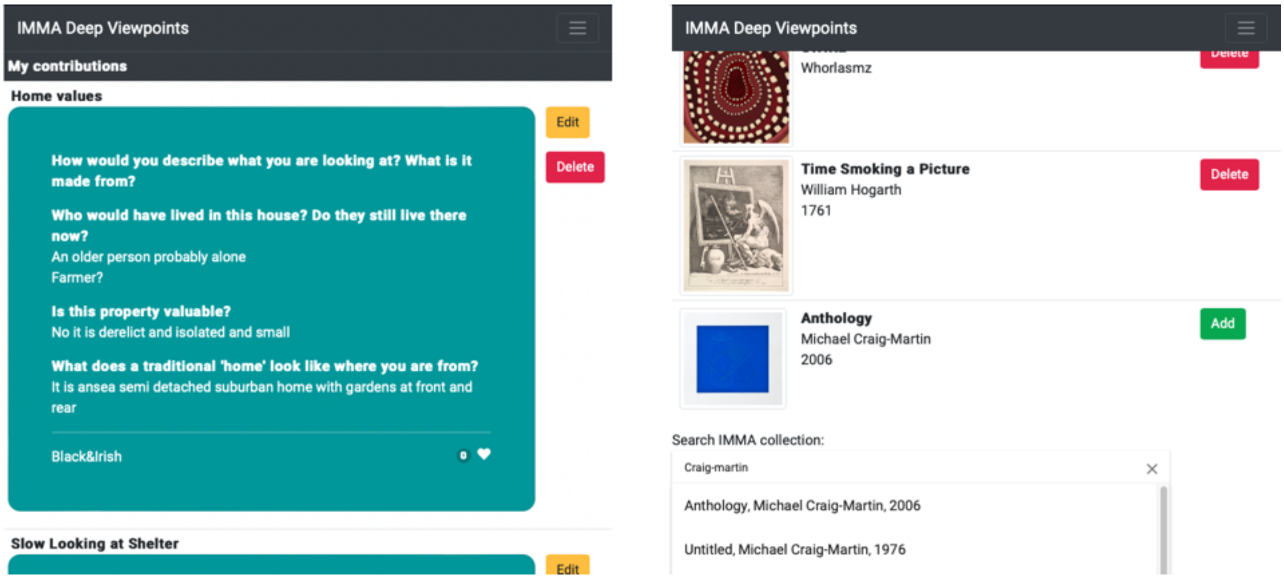
Mellie 2

**Take in the entire room. Use all your senses. Look closely! What do you notice?**
The work also has an auditory component with the birdsong. It manages to capture the feeling of being in the woods but in a very sterilised way because of the starkness of the room.

**How do you feel in this moment?**
Cold. The themes,the setting, the sounds create an illusion of a forced nostalgia. This is a feeling immigrants know too well; being in

**(a)** IMMA Moderation area **(b)** Other People page

**Figure 2.40:** IMMA Deep Viewpoints


IMMA Deep Viewpoints

**My contributions**

**Home values**

**How would you describe what you are looking at? What is it made from?**

**Who would have lived in this house? Do they still live there now?**
An older person probably alone
Farmer?

**Is this property valuable?**
No it is derelict and isolated and small

**What does a traditional 'home' look like where you are from?**
It is ansea semi detached suburban home with gardens at front and rear

Black&Irish 0

**Slow Looking at Shelter**

IMMA Deep Viewpoints

Whorlasmz

**Time Smoking a Picture**
William Hogarth
1761

**Anthology**
Michael Craig-Martin
2006

Search IMMA collection:

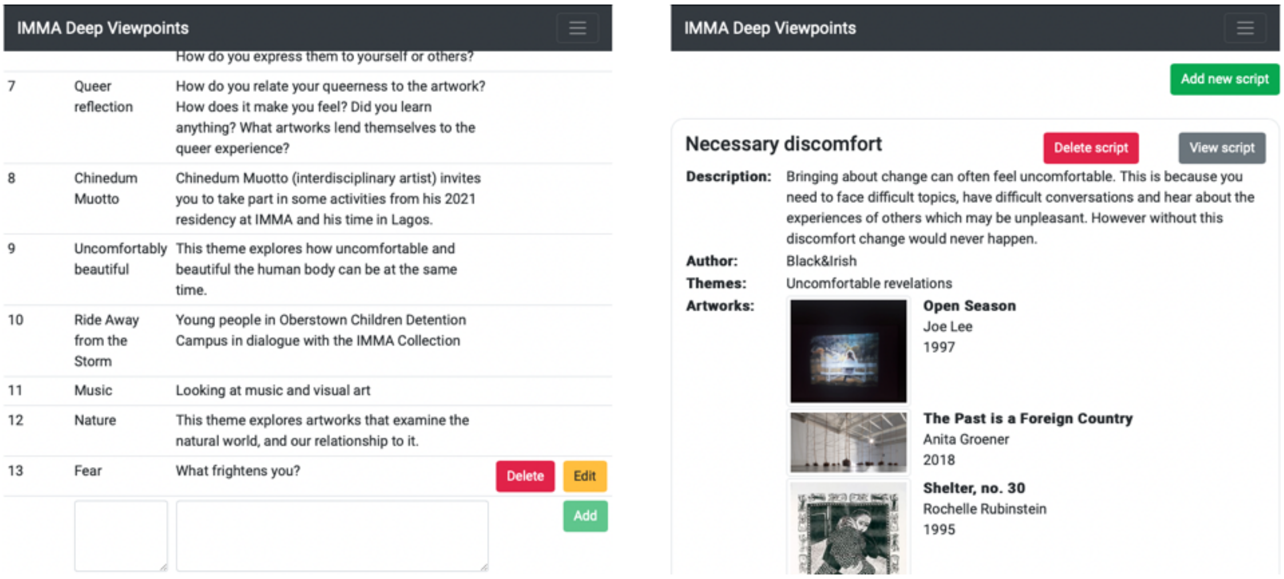
Craig-martin

Anthology, Michael Craig-Martin, 2006

Untitled, Michael Craig-Martin, 1976

**(a)** My Contributions **(b)** Searching the IMMA Collection

**Figure 2.41:** IMMA Deep Viewpoints



IMMA Deep Viewpoints

|  |  |  |  |
|---|---|---|---|
|  |  | How do you express them to yourself or others? |  |
| 7 | Queer reflection | How do you relate your queerness to the artwork? How does it make you feel? Did you learn anything? What artworks lend themselves to the queer experience? |  |
| 8 | Chinedum Muotto | Chinedum Muotto (interdisciplinary artist) invites you to take part in some activities from his 2021 residency at IMMA and his time in Lagos. |  |
| 9 | Uncomfortably beautiful | This theme explores how uncomfortable and beautiful the human body can be at the same time. |  |
| 10 | Ride Away from the Storm | Young people in Oberstown Children Detention Campus in dialogue with the IMMA Collection |  |
| 11 | Music | Looking at music and visual art |  |
| 12 | Nature | This theme explores artworks that examine the natural world, and our relationship to it. |  |
| 13 | Fear | What frightens you? | Delete Edit |
|  |  |  | Add |

**(a)** Themes Page

IMMA Deep Viewpoints

Add new script

Necessary discomfort

Delete script View script

**Description:** Bringing about change can often feel uncomfortable. This is because you need to face difficult topics, have difficult conversations and hear about the experiences of others which may be unpleasant. However without this discomfort change would never happen.

**Author:** Black&Irish

**Themes:** Uncomfortable revelations

**Artworks:**

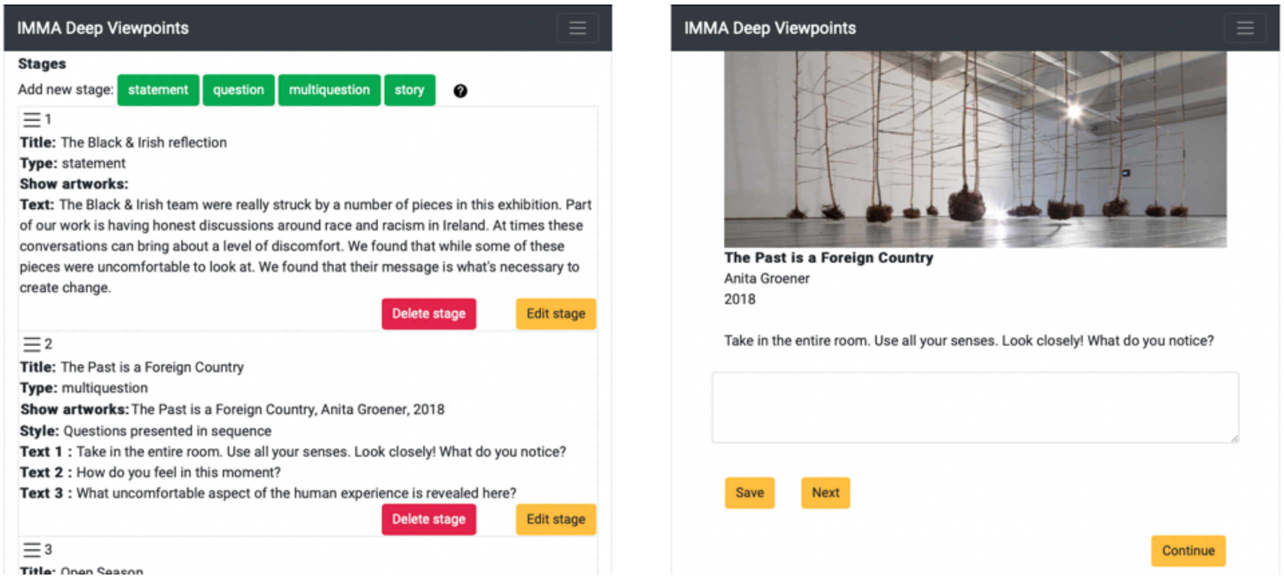
**Open Season**
Joe Lee
1997

**The Past is a Foreign Country**
Anita Groener
2018

**Shelter, no. 30**
Rochelle Rubinstein
1995

**(b)** Creating new scripts

**Figure 2.42:** IMMA Deep Viewpoints



IMMA Deep Viewpoints

**Stages**

Add new stage: statement question multiquestion story

1
**Title:** The Black & Irish reflection
**Type:** statement
**Show artworks:**
**Text:** The Black & Irish team were really struck by a number of pieces in this exhibition. Part of our work is having honest discussions around race and racism in Ireland. At times these conversations can bring about a level of discomfort. We found that while some of these pieces were uncomfortable to look at. We found that their message is what's necessary to create change.

Delete stage Edit stage

2
**Title:** The Past is a Foreign Country
**Type:** multiquestion
**Show artworks:** The Past is a Foreign Country, Anita Groener, 2018
**Style:** Questions presented in sequence
**Text 1 :** Take in the entire room. Use all your senses. Look closely! What do you notice?
**Text 2 :** How do you feel in this moment?
**Text 3 :** What uncomfortable aspect of the human experience is revealed here?

Delete stage Edit stage

3
**Title:** Open Season

**(a)** Adding stages to the script

IMMA Deep Viewpoints

**The Past is a Foreign Country**
Anita Groener
2018

Take in the entire room. Use all your senses. Look closely! What do you notice?

Save Next

Continue

**(b)** Testing a script before submission

**Figure 2.43:** IMMA Deep Viewpoints

## 2.5 MNCN

The MNCN use case revolves around the idea of museum experiences (or “adventures”) during which guests must search for artifacts using the camera on their mobile device or tablet (using AR and image recognition technologies) and follow clues or solve puzzles of different types to progress through a narrative adventure. These adventures are primarily linear in nature, in the sense that their narratives go through the museum’s rooms in an order previously determined by the designer, but within each room take on a more unrestricted flow in which participants are able to interact with a variety of puzzles and artifacts in any order they see fit. That said, the main flow of the adventures supported by this activity iterates through the following steps and blocks:

1. The participant of the activity goes through a series of stages sequentially, where they may find narrative elements, dialogues, artifact hunts, or blocks that control the player’s progress (more on this later). When we talk about an artifact hunt, we refer to a stage where the participant must use their device’s camera to point at the object indicated by a clue in the game; upon recognizing the correct artifact, the search can be considered complete, and/or some kind of augmented reality image can be displayed over the object with a hint on how to proceed or other additional information.
2. Upon reaching a room stage, the participant will be able to interact with all the sub-sequences of artifact hunts and puzzles placed in the room in any order they choose. To progress to the next stage from a room, the user must solve a final trial, which in principle should only be possible to solve successfully after having completed the rest of the trials hidden in the room (although this depends on the adventure designer).
3. Following certain rooms, the player might find a control block to prevent participants from progressing until they are given a keyword known only to the creator of the activity. This is especially useful when launching such an activity in the context of a large group of visitors with whom it is intended to run an escape room in a synchronized manner, allowing for instance to wait until all participants have completed one room before granting passage to the next, or to give some kind of informative talk at key points of the adventure while keeping the attention of the visitors.

At the end of the adventure, the application displays the results obtained by the user expressed as the number of correct answers to the puzzles and quizzes submitted out of the total number of items available. It is worth mentioning here that the designer also has the possibility of adding open-ended questions at any time during the adventure to request data such as opinions, statistics or impressions from the users. In the upcoming sections, we shall present an example case developed with these notions and used extensively in the Natural Science Museum of Madrid.

### 2.5.1 Introduction

Museums have a prescribed route for visitors to follow, as well as a rationale for the placement of their exhibits. They also provide a wealth of information about their collections, but unfortunately, this often goes unnoticed by visitors. At the Natural Science Museum of Madrid, for example, the exhibits are divided into three distinct areas: Biodiversity, Evolution, and Conservation, each one highlighting a different aspect of nature and providing important insights. However, visitors often fail to grasp the significance of these themes without the guidance of an expert from the museum. To address this issue, a game was developed specifically for children aged 10-16 who are visiting the museum. The game offers a detailed and engaging way for young visitors to explore the exhibits and learn about the natural world.

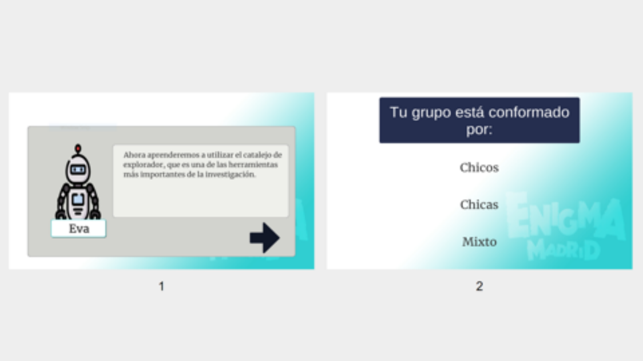
To get started, each participant is given a tablet with the game already loaded, and they can choose to play individually or in groups. To help players get accustomed to the game mechanics, a tutorial stage is included, ideally located in a designated area of the museum before starting the game.

### 2.5.2 Tutorial Phase

The tutorial begins with the introduction of a character named Eva, who is a staff member at the museum. Eva enlists the player’s assistance in conducting an investigation, which involves solving puzzles, searching for clues, reading information from the museum's panels, and using an explorer's spyglass (figure 2.44, image 1).

Eva guides the player through the tutorial, teaching them how to navigate the game and solve the puzzles required to progress. This interactive tutorial not only helps players understand the game mechanics but also allows them to appreciate the wealth of information available at the museum.

At the start of the game, players are introduced to the first mechanic - answering a question that has no definitive or correct answer (figure 2.44, image 2). The question prompts players, whether they are visiting as a group or an individual, to identify their composition as either male, female, or mixed. This initial task serves as a primer for how to respond to subsequent game prompts.



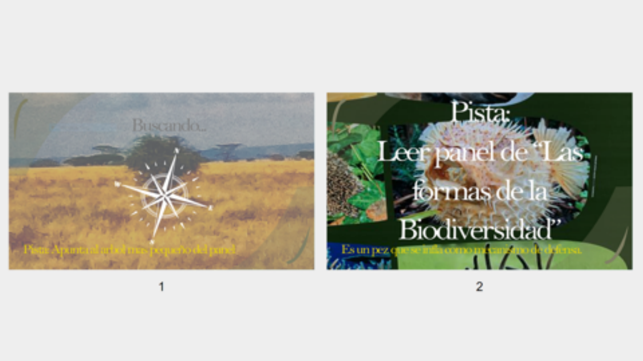
Ahora apenderemos a utilizar el catalejo de explorador, que es una de las herramientas más importantes de la investigación.

Tu grupo está conformado por:

**Figure 2.44:** Tutorial: Introduction to the game and how to answer a question with no correct answer.

Following this, players are introduced to one of the most important tools in the game - the explorer's spyglass. Upon using this tool, a message appears on the tablet screen, providing a helpful hint: "Aim at the smallest tree in the panel" (figure 2.45, image 1). The relevant panel is conveniently located near the players' seating area, making it easy for everyone to locate the tree, point the camera at it, and detect it using the spyglass. Players are rewarded for correctly using this tool and informed that it can only be employed with the panels on the museum walls and not on the glass cases. By introducing players to these core mechanics early on, the game sets the stage for a fun and educational museum experience that is both engaging and informative.

The next tool players learn about is the AR, or augmented reality feature (figure 2.45, image 2). To familiarize players with this tool, the game directs them to a new panel in the museum and prompts them to "Look for the fish that puffs itself up as a defense mechanism." Utilizing the explorer's spyglass, which players have already mastered, they scan the panel until the correct image is detected. Once the image is located, the AR Overlay mechanism is activated, and a message appears above the image, instructing players to "Look for the 'Biodiversity Shapes' panel."



Buscando...

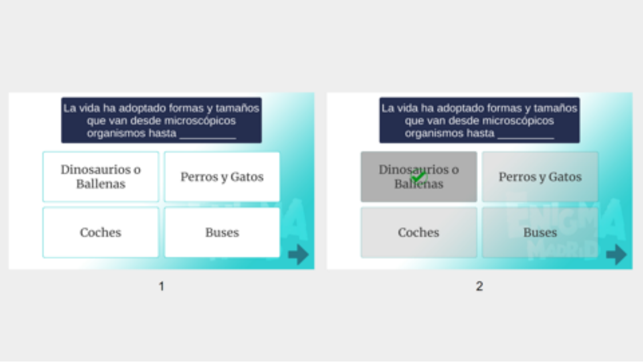
Pista: Apunta al arbol mas pequeño del panel

Pista: Leer panel de "Las formas de la Biodiversidad"

Es un pez que se infla como mecanismo de defensa.

**Figure 2.45:** Tutorial: Explorer's spyglass and Augmented Reality.

Next, players must search the museum walls to find the "Biodiversity Shapes" panel, where they encounter a question that can only be answered by reading the accompanying information. The question asks, “Life has taken shapes and sizes ranging from microscopic organisms to...?” and offers answer choices of “Dinosaurs or Whales, Dogs and Cats, Cars, Buses.” Correctly reading the panel reveals that the answer is “Dinosaurs or Whales” (figure 2.46, image 1). Players who answer correctly receive a green check, while those who answer incorrectly receive a red cross. As seen in image 2, the player answered correctly.


La vida ha adoptado formas y tamaños que van desde microscópicos organismos hasta ________

Dinosaurios o Ballenas | Perros y Gatos | Coches | Buses

**Figure 2.46:** Tutorial: Question with a correct answer.

Having mastered the use of the explorer’s spyglass, learned how to identify panels, and practiced answering questions, players are now ready to move on to the first escape room of the game. The tutorial phase is complete, and players can fully immerse themselves in the adventure.

### 2.5.3 First Escape Room

The first escape room of the game belongs to the first area of the museum: Biodiversity. In this room, the player can find four open blocks and one locked block (figure 2.47, image 1). All the blocks are different and full of puzzles. The four available have different icons: A squirrel, a beard, planet earth and an elephant. Each icon is a clue to the panel the player must go to in order to solve the block (figure 2.47, image 2). There is no specific order of the blocks and players can solve them in any order they want. They must finish the first four to unlock the Exit Room and finish the Biodiversity escape room.

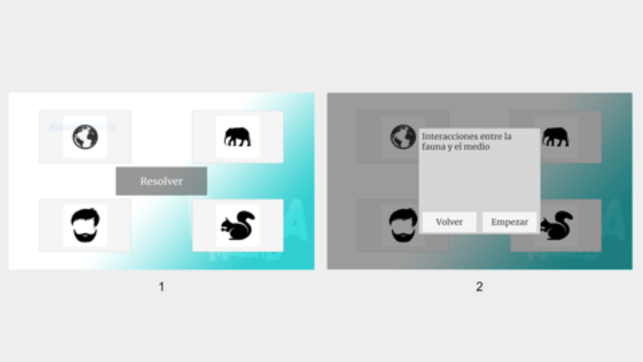
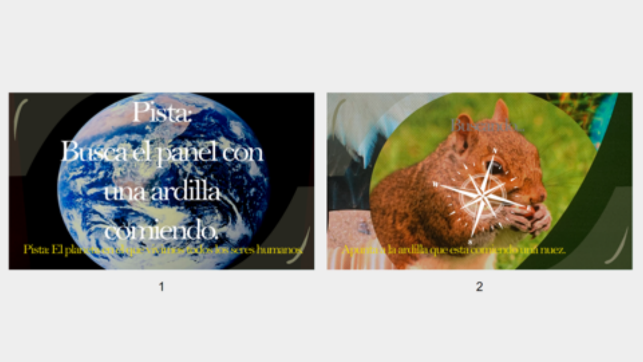

Interacciones entre la fauna y el medio

**Figure 2.47:** First escape room with four blocks and blocked exit room and panel clue before entering a block.

First, the player enters the block with the squirrel icon. As soon as the player enters, the explorer’s spyglass opens and the text says: "Hint: The planet where all human beings live" (figure 2.48, image 1). The player must look for the panel where the image of the planet earth can be seen. Using the spyglass, the player points to the planet earth



Pista:
Busca el panel con una ardilla comiendo.

Pista: El planeta en el que vivimos todos los seres humanos.

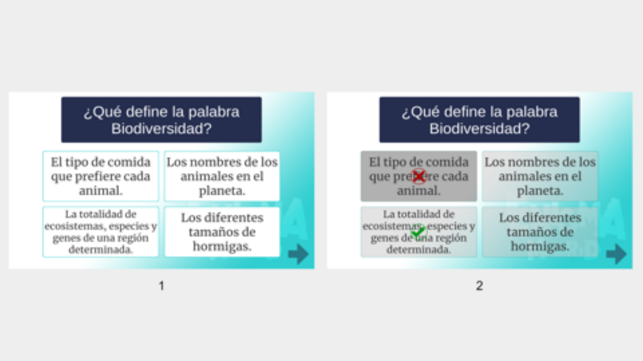
Buscando...

Apunta a la ardilla que esta comiendo una nuez.

**Figure 2.48:** Augmented reality showing a clue and the explorer's spyglass in action.

and the AR Overlay is activated with the following hint: "Look for the squirrel eating in a panel". The player must go to the "What is Biodiversity?" panel and point to the squirrel (figure 2.48, image 2).

Here appears the first question of this panel: "What defines the word Biodiversity?" (figure 2.49, image 1) and the correct answer is "The totality of ecosystems, species and genes of a given region". If the player answers correctly, he gets the score and if he answers incorrectly, he is shown the correct answer but he does not get the points. (figure 2.49, image 2). The next question is asked: "In which year was the word Biodiversity used for the first time?"



¿Qué define la palabra Biodiversidad?

El tipo de comida que prefiere cada animal.

Los nombres de los animales en el planeta.

La totalidad de ecosistemas, especies y genes de una región determinada.

Los diferentes tamaños de hormigas.

¿Qué define la palabra Biodiversidad?

El tipo de comida que prefiere cada animal. ✗

Los nombres de los animales en el planeta.

La totalidad de ecosistemas, especies y genes de una región determinada. ✓

Los diferentes tamaños de hormigas.

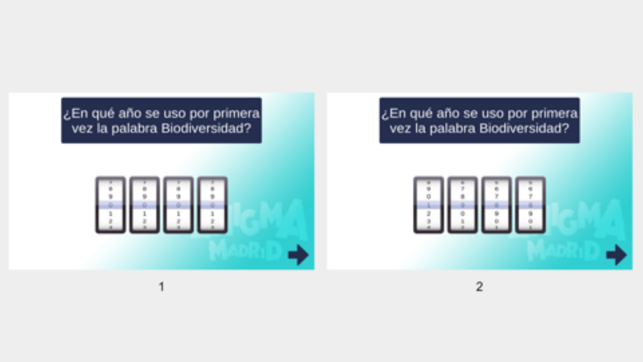
**Figure 2.49:** A question with correct answer and question if answered incorrectly.

Players must activate the 4-digit number mechanism to correctly answer the year: "1988" (figure 2.50, image 1 and 2). If they do not answer this question correctly, they will not be able to advance in the game.

Finally, the last question asks: "What percentage of species on the planet are bacteria according to Larsen's study?" And players must answer: "78 percentage". This question is as shown in Figure 2.49, with one correct answer. Once they answer this question, the players receive a first piece of a jigsaw puzzle (figure 2.51, image 1). The squirrel icon that appeared on the block changes to the puzzle piece obtained (figure 2.51, image 2).

Second, the player enters the block with the elephant icon. As soon as they enter, the explorer's spyglass opens and the text says: "Hint: Look for the black beetle". The player must look for the panel where a black beetle is located. With the spotting scope, the player points to the beetle and the AR Overlay is activated with the following clue: "Look for the man who is drawing the huge elephant" (figure 2.52, image 1). The player must go to the "Wildlife-Environment Interactions" panel and point to the man drawing an elephant (figure 2.52, image 2).

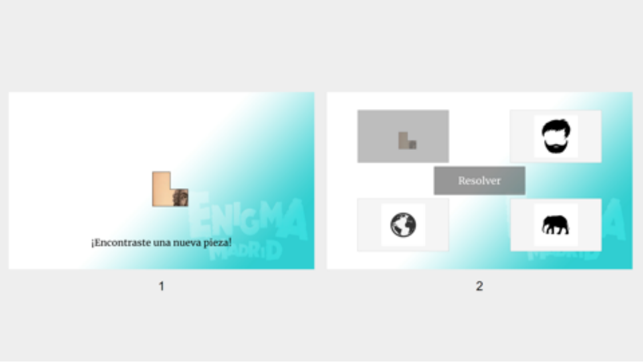
Here the first question of this panel appears: "Who are the main primary consumers of the African savanna's?" and the correct answer is "Insects". If the player answers correctly, they gets the score and if they answer incorrectly, they don't get the points. Finally, the second question asks: "Can any species survive the dry season without moving to



¿En qué año se uso por primera vez la palabra Biodiversidad?

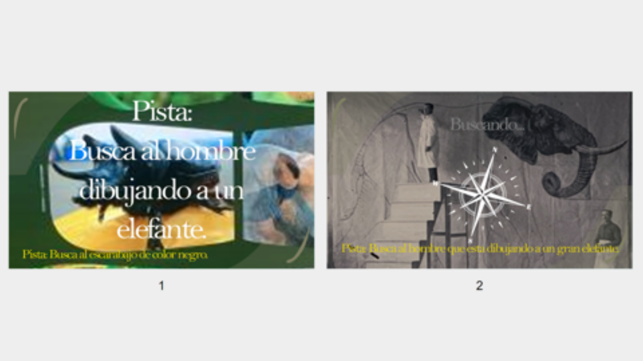
¿En qué año se uso por primera vez la palabra Biodiversidad?

**Figure 2.50:** A question asking for a specific year and the digit wheels showing the correct year.



¡Encontraste una nueva pieza!

**Figure 2.51:** Receiving a piece of the jigsaw puzzle and the icon of the first block changes to that piece.



Pista: Busca al hombre dibujando a un elefante.

Pista: Busca al escarabajo de color negro.

Buscando...

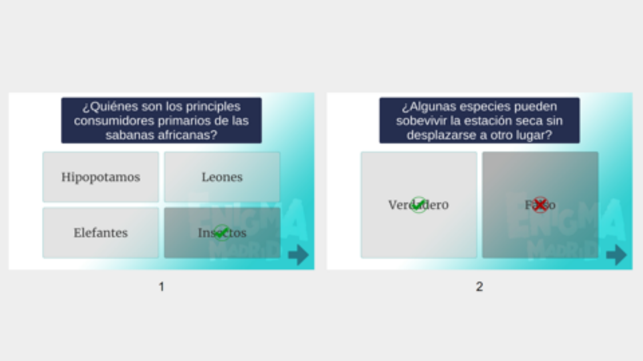
Pista: Busca al hombre que esta dibujando a un gran elefante.

**Figure 2.52:** Augmented reality showing a clue and the explorer's spyglass in action.

another location?" And the players have to answer if it is true or false. In this case, the answer is: True (figure 2.53, images 1 and 2).

Once they answer this question, the players receive a second piece of a jigsaw puzzle as shown on figure 2.51, image 1. The elephant icon that appeared on the block changes to the puzzle piece obtained as shown on figure 2.51, image 2.

Third, they enter the block with the planet earth icon. As soon as they enter, the explorer's spyglass opens and the text says: "Hint: Look for the functional diversity panel". The player must search for this specific panel. With



¿Quiénes son los principles consumidores primarios de las sabanas africanas?

¿Algunas especies pueden sobevivir la estación seca sin desplazarse a otro lugar?

**Figure 2.53:** Questions with correct answer, one answered right and one answered wrong.

the spotting scope, the player points to the panel and the AR Overlay is activated with the following clue: "Look for the panel with the planet we live on". The player must go to the panel "Biodiversity distribution" and point to the planet Earth, as seen on figure 2.52, images 1 and 2). Here the first question of this panel appears: "The distribution of biodiversity in Biomes is homogeneous, true or false?" and the correct answer is "False". If the player answers correctly, they get the score and if they answer incorrectly, they don't get the points. This type of question is shown on figure 2.53, image 2. The second question is: "In what year were the Biogeographic Regions originally described?" and the player must answer correctly to move on to the next question. He must activate the 4-digit number mechanism and answer the year: "1876". This type of question is shown on figure 2.50. Finally, the last question asks: "Who originally described the biogeographical regions?" And the players must answer the correct character: "Alfred Russel Wallace".This type of question is shown on figure 2.53, image 2. Once they answer this question, the players receives a third piece of a jigsaw puzzle as shown on figure 2.51, image 1. The planet earth icon that appeared on the block changes to the puzzle piece obtained as shown on figure 2.51, image 2.

Fourth, they enter the block with the beard icon. As soon as they enter, the explorer's spyglass opens and the text says: "Hint: Look for the huge letter "B"". The player must search for this specific panel. With the spyglass, the player points to the panel and the AR Overlay is activated with the following clue: "All humans are different. Look for the one with the most beard". The player must go to the "Biodiversity Appreciation Levels" panel and point to the one human with the most beard as seen on figure 2.52, images 1 and 2). Here appears the first question of this panel: "How can a process of extinction of a species begin?" and the correct answer is "With the decrease of genetic variability". Finally, the last question says: "Do humans find it difficult to perceive the biological diversity of organisms that are evolutionarily distant from us?". And the players must answer: "True". This type of questions are shown on figure 2.53, image 2. Once they answer this question, the players receives a fourth piece of a jigsaw puzzle as shown on figure 2.51, image 1. The beard icon that appeared on the block changes to the puzzle piece obtained as shown on figure 2.51, image 2.

After solving all four blocks, the central block is unlocked. This block functions as the "Exit Room" (figure 2.54, images 1 and 2).

Once the player enters, using the jigsaw puzzle pieces, they must put together a picture (figure 2.55, image 1). Once the image is assembled, the image of Charles Linnaeus from the "Ordering Biodiversity" panel is revealed (figure 2.55, image 2). Here appears the first question of this panel: "What words did Linnaeus use for the binomial system of scientific names?" and the correct answer is "Genus and Species". This type of question is shown on figure 2.50. The next question says: "In which year was Charles Linnaeus born?" and the player must find the date and enter it with the 4-digit number mechanism. The answer is: "1707". This type of question is shown on figure 2.50. Finally, the last question is: "What is Taxonomy responsible for?" And the players must answer: "Describing and naming new species". This concludes the first area of the museum and the first escape room.

To prevent players from moving on to the next area before the rest of the players have finished, an Introduce Code Stage is set up, where players have to wait for a code before they can move on to the second area of the game. The

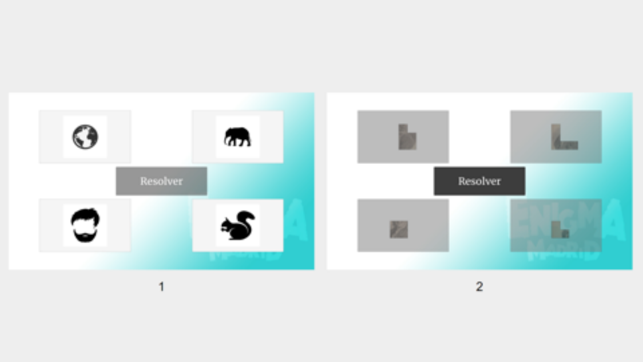


**Figure 2.54:** Escape room with four incomplete blocks and exit room locked and escape room with four completed blocks and exit room unlocked.

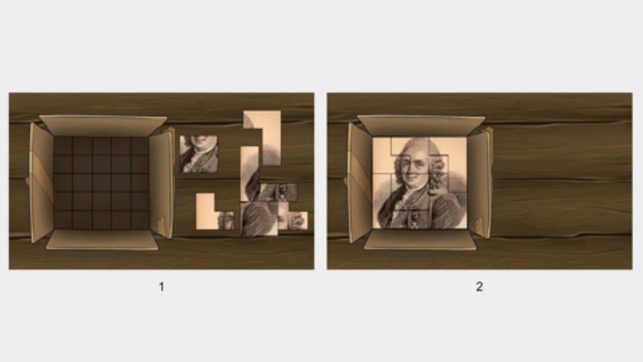
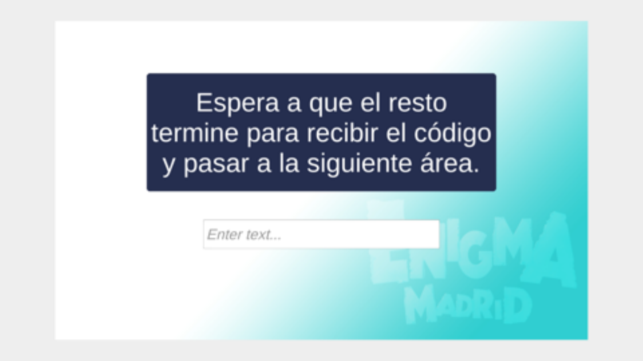


**Figure 2.55:** Escape room with four incomplete blocks and exit room locked and escape room with four completed blocks and exit room unlocked.



Espera a que el resto termine para recibir el código y pasar a la siguiente área.

Enter text...

**Figure 2.56:** Waiting for code block.

code word is: "Biodiversity" (figure 2.56).

### 2.5.4 Second Escape Room

The second escape room of the game belongs to the second area of the museum: Evolution. As in the first room, in this one the player can also find four open blocks and one locked block, as seen on figure 2.47, image 1. All the blocks are different and full of puzzles. The four available have different icons: A camel, a book, a swordfish and an butterfly. Each icon is a clue to the panel the player must go to in order to solve the block. There is no specific order of the blocks and players can solve them in any order they want. They must finish the first four to unlock the fifth and finish the Evolution escape room.

First, they enter the block with the camel icon. As soon as the player enters, the explorer's spyglass opens and the text says: "Hint: Look for the panel with the orangutan, gorilla, chimpanzee and human". The player must look for that panel and use the spyglass. The AR Overlay is activated with the following hint: "Look for the panel with the different types of hooves". The player must go to the "A common history" panel. The following hint appears: "There are different types of hooves, but the camel uses two hooves to move better in the desert". The player must point to the camel's hoof, this works as seen on figure 2.52, images 1 and 2). Here appears the first question of this panel: "What is highly modified about ungulate mammals?" and the correct answer is "Extremities or limbs". If the player answers correctly, he gets the score and if he answers incorrectly, he does not get the points. In both cases, the next question is asked: "Camels are more closely related to which animal rather than horses?" and players must answer: "Whales". This questions have a correct answer, so they are like figure 2.49, image 1. Once they answer this question, the players receive a first piece of a jigsaw puzzle. The camel icon that appeared on the block changes to the puzzle piece obtained as shown on figure 2.51, image 2.

Second, the player enters the block with the book icon. As soon as they enter, the explorer's spyglass opens and the text says: "Hint: A panel showing the evolution of limbs, from an arm to a wing". The player must look for that specific panel. Using the spyglass, the player points to the panel and the AR Overlay is activated with the following hint: "The collection of books in which Darwin's Origin of Species is written". The player must go to the "Charles Darwin, the father of evolutionary theory" panel and point to the books, this works as seen on figure 2.52, images 1 and 2). Here appears the first question of this panel: "An observation that made Darwin consider the evolution of living things?" and the correct answer is "The presence of fossils of giant animals with smaller living relatives". If the player answers correctly, he gets the score and if he answers incorrectly, he does not get the points. This question has a correct answer, so it is like figure 2.49, image 1. In both cases, the next question is asked: "In which year did Darwin propose his theory of evolution by natural selection?" Players must activate the 4-digit number mechanism to correctly answer the year: "1859". If they do not answer this question correctly, they will not be able to advance in the game. This question is like figure 2.50, image 1). Once they answer this question, the players receive a second piece of a jigsaw puzzle. The book icon that appeared on the block changes to the puzzle piece obtained as shown on figure 2.51, image 2.

Third, the player enters the block with the swordfish icon. As soon as they enter, the explorer's spyglass opens and the text says: "Hint:It is a fish that is recognized for looking like a sword". The player must search for this specific panel showing the swordfish. With the spotting scope, the player points to the panel and the AR Overlay is activated with the following clue: "Search for the Macroevolution panel". The player must go and point to the "Marine animals and Macroevolution" panel, this works as seen on figure 2.52, images 1 and 2). Here the first question of this panel appears: "How many large groups of animals are there in the animal kingdom?" and the correct answer is "36". If the player answers correctly, they gets the score and if they answers incorrectly, they don't get the points. The second question is: "Most amphibian species are?" and the players must answer: "Oviparous". This questions have a correct answer, so they are like figure 2.49, image 1. Once this question is answered, the players receive a third piece of a jigsaw puzzle. The swordfish icon that appeared on the block changes to the puzzle piece obtained as shown on figure 2.51, image 2.

After solving all four blocks, the central block is unlocked. This block functions as the "Exit Room", as shown on figure 2.54, images 1 and 2. Once the player enters, using the jigsaw puzzle pieces, they must put together a picture. Once the image is assembled, the image of "Extinctions in the distant past" panel is revealed, as shown in figure 2.55, images 1 and 2). Here appears the first question of this panel: "What percentage of extinctions occur naturally?" and the correct answer is "95 percent". The next question says: "Extinction can happen in a matter of days, while the formation of new species happens in how long?" and the player must answer: "Millions of years". This questions have a correct answer, so they are like figure 2.49, image 1. This ends the second area of the museum and the second escape room.

To prevent players from moving on to the next area before the rest of the players have finished, an Introduce Code

Stage is set up, where players have to wait for a code before they can move on to the third area of the game, the same as figure 2.56. In this escape room, the code word is: "Evolution".

### 2.5.5 Third Escape Room

The third and final escape room of the game belongs to the final area of the museum: Conservation. As in the last two rooms, in this one the player can also find four open blocks and one locked block, as seen on figure 2.47, image 1. All the blocks are different and full of puzzles. The four available have different icons: a tractor, a frozen egg, a panda and a saber-tooth. Each icon is a clue to the panel they must go to in order to solve the block. There is no specific order of the blocks and players can solve them in any order they want. They must finish the first four to unlock the fifth and finish the Conservation escape room.

First, the player enter the block with the tractor icon. As soon as they enter, the explorer's spyglass opens and the text says: "Hint: Search for the tractor in the waste field". The player must look for that panel and use the spyglass, this works as seen on figure 2.52, image 2). Here appears the first question of this panel: "In whose hands are the solutions to the causes of extinction?" and the correct answer is "Governments and public administrations". If the player answers correctly, he gets the score and if he answers incorrectly, he does not get the points. In both cases, the next question is asked: "Resource consumption exceeds the regenerative capacity of the planet, true or false?" and players must answer: "True". This questions have a correct answer, so they are like figure 2.49, image 1. Once this question is answered, the player finishes the first block.

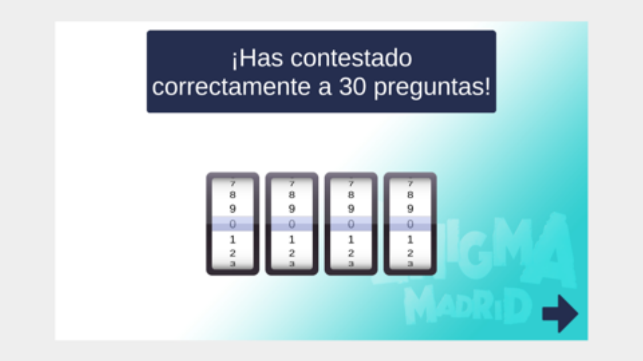
Second, they enter the block with the frozen egg icon. As soon as they enter, the explorer's spyglass opens and the text says: "Hint: It is frozen in case it is needed in the future". The player must look for the frozen egg and use the spyglass, this works as seen on figure 2.52, image 2). Here appears the first question of this panel: "What does the use of frozen sperm and eggs allow?" and the correct answer is "Exchange genetic material". If the player answers correctly, he gets the score and if he answers incorrectly, he does not get the points. In both cases, the next question is asked: "What is the objective of the MNCN Germplasm and Tissue Bank?" and players must answer: "Preserving genetic material of Iberian species". This questions have a correct answer, so they are like figure 2.49, image 1. Once this question is answered, the player finishes the second block.

Thirdly, enter the block with the panda icon. Here, there is no need to use the explorer's spyglass, as there is only one panda on the room. Here appears the first question of this panel: "In which year does the panda Chulin died?" and the player must use the four-digit mechanism to form the year in which Chulin died. In this case, the answer is: "1999". This question is like figure 2.50, image 1). In this case, the player must answer correctly in order to progress. The next question is asked: "What made Chulin famous?" and players must answer: "For being the first panda born by artificial insemination in Europe". This question has a correct answer, so it is like figure 2.49, image 1. Once this question is answered, the player finishes the third block.

Fourth and final block, the player enters the block with the saber-tooth icon. As soon as they enter, the explorer's spyglass opens and the text says: "Hint: Search for a feline that became extinct in the Pleistocene". The player must look for the Pleistocene extinctions panel and use the spyglass, this works as seen on figure 2.52, image 2). Here appears the first question of this panel: "Phase 1 of the extinctions is the transition from Pliocene period to?" and the correct answer is "Pleistocene period". If the player answers correctly, he gets the score and if he answers incorrectly, he does not get the points. In both cases, the next question is asked: "What percentage of the planet's net primary production is attributed to humans?" and players must answer: "24 percent". This questions have a correct answer, so they are like figure 2.49, image 1. Once this question is answered, the player finishes the final block to unlock the Exit Room.

After solving all four blocks, the central block is unlocked. This block functions as the "Exit Room", as shown on figure 2.54, images 1 and 2. This area of the museum is the smallest, so the panels in this area have already been used. For the exit block of the "Conservation" area, the two-story display case was used. In one, the sad story of the Thylacine, an extinct animal that could not be rescued in time, and the happy story of the Iberian Lynx, which with timely measures, was saved from extinction. The first question is about the Thylacine: "In which year was the Thylacine officially declared extinct?" and the player must use the 4-digit mechanism to form the correct anus: "1986". The player must answer correctly to be able to move on to the next question. The second and last question of the game is about the Iberian Lynx: "What was the main reason for the decline of the Iberian Lynx?" and the correct answer is: "The vermin law" which allowed the killing of these animals. It doesn't matter if the player answers right or wrong, that question ends the game. This questions have a correct answer, so they are like figure 2.49, image 1.

Before the players are given the results of how many questions they answered correctly, an Introduce Code Stage is set up, where players have to wait for a code, the same as figure 2.56. The code word is: "Conservation".



¡Has contestado correctamente a 30 preguntas!

**Figure 2.57:** Amount of correct answers obtained by the player.

Once they enter the correct code, they will be shown a screen with the result of how many questions they answered correctly. This ends the game (figure 2.57).

| Experimental Group | Artworks | Emphatic People | Non-Emphatic People |
|---|---|---|---|
| 1 | 1 | 77% | 23% |
| 1 | 2 | 64% | 36% |
| 1 | 3 | 59% | 41% |
| 2 | 1 | 72% | 27% |
| 2 | 2 | 50% | 50% |
| 2 | 3 | 86% | 14 % |

**Table 2.1:** The percentage of empathic and non-empathic people for each artwork.

## 2.6 A VR Interface to Promote Social Cohesion through Cultural Heritage

Based on studies related to the use of Virtual Reality (VR) to increase prosocial [2] and empathic [3, 4] behaviours, our research employs VR technology to encourage users to adopt an alternative point of view through a virtual embodiment, to increase social cohesion. To this aim we have built a virtual museum where different avatars (parameterized on age, gender and nationality) can interact with experimental subjects to discuss emotional and value-driven interpretations related to works of art, aiming at bootstrapping user's interpretation-reflection loops [5]. Based on the results of our pilot study, which show that a VR-driven methodology fosters a sense of embodiment and maximizes social cohesion among users, we are working on an innovative real-time interface based on data semantics, to sensitize people to other interpretations.

### 2.6.1 Experimental Study

Technologies can facilitate social interactions by promoting the psychological well-being of people in social contexts. In particular, the use of immersive virtual environments has proved very useful in the field of psychology for social interactions [6, 7], thanks to VR tools that allow subjects to experience real situations, perceiving their own body within a simulated environment [8]. Previous studies, for example, have used VR to promote empathic behavior [3, 4] and reduce violent behavior [9] or prejudice [10]. Based on these studies, we used VR to promote social cohesion, encouraging the user to take a different point of view through virtual embodiment. We did a pilot study on a sample of N=44 subjects, divided into two groups of N=22, with an average of 26 years old in the first group and 27 years old in the second one. In our experimental design, we have simulated a visit to a virtual Museum, using Oculus Quest 2 and Unity Engine 3D as software, with Art Dot Gallery package. We have recorded the verbal response of the users and their psycho-physiological response, related to the electrodermal activity using BioSignal Plux Kit. We asked the users to provide information about their feeling related to three specific artworks (time 0); to listen to the interpretations provided by avatars that share the scene with him (time 1); to explain their feeling, again, dressing the shoes of the avatar (time 2); and to give a free answer to the avatar's interpretation (time 3). The time 2 and 3 were counterbalanced in the two experimental groups. For our analysis, we compared the user interpretation at the time 0, when the user dresses his own body, and at the time 2/3 when the user dresses the shoes of the avatar. Our results can be synthesized in 4 points: First, from the dialogue analysis our results show that in both groups the percentage of empathic people (participants that change partially or totally their interpretation when they dress another body) is greater than non-empathic people (Chi-square Analysis experiment n.1 p-level 0.007; experiment n.2 p-level 0.016)-Table 2.1; Second, empathic people show a decrease of the verbal reaction time during the virtual embodiment (experiment n.2 t-test analysis p-level 0.036); Third, empathic people show an increase of the electrodermal activity during the virtual embodiment, that can be understood as an index of their emotional involvement (experiment n.1 one-way ANOVA p-level 0.049); Finally, using self-report questionnaires post the VR experience, our results show an increase of the affective empathy in relation to the haptic perception (Pearson correlation r 0.339; p-level 0.025); and an increase of the cognitive empathy in relation to the realism of the verbal input provided by the avatars (Pearson correlations r 0.375 p-level 0.012).

### 2.6.2 VR Interface

Based on the results of our pilot study, we designed a system capable of recording verbal interpretations on an external Linked Data hub and analyzing and enriching them semantically to guide an avatar engine in choosing what avatar to present to the user. Specifically, we have created 27 avatars, representative of different physical characteristics of the world population, distinguished by age, gender and nationality and we used two sensemaking tools (cf. Deliverable D6.6), one based on Zero-Shot learning [11] and FRED, based on hybrid knowledge-based methods [12, 13] to do an emotional-value detection on the verbal response of the users. Then, we collected all the verbal interpretation that we recorded during the pilot study (N=396) and the avatars in the external Data Hub. In our final application, the visitor can both explain his interpretation and then choose a specific emotion and moral value, from a list inside the VR environment. Based on this, the VR communicate with the Data Hub to take a specific avatar-audio object and present it in the VR environment. Our system uses three methodologies to choose the most appropriate avatar: i) an AI-based methodology, which decides by using an emotion detection system and by reasoning over contextual knowledge stored in the Linked Data Hub; ii) User-Based methodology, in which the choice is made on the user input (i.e. the system asks the user to indicate emotion and value through a set of buttons placed in the environment); iii) random choice, it works in the worst case in which the visitor is not able to choose any emotion and moral value. In this way, our system allows the visitor to interact with specific avatars having different physical characteristics as well as with different emotional-value interpretations. Figure 2.58 shows the use-case diagram of our real-time application.

In conclusion, the results of our pilot study show that it is possible to use a virtual reality system, exploiting virtual embodiment, to promote social cohesion. In this line, our intelligent system could help people relate to users with different interpretations and/or different physical characteristics, through the sharing of cultural heritage.

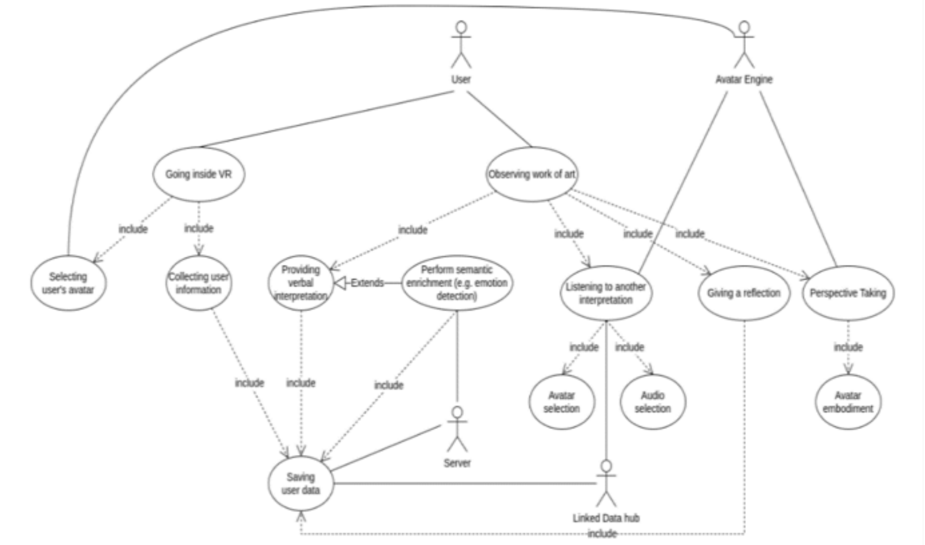
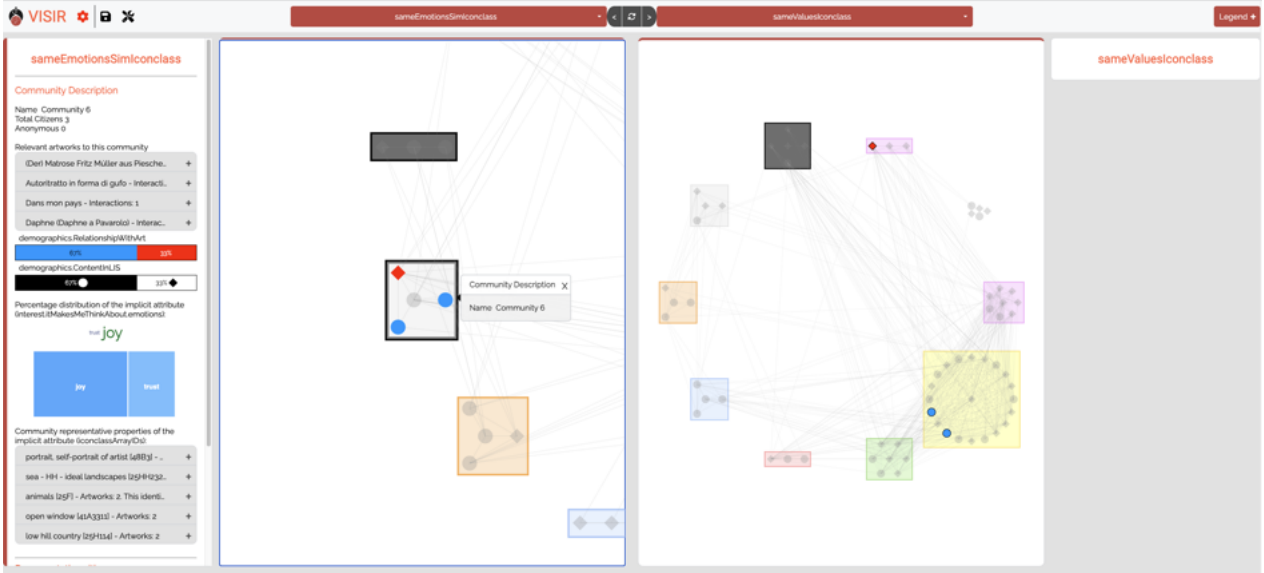


**Figure 2.58:** Use-Case diagram of the VR application

# 3 Community visualization

VISIR (VISualization for Interpretation and Reflection) is a tool that enables museum curators the detection, visualization, and explanation of communities needed in the SPICE IRL model. The main interface is shown in Figure 3.1. This tool also supports the creation of new perspectives for the community model that can be easily defined without any knowledge about clustering algorithms or similarity functions. The new perspectives that are useful for the curator can be downloaded for later configuring a community model that uses those perspectives.



sameEmotionsSimIconclass

Community Description

Name Community 6
Total Citizens 3
Anonymous 0

Relevant artworks to this community

- (Der) Matrose Fritz Müller aus Piesche..
- Autoritratto in forma di gufo - Interacti..
- Dans mon pays - Interactions: 1
- Daphne (Daphne a Pavarolo) - Interac..

demographics.RelationshipWithArt

67% 33%

demographics.ContentInLIS

67% ● 33% ◆

Percentage distribution of the implicit attribute (interest.itMakesMeThinkAbout.emotions):

Community representative properties of the implicit attribute (iconclassArrayIDs):

- portrait, self-portrait of artist [48B3] - ..
- sea - HH - ideal landscapes [25HH232..
- animals [25F] - Artworks: 2. This identi..
- open window [41A3311] - Artworks: 2
- low hill country [25H114] - Artworks: 2

sameValuesIconclass

**Figure 3.1:** Main interface in VISIR.

We describe the complete tool in the following sections.

## 3.1 Visualization Tool

The visualization tool is the main feature of the application and occupies most of the user interface. The visualization tool can show simultaneously two different perspectives with common explicit attributes (as shown in Figure 3.1).

Each perspective visualizes the communities computed by the community model (see Figure3.2). Each community is represented by a rectangle (a bounding box) that encloses a set of nodes, which represent the citizens within the community. A group of nodes without a bounding box represent the citizens that do not belong to any community in this perspective.

Each citizen node is identified by a label or citizen id (hidden by default) and characterized by a color and shape. Both visual dimensions are employed to identify up to two explicit citizen attributes. Nodes are linked by edges that represent the similarity between citizens according to the similarity functions defined by the perspective. To simplify the visualization, edges are displayed using attenuated colors and the user can choose the similarity threshold to hide the edges below it.

Both nodes and bounding boxes in the perspective visualization are interactive so when the user clicks on them, a Data Panel appears aside the perspective (on the left or on the right, depending on to which perspective the data belongs to). Each Data Panel is related to a perspective data, so the information shown in each of them may be differ even when the same user exists in both perspectives.

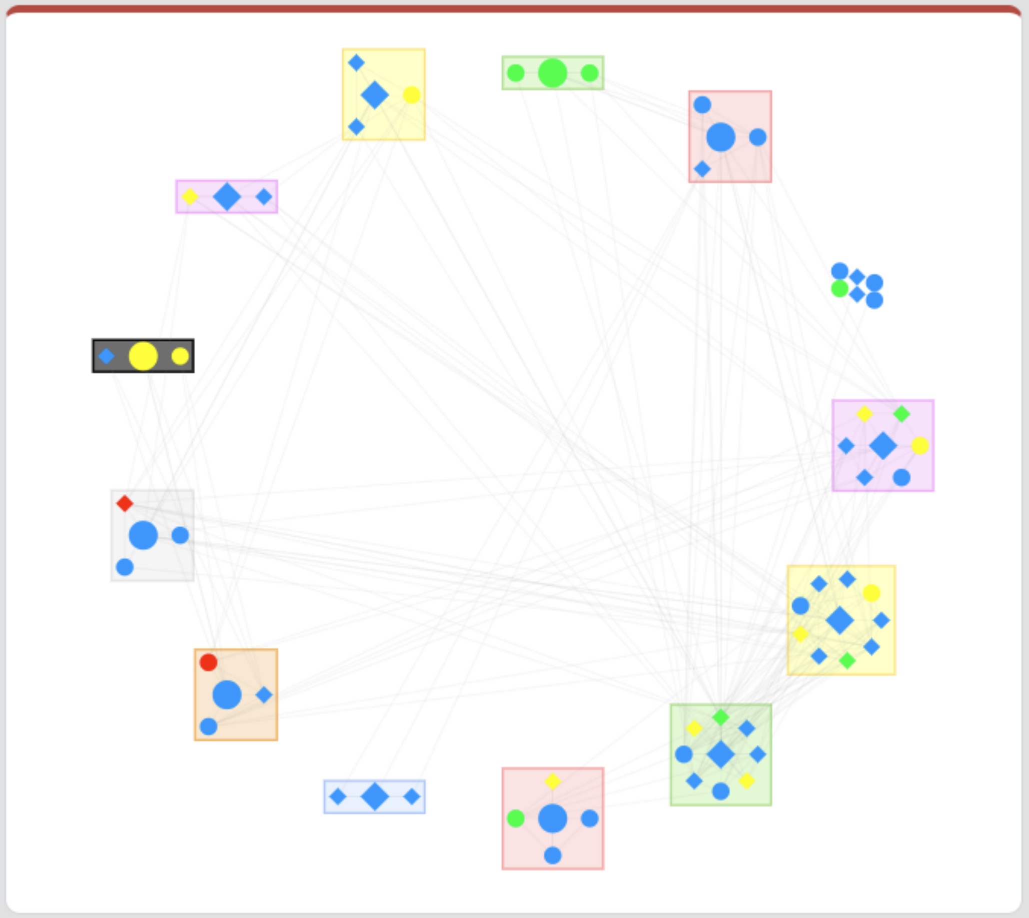


**Figure 3.2:** Perspective visualization.

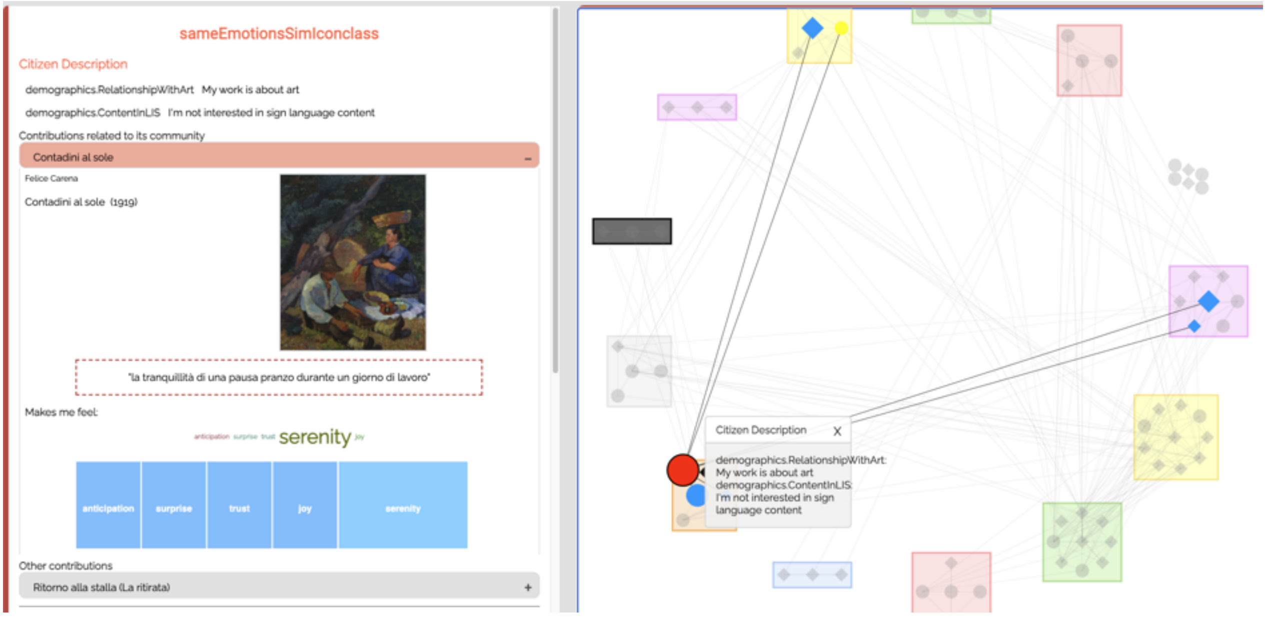
### 3.1.1 Citizen data panels

When the user clicks on a node –a citizen, the data panel displays the information for the selected citizen (see Figure 3.3). This panel will list the citizen's explicit attributes (legend attributes) and all the citizen's contributions, divided in two accordion lists: a first list with the contributions related to the community that she belongs to, and a second list with the rest of this citizen contributions. Each contribution contains the artwork involved in the interaction, the citizen contribution itself (generally, a text) and the implicit attributes extracted from this contribution. Additionally, when a node is selected, the edges with the origin in this node are highlighted to see which other citizens are similar to him/her (in this community or in other communities).

### 3.1.2 Community data panels

When the user clicks on a community, the data panel displays some basic information about the community description (community name, the number of citizens and the most relevant artworks to this community). Artworks are represented as accordion panels with the title, author's name, an image, and the number of users of this community that interacted with it (see Figure 3.4, on the left).

After the basic information, the different community explanations will be shown. Each type of explanation will change how they are visually represented (see Figure 3.4, on the right):



sameEmotionsSimIconclass

Citizen Description

demographics.RelationshipWithArt My work is about art

demographics.ContentInLIS I'm not interested in sign language content

Contributions related to its community

Contadini al sole

Felice Carena

Contadini al sole (1919)

"la tranquillità di una pausa pranzo durante un giorno di lavoro"

Makes me feel:

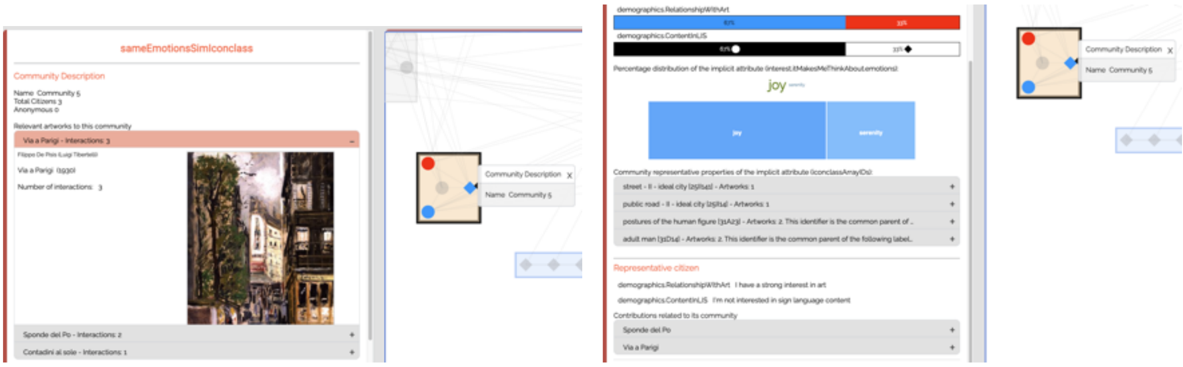
Other contributions

Ritorno alla stalla (La ritirata)

Citizen Description

demographics.RelationshipWithArt: My work is about art
demographics.ContentInLIS: I'm not interested in sign language content

**Figure 3.3:** When a user is selected, the Citizen data panel is shown (on the left) and similar citizens are highlighted.



sameEmotionsSimIconclass

Community Description

Name Community 5
Total Citizens 3
Anonymous 0

Relevant artworks to this community

Via a Parigi - Interactions: 3

Filippo De Pisis (Luigi Tibertelli)

Via a Parigi (1930)

Number of interactions: 3

Sponde del Po - Interactions: 2

Contadini al sole - Interactions: 1

Community Description

Name Community 5

demographics.RelationshipWithArt

demographics.ContentInLIS

Percentage distribution of the implicit attribute (interest.itMakesMeThinkAbout.emotions):

Community representative properties of the implicit attribute (iconclassArrayIDs):

street - II - ideal city [25I1541] - Artworks: 1

public road - II - ideal city [25I14] - Artworks: 1

postures of the human figure [31A23] - Artworks: 2. This identifier is the common parent of ..

adult man [31D14] - Artworks: 2. This identifier is the common parent of the following label..

Representative citizen

demographics.RelationshipWithArt I have a strong interest in art

demographics.ContentInLIS I'm not interested in sign language content

Contributions related to its community

Sponde del Po

Via a Parigi

Community Description

Name Community 5

**Figure 3.4:** Information about a community: basic information (left) and explanations (right) about a community

- Explicit attributes. Two bars will show the distribution of values for each explicit attribute (legend attributes) of all citizens of the community.
- Explanation attributes. The implicit attributes employed by the community model to create the communities can be displayed in different ways:
  - Some implicit attributes like emotions or sentiments are shown as a word clouds and treemaps. Clicking on any of the values of the treemap will filter the visualization to highlight all communities whose dominant values for this attribute is the selected one.
  - Other artwork attributes like concepts that describe the artworks are as a list of attributes in an accordion. Each item also displays a button to filter the visualization to highlight all communities that contain this value as part of their explanations.
- Medoid. Each community has a representative "fake" citizen, created with the most representative values of the community. This medoid appears at the bottom of the community data panel, as a citizen data panel.

### 3.1.3 Menu bar

The Menu bar (Figure 3.5) allows the configuration of VISIR functionality for visualization. Additionally, it provides access to configuration options and other perspective tools. Note that the menu bar is responsive, so when the screen width is not enough to fit all options, a hamburger button will appear to collapse some options.

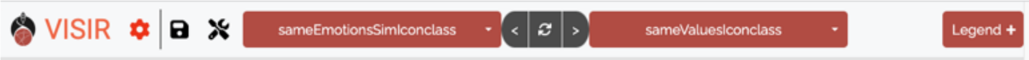


**Figure 3.5:** VISIR interface and its Menu Bar.

The menu bar contains the following buttons (from left to right):

1. VISIR button: for refreshing the webapp.
2. The cog button is a dropdown allows the user to choose the source of the visualization files (local files or download from a community model, using user and password), and to configure some visualization options.
3. The floppy disk button: is used to Save Perspectives (more details in section 1.3).
4. The screwdriver-wrench button: opens the Perspective Builder component (more details in section 1.2).
5. Select Perspective Dropdown buttons (A and B): allow users to choose two different perspectives to visualize and interact with.
6. Collapse Buttons (left and right arrows near Select Perspective Dropdown): only appear if two perspectives are active. They will collapse the visualization to one of the sides to increase the view space of one of the networks without losing the secondary network.
7. The rotating arrows button: is an update button that removes the active perspectives and updates the Select Perspective Dropdown buttons with the available perspectives.
8. Legend Button: toggles the legend information. Here the user can see the relationship between the citizen's colors and shapes with their explicit community values. Additionally, the legend is interactive so the user can click on any legend value to hide all the citizens with such attributes.

### 3.1.4 Perspective Builder

Perspective configuration allows the museum curators guiding the community model about her interests in clustering the users in a set of implicit communities according to the selected configuration of interaction attributes and properties.

The Perspective Builder is used to configure new perspectives and sending them to a Community Model to create new visualizations. A perspective is created using a minimal and non-technical interface, specifically for curators without any technical knowledge about clustering algorithms and similarity functions, based on the creation of a sentence that explains (in plain English) how the clustering algorithm will behave, which citizen attributes will appear in the legend and which artwork attributes will be employed for deciding the similarity between two artworks (see Figure 3.6, on the left).

For more technical users, the Perspective Builder has a Dev mode (active when clicking on the Dev Mode Button) where more technical options related clustering algorithms, similarity functions and parameters can be selected (see Figure 3.6, right).

Next, we describe this interface focusing on the rows that conform its layout.

1. First row contains the buttons for toggling the Dev mode and closing the Perspective Builder.
2. Second row is only visible if dev mode is selected. This row displays the Algorithm dropdown selector that allows users to choose which clustering algorithm to use, and to tune the explainability weight using a slider.
3. Third row contains the sentence to configure the perspective using several sliders:

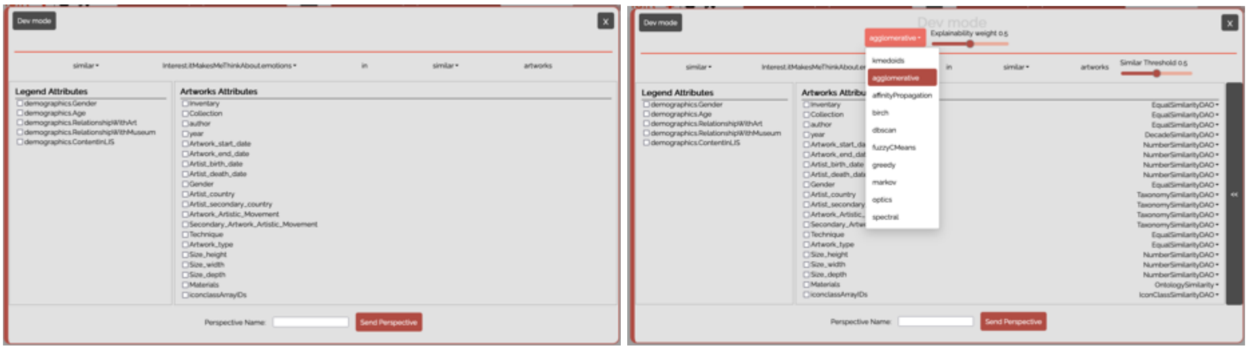


**Figure 3.6:** Perspective builder interface. On the right, the Dev Mode is active.

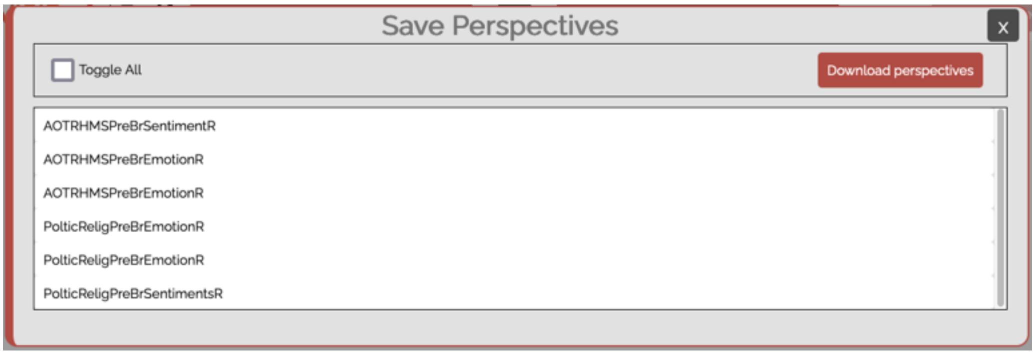
- The Similarity dropdown selector defines how to compare the interaction attributes (same, similar, or different)
- The Interaction attribute dropdown allows to choose which interaction attribute is employed to create the communities (for example, emotions, sentiments, or values).
- The Artwork Similarity dropdown selector is similar to the Similarity dropdown selector but defines how to compare the artworks (or beliefs) attributes.
- If the "Same" similarity method is selected in the previous dropdown, the Artwork dropdown selector is displayed to choose the artwork that the visualization will focus on
- If Dev mode is active and same-similarity is not selected, a slider will appear allowing the user to adjust at what range two interactions should be assumed to be similar/dissimilar.

4. Fourth row is divided into two panels to choose different attributes:
   - Legend Attributes show the available citizen attributes that will be shown in the legend of the perspective and that will characterize the explicit communities. Only two attributes will be shown using color and shape visual dimensions. Other attributes will only be shown as part of the citizen data shown in the Data Panels (see Section 3.2.2.2).
   - Artwork Attributes allows to choose the attributes employed when similar/different option is selected in the Artwork Similarity dropdown selector. If dev mode is active, each attribute will have a dropdown to choose the similarity function to use (from a list provided by the Community model in the seed file, described in Section 3.2.3).
5. If dev mode is active, a button with an arrow will appear at the right of Artwork attributes panel. Clicking it will toggle an area that shows the JSON file that will be sent to the Community Model according to the selected options.
6. Fifth and last row allows users to write a perspective name and to finally send the perspective configuration file to the Community Model. After that, the new perspective will appear in the Select Perspective Dropdown buttons.

### 3.1.5 Save perspective

This component is used to choose and download the perspectives that are interesting or the curators and to upload them to the Community Model in the future (see Figure 3.7).

Clicking on the perspective names will select the perspectives to download when clicking on the Download perspectives button. We can select all the perspectives using the Toggle all button on the top left.



AOTRHMSPreBrSentimentR
AOTRHMSPreBrEmotionR
AOTRHMSPreBrEmotionR
PolticReligPreBrEmotionR
PolticReligPreBrEmotionR
PolticReligPreBrSentimentsR

**Figure 3.7:** Save perspective component.

## 3.2 Architecture

VISIR is fully implemented using Typescript and React. It also uses other Javascript libraries like Axios , for managing API requests, and Vis.js , for creating and managing the network visualization employed for the perspectives. VISIR architecture (Figure 3.8) is organized in four modules:

- App is the core module that links all the other components, stores the application state, and shares data between them like the requestManager to connect VISIR with the Community Model.
- Visualization panel is the module that is in charge of loading the perspectives for visualization and manages the user interactions with the nodes and communities in the visualization.
- Perspective builder is the module for creating personalized perspectives. With this interface, users can configure the perspective, choosing the user attributes, the interaction attributes –emotions, sentiment, polarity. . . – and the artwork attributes, as long as the similarity measures are employed by the community model. It provides a developer mode where advanced algorithms and parameters can be selected for fine tunning.
- Perspective storage is the module that allows users to download the perspectives created by the Perspective builder and use them to configure a Community Model.

These modules will be deeply described in the following subsections.

### 3.2.1 App module

The app module creates the base UI components to use all the other features of the application. Additionally, it creates and maintains other different states/objects that will be used everywhere in VISIR. The main classes of this module are the following:

- App implements the navigation bar component that holds the main options and features of the application. It also manages the application state and other objects employed in the other components.
- RequestManager centralizes all the communication with the Community Model API. It manages the requests related to the available perspectives in the Community Model, as long as sending the configuration files for creating new perspectives.
- Translation is responsible of the UI localization of VISIR.
- LoadingFrontPanel is a basic component that disables the interactions of the user with VISIR while a perspective is loading in the background –for example, when a new perspective is being requested to the Community model.
- VisirOptions is in charge of the UI dropdown button that allows user to configurate some visualization and source options.

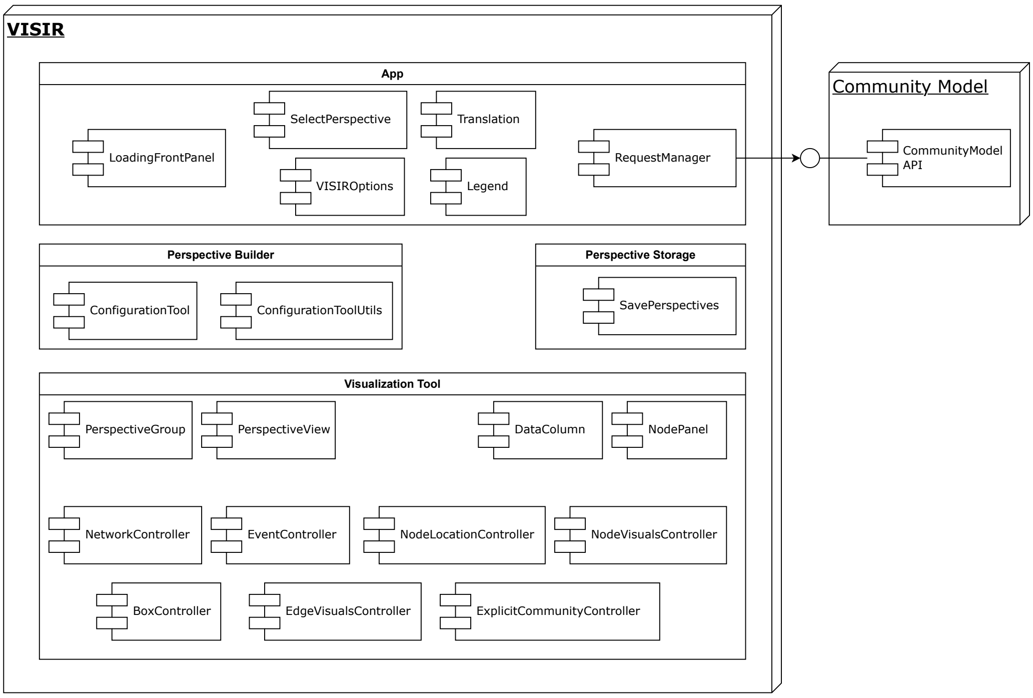


**Figure 3.8:** VISIR Architecture.

- SelectPerspectiveDropdown is in charge of the Perspective Selection Dropdown buttons in the UI.
- LegendComponent manages the legend of the visualization tool and the filtering features performed using it.

### 3.2.2 Visualization module

The visualization module manages the visualization of two perspectives simultaneously, the information panels and the interactivity around the perspectives. It is divided into the following components. Each task is composed by several components, described in the following subsections.

#### 3.2.2.1 Visualization of perspectives

Each perspective is visualized with vis.js using a network. User interactions not only modifies the network where she clicks but also the perspective simultaneously displayed (if any). So, we need several components to manage and share some states between all active perspectives.

PerspectivesGroup component controls the shared states between the networks like what is the current selected object or in which network is the user clicking. The tooltip is created here depending on the location of the current selected object. If two perspectives are active, this component also collapses the perspectives when the user interacts with the Collapse Buttons. When all perspectives are unloaded, it restarts everything to default.

PerspectiveView is the component that embeds the vis.js network to the VISIR app in React. First, it creates the network controller and the DataColumn component, described in the following section. Later, it forwards user events to the former controllers. When the user changes any visualization option (like showing labels), this component will detect that change and will ask the network controller to update all nodes to show their labels. Additionally, when a shared state between perspectives is modified (like, when a user clicks on a node), PerspectiveView component would recognize if the node clicked is from this network, is a medoid or if it is from the other network. In any case, it will tell the network controller what to do.

#### 3.2.2.2 Data panels

These panels are displayed aside of each visualization of a perspective and contains data of a specific perspective. For this reason, the citizen information shown in each of them can differ when the same citizen exists in both perspectives.

Each piece of information (bars for the distribution of explicit attributes in a community, the treemaps for the implicit attributes, the accordion lists for explanations and artworks, etc.) is managed by a component but there are two main wrapper components:

- DataColumn shows the information about a community and creates the nodePanel of the selected user.
- NodePanel creates a panel with the information and data from the user, excluding any description of the community. This panel will list the user's explicit attributes (legend attributes), its implicit attributes (if they exist) and will list all the user's contributions using two accordions: the interactions related to its community, and all the other user interactions.

#### 3.2.2.3 Perspective controllers

Each perspective has its own set of controllers that parses the perspective's data, configurates the visualization options of the vis.js network and reacts to the different events that may happen while playing with the visualization.

- NetworkController is the main component that creates and initializes vis.js options and iterates over all nodes and edges to initialize all the other controllers.
- EventController is the controller in charge of any event from a network, like clicking on a node, or any other external event detected in PerspectiveView, like clicking in a node of another network or changes in the visualization options.
- ExplicitCommunityController computes the distribution of the values of explicit attributes for each community. This controller also parses each node interactions to know what are the most relevant to each community.
- NodeLocationController visually arranges the citizen nodes in a community and the communities in a perspective visualization using circular pattern. To avoid overlapping, it uses an iterative separation algorithm that increases the distance between nodes and communities to improve the visualization of each perspective.
- NodeVisualsController changes the color and shape of all nodes depending on their state (focused, selected, unselected), the legend configuration options and their explicit community values. If this is the first network loaded, this controller will also create the DimensionStrategy object, a shared object between all active perspectives and the legend, that relates each user explicit community value with a color/shape.
- BoxController calculates the bounding box created for representing a community using all the citizen nodes of the same community, and colors those bounding boxes. It also manages the clicks inside this bounding box, to modify the bounding box border width and color when the community is highlighted.
- EdgeVisualController is responsible of the edges that join citizen nodes in the visualization. It changes the color of the edges depending on their selected/unselected state. (an edge is selected if any of their source nodes is selected). This controller also removes edges below a certain threshold or hide all edges that are not selected, according to the visualization options.

### 3.2.3 Perspective builder module

The Perspective builder module allows selecting different options to create a new perspective for the Community Model. The main classes of this module are the following ones:

- ConfigurationTool creates all the UI elements in the Perspective builder, downloads the seed file and uploads the perspective configuration file from/to the Community Model using the RequestManager. Additionally, it customizes the UI according to the user interactions and the selected options.
- ConfigurationToolUtils contains the data structures needed by the Perspective builder, as long as the helper methods to manage the JSON files that configure the UI –the seed file– and that will be sent to the Community Model to create a perspective.

The Perspective builder uses a seed file for self-initialization of it UI. The seed file is a JSON object that contains the following attributes:

- user_attributes: For configuring the Legend Attributes checkbox.

```
    "user_attributes": [
        {
            "att_name": "demographics.explicit-community",
            "att_type": "String"
        }
    ],
```

- interaction_similarity_functions: For configuring the Interaction attribute dropdown selector. If its empty, the first similarity dropdown and the options dropdown will be hidden.

```
    "interaction_similarity_functions": [
        {
            "name": "ExtendedPlutchikEmotionSimilarity",
            "params": [],
            "on_attribute": {
                "att_name": "interest.emotions",
                "att_type": "dict"
            },
            "interaction_object": {
                "att_name": "id",
                "att_type": "String"
            }
        }
    ],
```

- artwork_attributes: For configuring the Artwork Attributes checkboxes. It contains sim_function objects for configuring the devmode-algorithm selectors shown when dev mode is active.

```
    "artwork_attributes": [
        {
            "on_attribute": {
                "att_name": "author",
                "att_type": "String"
            },
            "sim_function": [
                {
                    "name": "EqualSimilarityDAO",
                    "params": [],
                    "default": true
                }
            ]
        }
    ],
```

- artworks: A list of artworks for configuring the Artwork dropdown selector.

```
    "artworks": [
        {
            "name": "1610",
            "id": "22769"
        }
    ],
```

- algorithm: For configuring the Algorithm dropdown selector available on dev mode. One of them will have the default attribute with a true value, meaning that this algorithm will be used when dev mode is not active.

```
    "algorithm": [
        {
            "name": "agglomerative",
            "params": [],
            "default": false
        }
    ],
```

- BeliefStructure: For configuring the perspective builder for special case studies, like Hecht Museum, where the artworks are substituted by beliefs and the configuration sentence is slightly modified.

```
    "BeliefStructure": false
```

## 3.3 Perspective storage

This small component is responsible for the perspective selection and the download of the configuration files of the selected perspectives. SavePerspectives creates the UI components for checking the available perspectives to download and it communicates with the RequestManager to download them.

# 4 inSPICE

## 4.1 Introduction

inSPICE is a web system for the creation, management, execution, and analysis of citizen curation activities which abstracts and generalizes a good part of the interfaces of the SPICE use cases: GAM (Section 2.2), Hecht Museum (Section 2.3), IMMA (Section 2.4), and MNCN (Section 2.5). In addition, inSPICE includes a library of components, the inSPICE framework, designed to be easily integrated in activities hosted by museums (including components to visualize artifacts and artworks or request inputs from participants in different formats, to name a few), and a preset workflow to build new activity templates from the available components.

inSPICE templates are closely related to the concept of "citizen curation script" described in Section 1.1. Each script is made up of predefined sequence of interpretation activities (e.g. collecting, artefact analysis) and reflection activities (e.g. search, visualizing similarities and differences). In our system, an instance of an inSPICE template defines a citizen curation script.

At the moment, the system includes three types of templates: visual story template, which implements the GAM Game, multistage form template, which generalises IMMA and Hecht use cases, and escape room template, which implements MNCN treasure hunts.

In addition to the management of citizen curation templates, inSPICE also supports session management. It is common for a citizen curation activity to be carried out by different groups at different points in time, and it can be interesting to manage these groups separately, both in terms of access control, which makes it possible to identify individual contributions, and in terms of processing the data generated during each execution of the activity. This is handled by the inSPICE sessions.

Figure 4.1 provides an example, taken from the visual story template, which gives an overview of the different roles and perspectives in the use of inSIPCE that tipically includes:

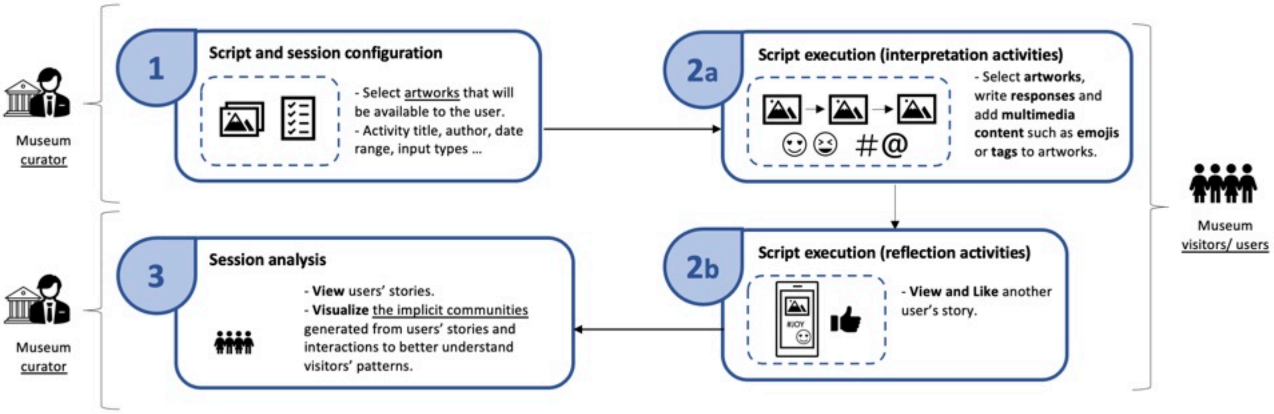

Museum curator
1
Script and session configuration
- Select artworks that will be available to the user.
- Activity title, author, date range, input types ...
2a
Script execution (interpretation activities)
#@
- Select artworks, write responses and add multimedia content such as emojis or tags to artworks.
Museum visitors/ users
2b
Script execution (reflection activities)
#JOY
- View and Like another user's story.
3
Session analysis
- View users' stories.
- Visualize the implicit communities generated from users' stories and interactions to better understand visitors' patterns.
Museum curator

**Figure 4.1:** inSPICE perspectives example.

1. **Script and session configuration** A museum curator selects and instantiates a citizen curation template, i.e. a script. Once the script has been configured, different sessions can be defined and login credentials distributed to museum visitors. According to the type of template, we distinguish two types of script configuration:

   **Parameter configuration** . Some templates, as the visual story in the example, come with a predefined sequence of activities, a fixed script. In that case, just general parameters of the script can be configured such as the artworks available to the user or the instance metadata.

   **Workflow configuration** . In other cases, such as the escape room and multistage form templates, the concrete sequence of activities that make up a particular script is not fixed. The script author has a palette of activities with which to design a particular workflow.

2. **Script execution**. Once the script and the session have been configured, museum visitors can "consume" or execute the script, carrying out the interpretation and reflection activities that the script proposes and typically generating some kind of input that the system will make persistent.
3. **Session analysis**. The set of data generated by the execution of a script can be visualised and analysed a posteriori. Both individually, per session, from inSPICE, and in aggregate using SPICE's community visualisation tools described in Chapter 3.

Next Sections describe templates and sessions in more detail. Chapters 5, 6 and 7, describe configuration tools for available templates, and finally Chapter 8 describes inSPICE framework.

## 4.2 inSPICE: activity templates

The inSPICE activities are developed around the concept of "templates". An activity template can be understood as a blueprint that provides the following key points:

- A **data-driven activity** that a museum visitor can interact with either from the inSPICE platform itself or from an external application (as will be seen later when describing the templates that make use of AR and VR-based applications). These activities can have vastly different natures: games, forms, guided tours, etc. Something important to note is that every activity included here must be able to be executed in its corresponding platform from a JSON file in the format imposed by the template. That is, applications running an activity must be data-driven and clearly define the format in which they need their data to operate.
- An **authoring tool** to generate the JSON files needed to launch the application running the activity. In order to allow any curator to create new activities without the need for technical knowledge, each template must have a web editor included in inSPICE that guides the user through the process of building a new instance of the corresponding activity. The result of this process will be precisely the JSON file to be used by the activity executor.
- An **activity instance manager** included within the inSPICE Dashboard. To enable access to an activity template from the framework on a general basis, it is necessary to include it within the Activity Dashboard (more on it below) and define what options to enable for an activity created by its corresponding authoring tool. This may include duplicating or deleting the activity, opening it in its executor, or downloading the associated JSON if it needs to be used in an external project. Additionally, the instance manager allows viewing the public activities of other curators and using them as a basis or reference when creating one's own activities.
- An **activity session manager** to control the access to activities through restricted users. This functionality is enabled by default for any activity instance whose executor is inSPICE itself, and provides management of named sessions in which a museum visitor can participate. In this way, a museum curator can create as many sessions as required for their activity, and produce a number of anonymized user identifiers that can be used in a given session to access it. Consequently, the participant will only be able to access an activity if they are provided with a session name and an anonymous user ID associated with that session, and any contributions or interactions generated by the user will be recorded in the system with the corresponding identifiers. This allows a sense of identity to be maintained without the need to store sensitive information while limiting access to only those users who have been explicitly granted credentials.
- A number of **LDH collections** to support the storage of activity data. In general, each activity template should have at least one collection in the LDH where all the JSON files that define its instances are made available. The authoring tools will then send their generated activities to these collections, and the dashboard will also make use of these collections to retrieve the activities to be displayed. A template may rely on additional collections that may be needed to store other types of supplementary information, such as user contributions.
- Optionally, a template can include one or more **visualizers** (internal or external) to analyze and understand the patterns present in the participants' contributions.

That said, the main access point to the framework is the activity dashboard, which can be seen in Figure 4.2, and which we will refer to frequently throughout the document as the main entry point for museum curators to the platform. To access the framework one must possess a username and password provided by a platform administrator, since at the time of writing there is no public service available for logging into the system. Once logged in to the application, it is possible to see two different sections:

- The first row contains a set of activity templates available for creating new activity instances. In the example from the figure, three templates are available: Visual story, detailed in chapter 5, Multistage Form (chapter 6) and Escape Room (chapter 7). By clicking on any of these options it is possible to create a new activity based on the corresponding template.
- The lower section contains an explorer for the activity instances available in the system using the templates in the upper panel. This way, we can browse the public activities created by the current and other users, manage them or use them as a basis for creating new activities. The specific options for a particular activity can be consulted by clicking on the three vertical dots icon in the lower right corner of each card, and these are usually different depending on the type of activity selected (for example, an Escape Room type activity does not have sessions and cannot be launched in the browser, since it runs in a mobile application).

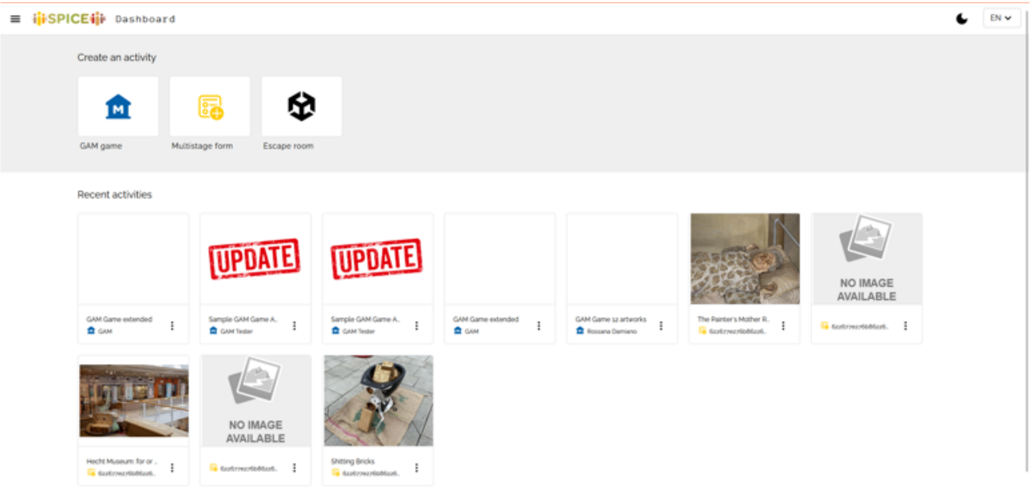


**Figure 4.2:** Activity Dashboard.

## 4.3 Session Management and User Authentication

One of the most pressing concerns in the early stages of inSPICE development was the need to maintain a notion of identity for a user interacting with an activity in order to store their input and other interaction records, without this raising a problem from the perspective of privacy and data protection. The way in which the Linked Data Hub is constructed, however, poses a challenge regarding the authentication of these users. On the one hand, LDH collections are not well conditioned to the storage of credentials or other sensitive data, which end up being exposed to all those who have access to the collection itself. On the other hand, we pondered whether the notion of an inSPICE user was necessary to begin with: most participants only end up taking part in a single instance of a particular use case with its unique needs for demographic information on individual users.

As an example, in the MNCN use case the only demographic data of interest are age and gender, and it is the use case itself that is responsible for keeping a record of these statistics, without these ever reaching the LDH. In the context of the Narrative Game something similar happens: the demographics of the participants are collected independently through a Google Forms form and stored by the use case maintainers privately. In view of this situation, it seems that any attempt to incorporate a full-fledged notion of user with full demographic and identity information in the LDH would end up generating friction or privacy issues with some of the use cases. Nevertheless, some activity templates, such as the Narrative Game require that participants can re-access the corresponding activity instance in order to continue to generate content and manage the stories they had previously created (mainly viewing and deleting them), and that access to the activity is restricted to only a specific group of people who have been granted permission to participate by the activity creator.

Summarizing all the above comments derived from the specification requirements of the different use cases we gathered the following general points as guidelines for the development of an acceptable identification and access system:

- Access to activity instances should be limited to a set of users who are granted explicit permissions by the activity designer to interact with them.
- It should be possible to store a specific user's interactions with a given activity so that their contributions are tagged with some form of identifier that the curator can later pair with demographic data.
- Systematic collection of demographic data across the board in the framework is ruled out. This implies that the activities, from the participant's point of view, act as an independent entity; that is, the participant is not informed of the existence of other activities within the framework and does not own an account with associated passwords, emails or names.
- In the use cases that require it, the participants must be able to access the activity again to continue with their interactions, being able to manage and delete them if they wish to do so.
- The Linked Data Hub should not store any passwords or other sensitive participant information beyond possibly anonymized user identifiers.

With this, after several iterations of designing an access system, we ended up opting for a setup organized around the notion of "anonymized sessions", for general use within inSPICE. Every activity instance managed by a content curator hosts a set of named sessions (e.g., "science week 2022", "Narrative experiment March 2023", etc.), and each of these sessions in turn holds a limited list of anonymized user identifiers that can access them (8 alphanumeric characters, such as "vNLgKISY"). To access a session-protected activity instance, the participant must first enter the session identifier of the session they wish to take part in, followed by the user identifier assigned to them through another channel by the creator of the activity. Thereafter, assuming the credentials provided were valid, the participant is granted access to the activity instance and all subsequent interactions are labeled with the corresponding session-user pair.

The storage of the sessions allowed in each of the activity instances is done from a dedicated collection in the Linked Data Hub (uuid: 1522b478-33c2-49cc-a87f-241e68a8771e) that includes a document for each activity and session, containing the list of all the user identifiers allowed for the session at hand. An example of a document for the activity with id 6422d7195e6ae3ce1e1e1f019d and session name "sample" can be seen below, with a total of 10 allowed user identifiers. This collection is only accessible from the LDH keys associated with the inSPICE management applications, so it is kept isolated from each use case's own contribution collections and user demographic information.

```
{
  "sessionName": "sample",
  "activityId": "6422d7195e6ae3ce1e1f019d",
  "availableUsernames": [
    "0frHqal8",
    "p7PpHGOb",
    "MxTTwO9r",
    "SyUX6Csf",
    "jjp3LOWA",
    "nm4tDGc1",
    "v5zOtn07",
    "3Fk47B3E",
    "FMCNkWGG",
    "10A7txeZ"
  ]
```

```
      // other database properties here
    }
```

From a more visual perspective, the process of generating a new session begins in the inSPICE activity dashboard, where a logged-in user can click on the three vertical dots icon in the lower right corner of any of their activities to access the sessions menu, as shown in figure 4.3. From there, it is possible to manage the set of sessions associated with the selected activity, add new users, or create new sessions.

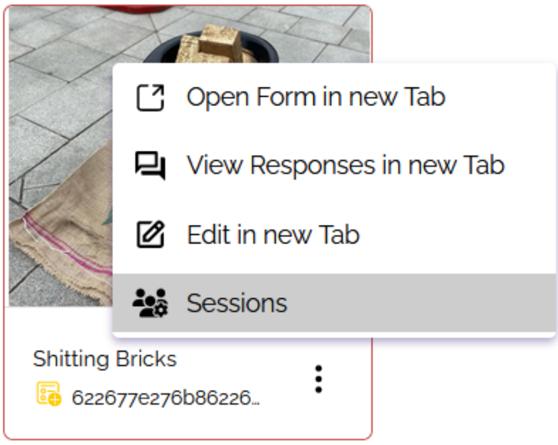
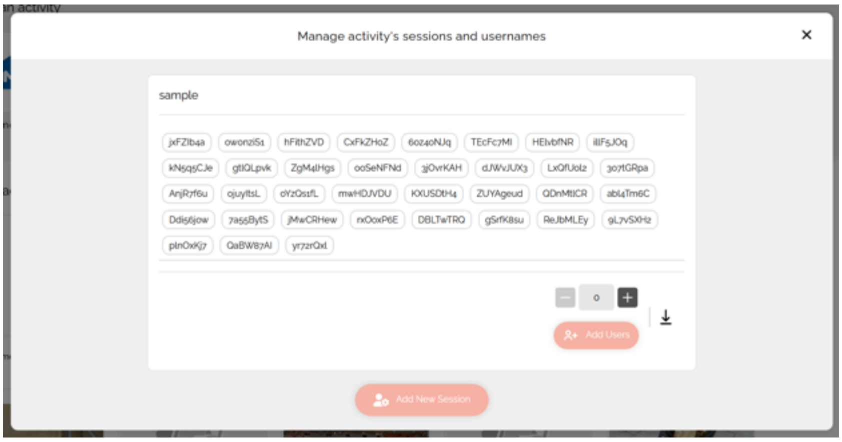


**Figure 4.3:** Opening sessions panel from activity dashboard.

An example of the session menu for a particular activity instance can be seen in figure 4.4. To create a new session, it is sufficient to click on the "Add New Session" button at the bottom of the popup, after which a session name (which must be unique and not have been used previously within the activity) will be requested before it is added to the list. Initially, a new session does not have any users associated with it, making it inaccessible for all practical purposes. To add additional users to the session, one can simply enter the number of additional identifiers to be generated in the field provided for this purpose in the lower right corner of the component, and click on the "Add Users" button. Within a short time, the system generates the number of anonymized identifiers entered and adds them to the list, which is then reflected in the interface. Next to the add users input there is a button to download the user names included in the session list for convenience.

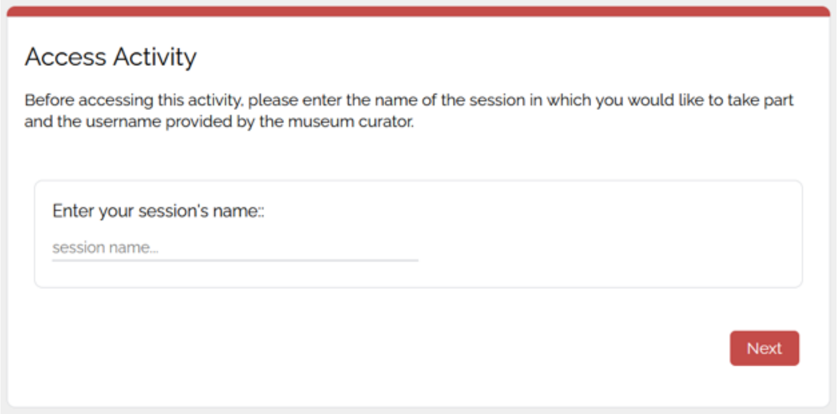


sample

jxFZIb4a owonziS1 hFithZVD CxFkZHoZ 60z40NJq TEcFc7MI HEIvbfNR illF5JOq
kN5q5CJe gtIQLpvk ZgM4lHgs ooSeNFNd 3jOvrKAH dJWvJUX3 LxQfUolz 307tGRpa
AnjR7f6u ojuyltsL oYzQs1fL mwHDJVDU KXUSDtH4 ZUYAgeud QDnMtICR abl4Tm6C
Ddi56jow 7a55BytS jMwCRHew rxOoxP6E DBLTwTRQ gSrfK8su ReJbMLEy 9L7vSXHz
plnOxKj7 QaBW87AI yr72rQxl

**Figure 4.4:** Session Management Panel.

From the point of view of an activity participant, upon entering the corresponding instance link, the application will redirect them to a session authentication screen like the one in figure 4.5, where they will have to enter the relevant data. Here it should be noted that the access links to the activities have support for "prefilling" of these fields, adding the values for the fields `sessionName` and `username` as query params of the url (example: ?sessionName=storie&username=e4aM9WL7), so that it is possible to provide customized links to each user if one wishes to avoid the need to go through the manual authentication process. Once a session access to an activity has been performed, these credentials are stored locally until the user changes activity or performs a manual logout. At any time, the user can consult their session data from the side menu accessed by clicking on the hamburger icon in the upper left corner of the interface, and close their session by clicking on the Log Out option, as shown in figure 4.6.



Access Activity

Before accessing this activity, please enter the name of the session in which you would like to take part and the username provided by the museum curator.

Enter your session's name::

session name...

**Figure 4.5:** Enter session credentials screen.

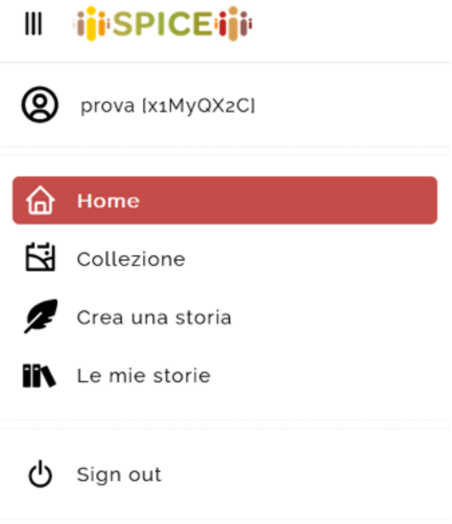


**Figure 4.6:** Side panel with user credentials and sign out option.

# 5 inSPICE template: visual story

The Visual Story activity template was inspired by the use case proposed by the Galleria d'Arte Moderna in Turin, originally known as "GAM Game" (see section 2.2) and was used to implement its current version in its entirety. This use case is structured in three complementary parts depending on the user's role in the activity: curation, story creation and story consumption, of which the last two have already been presented comprehensively in section 2.2, and therefore here we will only focus on detailing the part aimed at producing specific instances of the Visual Story template that can be customized by the museum's curator.

A museum curator's perspective on the Visual Story activity template is provided by a web tool designed to configure the various aspects of the flows in which visitors will participate during the activity. Provided with the appropriate credentials, this process can be initiated from the inSPICE dashboard by clicking on the corresponding template in the create activity section, as shown in figure 5.1. The current interface displays this template as "GAM Game", but this will progressively be replaced by "Visual Story" as its use becomes more widespread to other use cases.

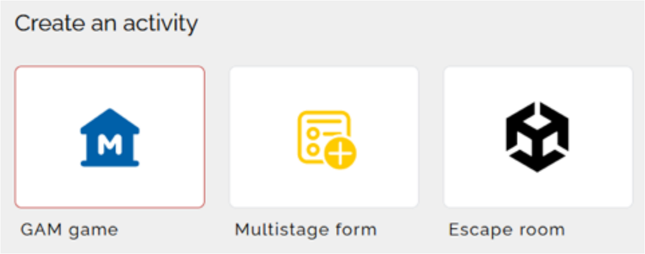


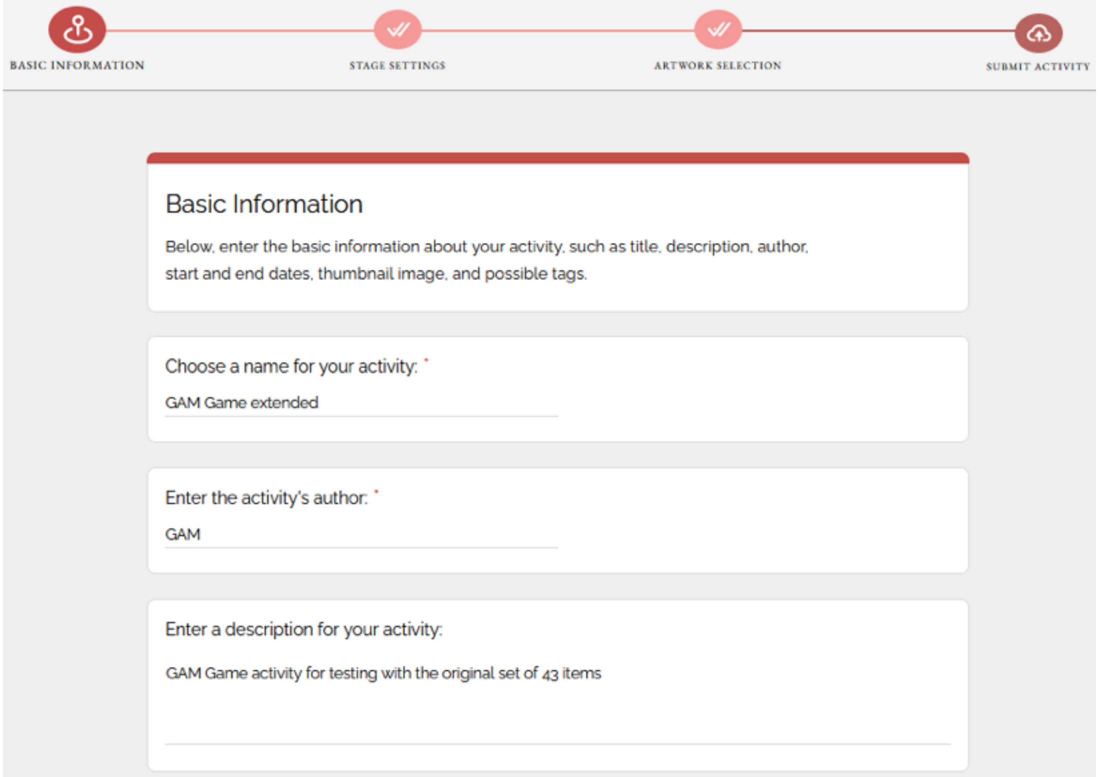
**Figure 5.1:** Creating a Visual Story Activity from the Activity Dashboard.

The process starts with a simple form in which the curator must specify the basic information of the activity, including a representative title, a brief description of its contents, an image that will act as a thumbnail to aid in identifying it in the dashboard, a list of tags (i.e. "Young audience", "Modern Art") and starting and end dates for the activity (determining where it should be available for consumption). This can be seen in figures 5.2 and 5.3. Note that figure 5.2 also shows a navigation bar on top of the page, which allows the creator to move back and forth between the different stages of designing a Visual Story by clicking on the corresponding stage selector. The activity can be submitted at any time (equivalent to saving it to the server and publishing it) by clicking on the "Submit Activity" option at the end of the bar, but it is important to note that this will only be enabled once all of the required pieces of information have been provided to define the activity instance (visually, this is represented by all the stages being colored and showing a ticks icon).

Once the basic information has been completed, it is possible to proceed to the configuration section of the game stages, as shown in figure 5.4. Essentially, this interface allows configuring on the one hand the number of artworks that the user must choose to create a story (a numerical range with extremes between 1 and 10) and the type of inputs that they can choose to introduce multimedia content in their interactions (tags, emojis, text, etc.). We recall here that a story is configured based on a number of collection artworks, for each of which the visitor must add an interaction in the form of text (completing prompts such as "It makes me feel..." or "It reminds me of..."), or emojis/tags placed over the image of the artwork.

Having established these practical restrictions, the last step consists of selecting the artworks that will be available to users from among those offered in the Narrative database. This stage is shown in figure 5.5 and presents a search tool in which the activity creator can explore the museum's collection and select those works that interest them for their instance. The selected works are marked with a colored frame, display their main data with an overlay on the thumbnail, and can be consulted as a list by clicking on the icon in the upper right corner, below the text search component. Hovering over any artwork displays a semi-transparent overlay with the same data displayed on the selected artworks.

The artworks are listed in grid views like those in the figures, on pages of no more than 30 elements. The creator



Basic Information

Below, enter the basic information about your activity, such as title, description, author, start and end dates, thumbnail image, and possible tags.

Choose a name for your activity: *

GAM Game extended

Enter the activity's author: *

GAM

Enter a description for your activity:

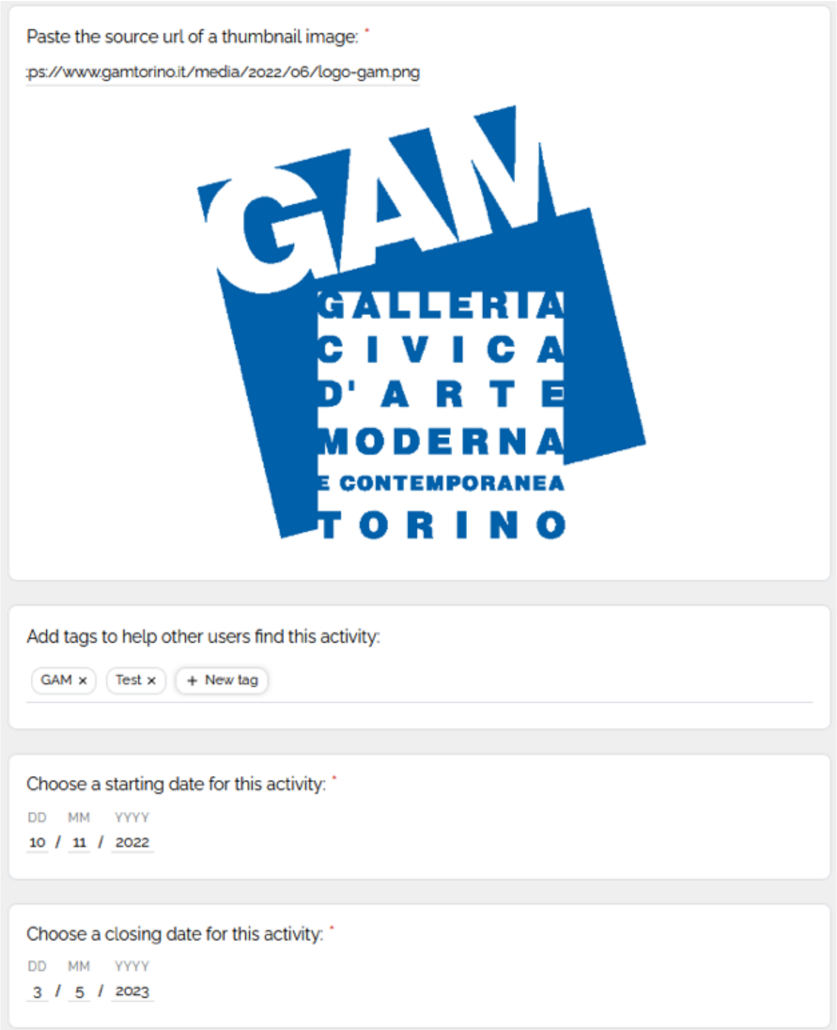
GAM Game activity for testing with the original set of 43 items

**Figure 5.2:** Basic Information: Title, Author and Description. Progress Line.

can easily change pages using the navigation component placed at the bottom of each page, which can be seen in figure 5.6. Additionally, it is possible to apply filters or search for artworks by keywords. At the moment, filters can be applied to the categories of date, author, and information (techniques used, for example), with filter tools placed to the left of the artworks. By expanding any of the categories, the creator can see a preview of some values that appear in the metadata of the collection artworks along with the count of how many items have that attribute in parentheses at the end of the name, and additionally click on the "See All" option to open a popup with a comprehensive explorer of all the filter options for the selected category (see figure 5.7). From this menu, a text search bar is also offered to facilitate exploration in cases where there are too many possible values for the field. When clicking on any of the filters or entering a search term in the search bar at the top of the interface, that filter is applied, this being reflected with a label placed above the artworks view. The creator can remove a specific filter by clicking on the associated "X" button, or by clicking on "Clear All" to erase all filters applied to the collection. This is exemplified in figure 5.8.

Once the activity is considered complete, the "Submit Activity" option can be clicked to send it to the server and publish it in the system. This returns the creator to the activities dashboard, where they can find a thumbnail of the activity they just created.

Being this an instance of the activity hosted within the inSPICE framework, in order for a user to access it they must log in via the link enabled for it and possess a session name and an anonymous user id (all provided by the curator, as specified in section 4.3). In this case, from the activity dashboard the curator may access the generated Visual Story by clicking on the three vertical dots icon at the bottom right of the activity card, and then selecting the option "Open Form in new Tab" (see figure 5.9). The URL of the page opened at that time corresponds to the link that should be sent to the participants to access the activity. Access to the sessions can also be done from the activity options, by selecting "Sessions", while if desired to continue editing the activity at hand from the creation tool, one can click on "Edit" for that purpose. Visual Story instances can also be duplicated using the corresponding option from the contextual menu.



Paste the source url of a thumbnail image: *

:ps://www.gamtorino.it/media/2022/06/logo-gam.png

Add tags to help other users find this activity:

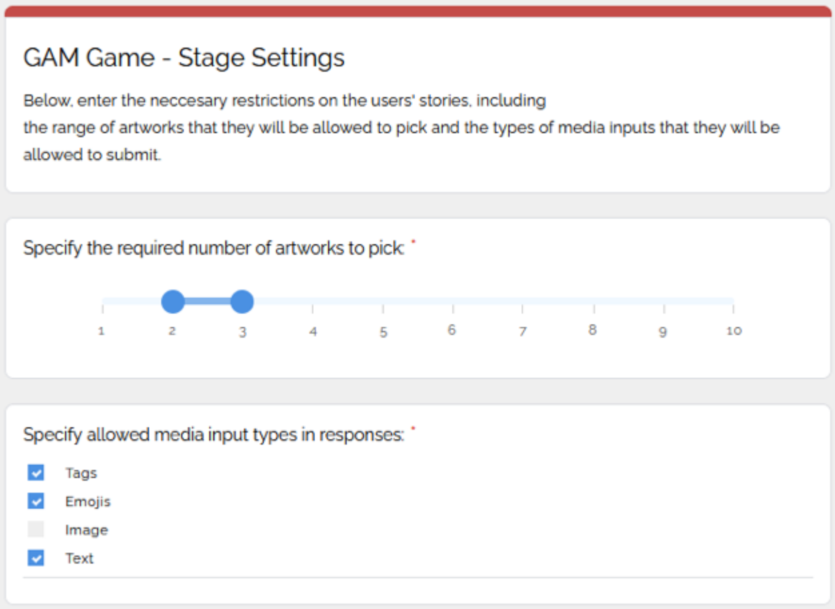
Choose a starting date for this activity: *

DD MM YYYY
10 / 11 / 2022

Choose a closing date for this activity: *

DD MM YYYY
3 / 5 / 2023

**Figure 5.3:** Basic Information: Thumbnail, Tags and Date Range.



GAM Game - Stage Settings

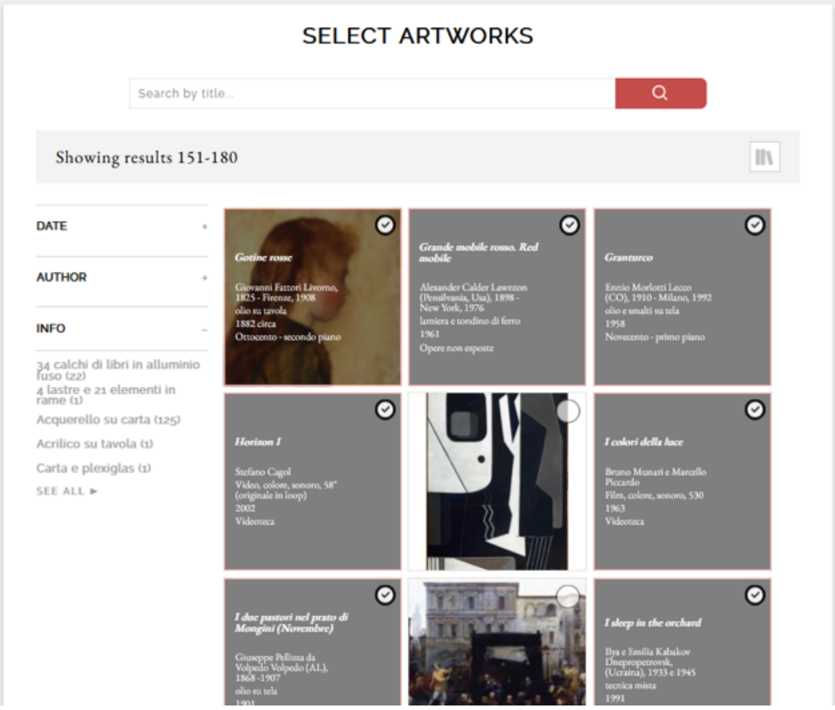
Below, enter the neccesary restrictions on the users' stories, including
the range of artworks that they will be allowed to pick and the types of media inputs that they will be allowed to submit.

Specify the required number of artworks to pick *

Specify allowed media input types in responses: *

☑ Tags
☑ Emojis
□ Image
☑ Text

**Figure 5.4:** Stage Settings Section



SELECT ARTWORKS

Search by title...

Showing results 151-180

DATE +
AUTHOR +
INFO -

34 calchi di libri in alluminio fuso (22)
4 lastre e 21 elementi in rame (1)
Acquerello su carta (125)
Acrilico su tavola (1)
Carta e plexiglas (1)
SEE ALL ▸

*Gotine rosse*
Giovanni Fattori Livorno, 1825 - Firenze, 1908
olio su tavola
1882 circa
Ottocento - secondo piano

*Grande mobile rosso. Red mobile*
Alexander Calder Lawnton (Pensilvania, Usa), 1898 - New York, 1976
lamiera e tondino di ferro
1961
Opere non esposte

*Granturco*
Ennio Morlotti Lecco (CO), 1910 - Milano, 1992
olio e smalti su tela
1958
Novecento - primo piano

*Horizon I*
Stefano Cagol
Video, colore, sonoro, 58" (originale in loop)
2002
Videoteca

*I colori della luce*
Bruno Munari e Marcello Piccardo
Film, colore, sonoro, 530
1963
Videoteca

*I due pastori nel prato di Mongini (Novembre)*
Giuseppe Pellizza da Volpedo Volpedo (AL), 1868 -1907
olio su tela
1901

*I sleep in the orchard*
Ilya e Emilia Kabakov Dnepropetrovsk, (Ucraina), 1933 e 1945
tecnica mista
1991

**Figure 5.5:** Artwork Selection Section

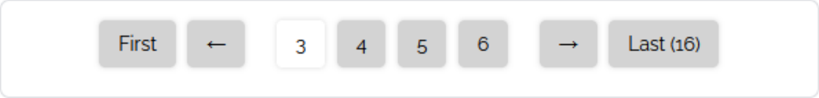
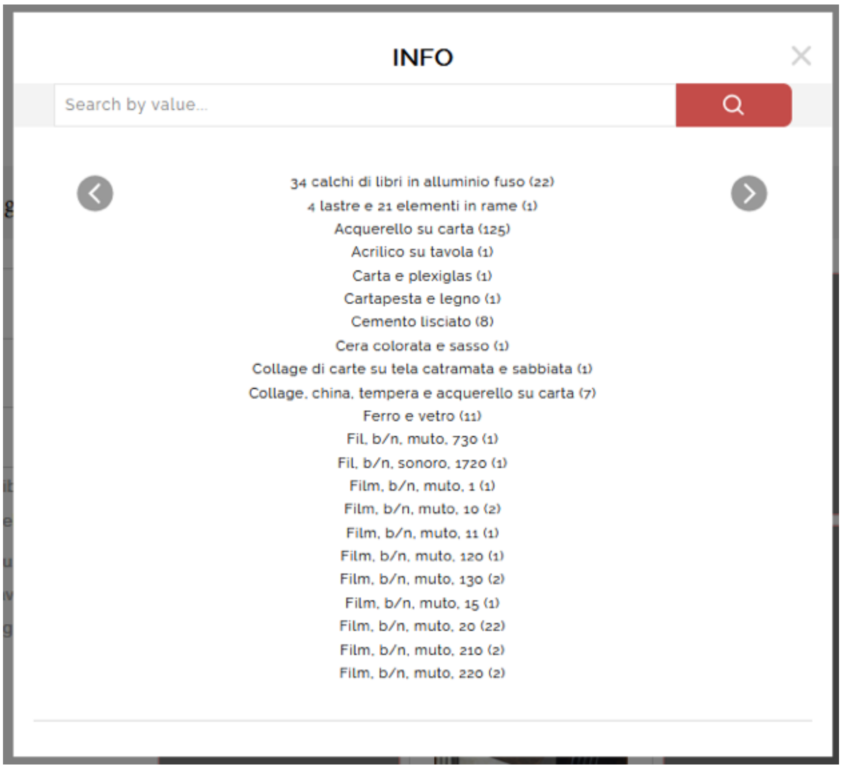
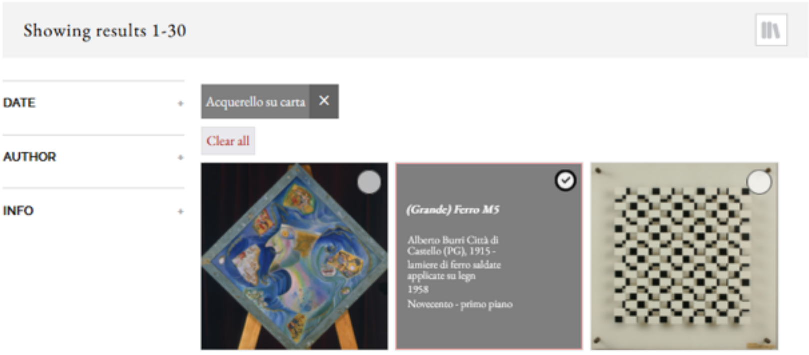


**Figure 5.6:** Page Navigation Component



34 calchi di libri in alluminio fuso (22)
4 lastre e 21 elementi in rame (1)
Acquerello su carta (125)
Acrilico su tavola (1)
Carta e plexiglas (1)
Cartapesta e legno (1)
Cemento lisciato (8)
Cera colorata e sasso (1)
Collage di carte su tela catramata e sabbiata (1)
Collage, china, tempera e acquerello su carta (7)
Ferro e vetro (11)
Fil. b/n, muto, 730 (1)
Fil. b/n, sonoro, 1720 (1)
Film, b/n, muto, 1 (1)
Film, b/n, muto, 10 (2)
Film, b/n, muto, 11 (1)
Film, b/n, muto, 120 (1)
Film, b/n, muto, 130 (2)
Film, b/n, muto, 15 (1)
Film, b/n, muto, 20 (22)
Film, b/n, muto, 210 (2)
Film, b/n, muto, 220 (2)

**Figure 5.7:** Field Filters Popup



*(Grande) Ferro M5*

Alberto Burri Città di Castello (PG), 1915 -
lamiere di ferro saldate applicate su legn
1958
Novecento - primo piano

**Figure 5.8:** Result after applying a Filter

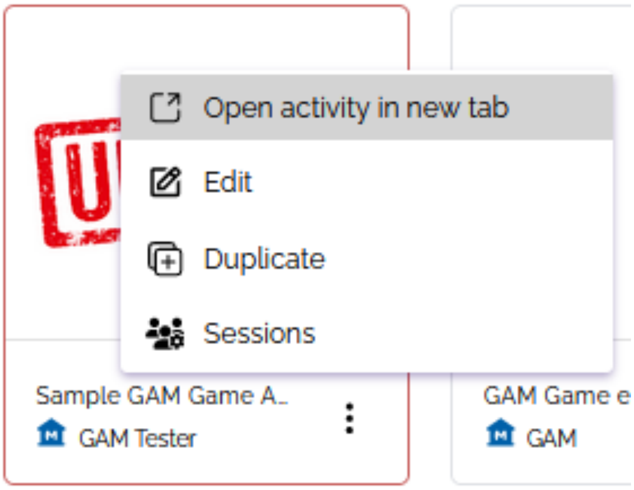


**Figure 5.9:** Accessing Generated Visual Story from Dashboard

# 6 inSPICE template: multistage form

The Multistage Forms activity template has been designed to abstract the workflows used in the Hecht museum and IMMA Deep Viewpoints pilots. The goal is to generalize them so that any museum curator would be able to implement similar activities with minimal friction.

As was the case with the Visual Story template, this activity is structured in two different perspectives depending on the type of user interacting with it, distinguishing between a curator/activity instance creator viewpoint and a museum visitor/activity consumer viewpoint.

This activity template consists of three fundamental modules:

- A multi-stage form creation tool for museum curators.
- A tool for the consumption of these forms by activity participants.
- A tool for visualization of user responses, for the time being on a per user basis.

The specific activity included in inSPICE consists of a form presented to the participant in several stages, in which the curator alternates between showing multimedia resources in the form of video, images or text with questions and other interactive elements for the user to express their ideas and opinions about it, such as highlighting components, likert questionnaires or open-ended questions, to name a few. These flows are fully configurable from a web editor made available to museum curators without requiring any technical knowledge on their part, and user responses can be explored through a user-friendly viewer.

In the following sections we will proceed to describe the operation of each of these modules within the use case template in detail.

## 6.1 Multistage Form Creation

The multi-stage form creation module provides support for user-friendly configuration of an instance of this activity template via a web interface. Provided with the appropriate credentials, this process can be initiated from the inSPICE dashboard by clicking on the corresponding template in the create activity section, as shown in figure 6.1.

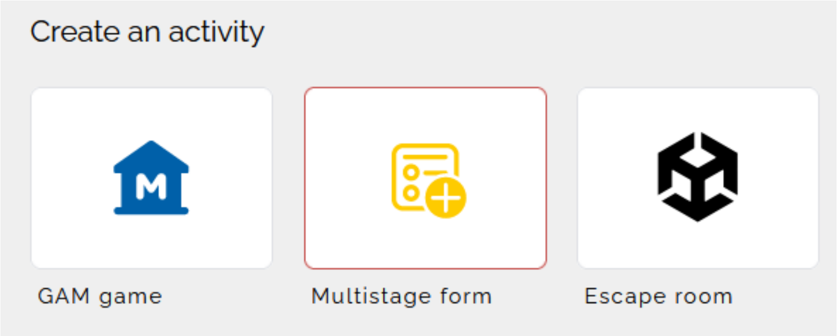
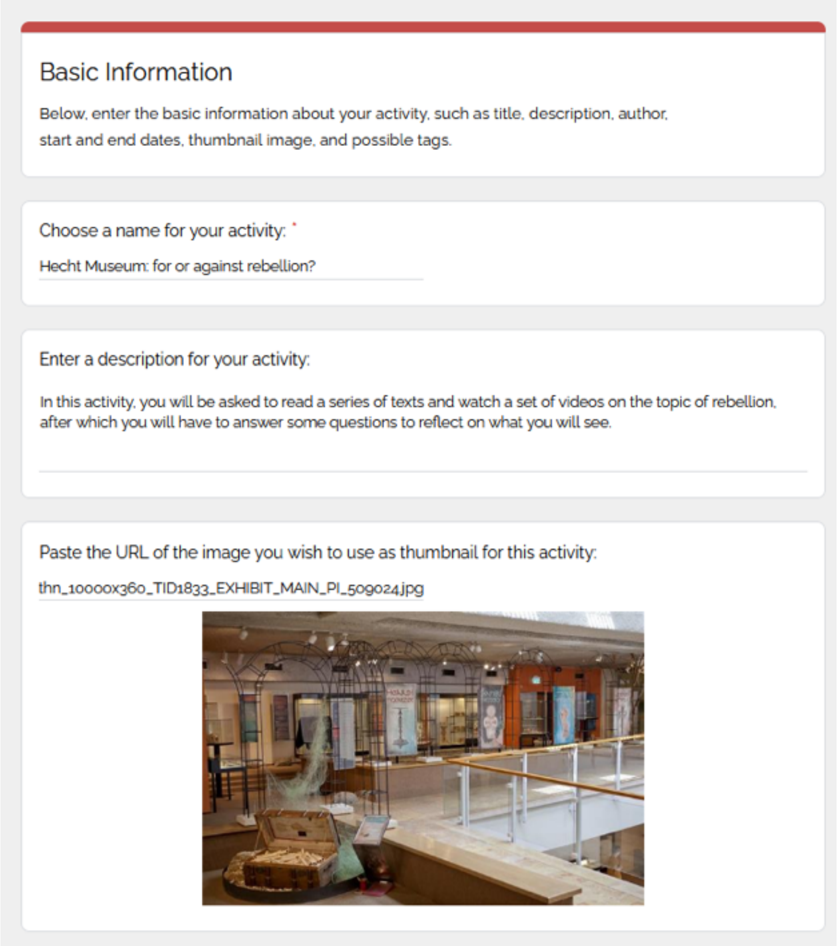


**Figure 6.1:** Creating a Multistage Form Activity from the Activity Dashboard

The process starts with a simple form in which the curator must specify the basic information of the activity, including a representative title, a brief description of its contents and, optionally, an image that will be used as a thumbnail in the dashboard to facilitate its identification. This can be seen in figure 6.2.

Next, the curator can proceed to the stage editing section, where they may gradually add different modules and interactive elements to their form from among the available types. Initially, the form is empty, showing something similar to what is illustrated in figure 6.3. In this figure we can appreciate the title editor interface for the first stage (every stage has one at the beginning of it), where the curator may specify the title of the section and a brief



Basic Information

Below, enter the basic information about your activity, such as title, description, author, start and end dates, thumbnail image, and possible tags.

Choose a name for your activity: *

Hecht Museum: for or against rebellion?

Enter a description for your activity:

In this activity, you will be asked to read a series of texts and watch a set of videos on the topic of rebellion, after which you will have to answer some questions to reflect on what you will see.

Paste the URL of the image you wish to use as thumbnail for this activity:

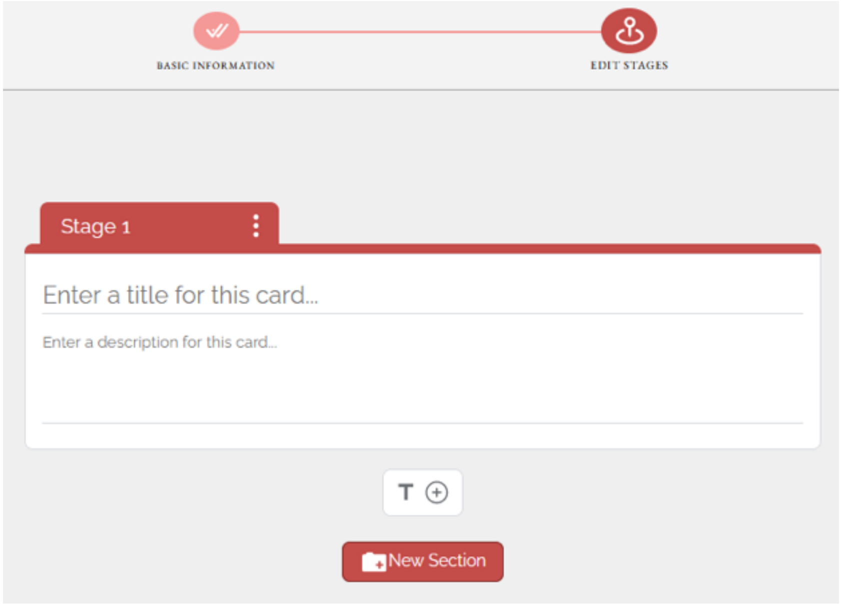
thn_10000x360_TID1833_EXHIBIT_MAIN_PI_509024.jpg

**Figure 6.2:** Basic Activity Information

description as an introduction to what the user will find in it. This may include some general instructions on how to approach the questions, or simply contextualize the material to be viewed next. Below this widget a button can be found to add a new interactive element to the section. This button will in fact appear below the active (selected) element of the editing tool, so that the curator can incorporate a new element at any time in any position they wish. Finally, in the lower part of the figure, a last button in maroon color is displayed to create a new section for the form.

After adding a couple of elements to our first stage, we find ourselves with something similar to what appears in figure 6.4. Note that here we have changed the type of the second element to “Display Text”, while the first one retains its default type, “Multiple Choice”. To modify the type of the element, it is enough to click on the drop-down in its upper right corner and choose a new value for this field. The drop-down displaying the types supported at the time of writing the document can be seen in figure 6.5. It is worth mentioning here that the types shown in the figure cover all the elements present in the current Hecht Museum activity, with the exception of element sorting widgets.

Another important detail of the previous figures is that it is possible to reorder and delete any form element by making use of the options placed at the bottom of each card. As long as it is allowed by position, the location of an element can be moved up or down by using the arrows in the lower left corner, while the trash can button in the lower right corner enables the deletion of the corresponding element. Next to this last button, a toggle determines whether the item is required in the form, or whether the end user must enter a compulsory response to it. Finally, at the top of the card, a text field for specifying the prompt of the element can be found. In most cases, this corresponds



BASIC INFORMATION

EDIT STAGES

Stage 1

Enter a title for this card...

Enter a description for this card...

**Figure 6.3:** Initial UI for Editing Activity Stages

to the question to be posed to the user, but in certain cases, as in the case of element types that only display information or audiovisual material, this takes on the role of the resource title. All changes made to the activity are saved automatically.

### 6.1.1 Item Types

In this section we will briefly present one by one the different types of elements that can be included in a form, starting with the audiovisual content display elements. These correspond to the types “Display Text”, “Display Image” and “Display Video” in figure 6.5, and can be found represented in figures 6.6, 6.7 and 6.8, respectively. As expected, the “Display Text” element accepts as input the text to be displayed to the user as a textual card at the current position within the section, while the cards for images and video take as input a link to the corresponding resource to be displayed when they are shown. In the case of videos, we currently support YouTube videos and, to a lesser extent, some embedded clips from other platforms. Lastly, in the case of images, it is possible to specify the size at which they will be displayed to the end user, with a choice between small, medium and large.

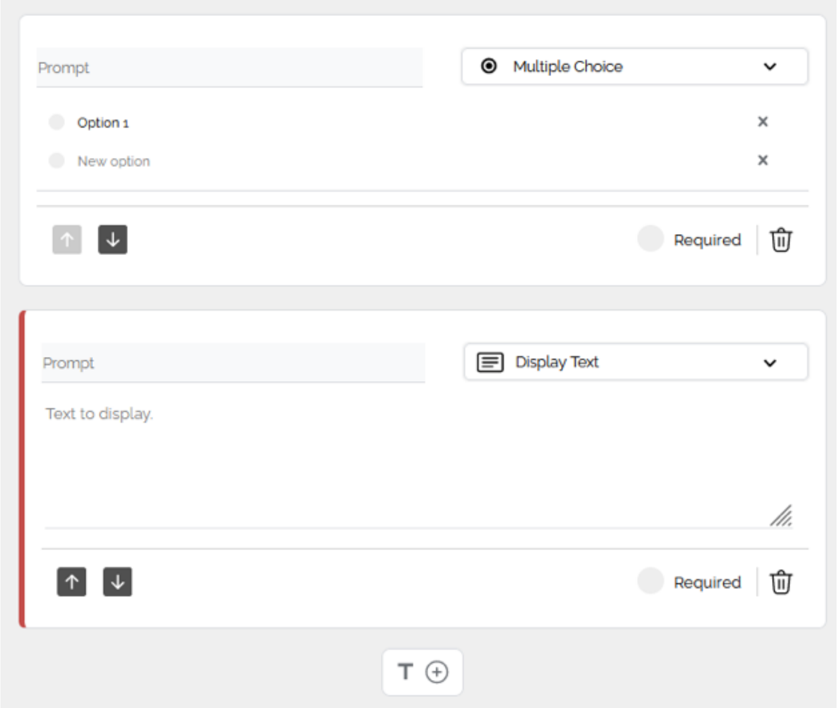


**Figure 6.4:** Adding new Items to a Stage

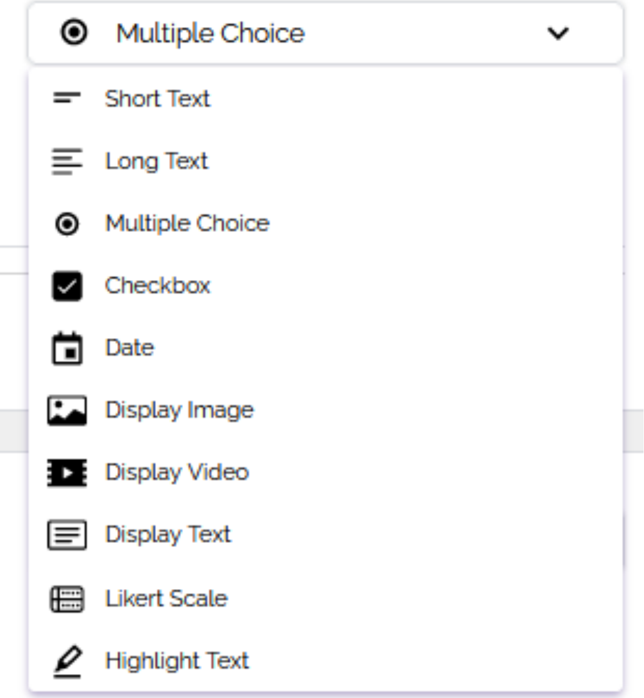
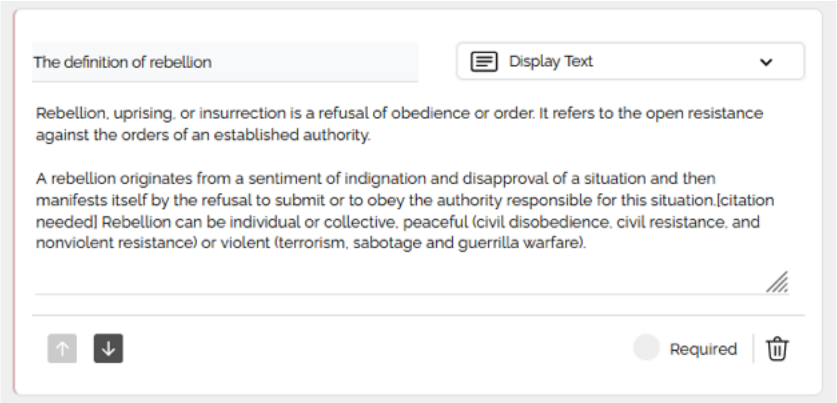


**Figure 6.5:** Selecting Question Type from Drop-down



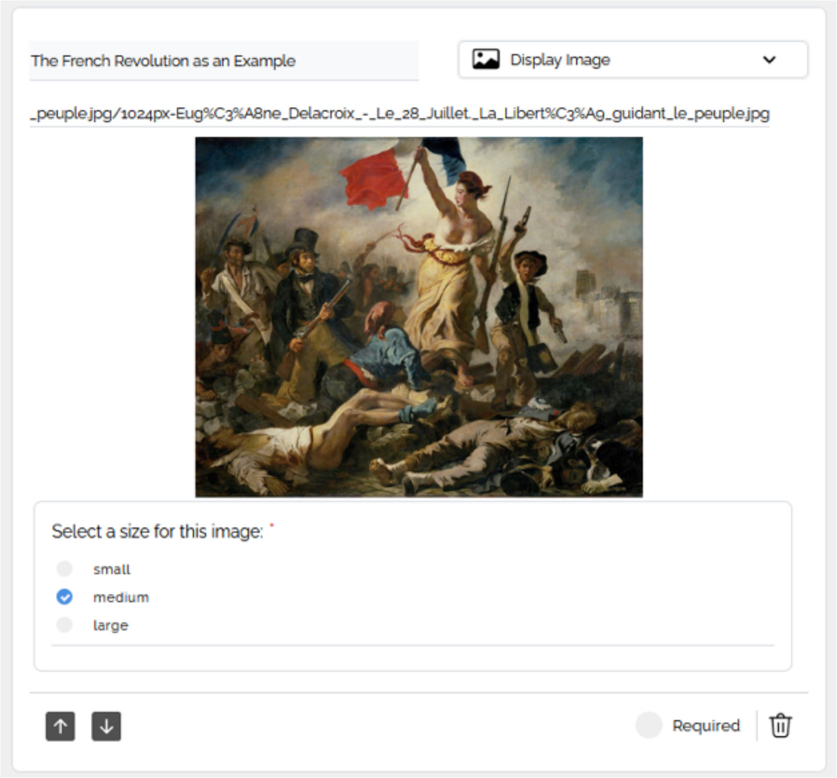
The definition of rebellion

Display Text

Rebellion, uprising, or insurrection is a refusal of obedience or order. It refers to the open resistance against the orders of an established authority.

A rebellion originates from a sentiment of indignation and disapproval of a situation and then manifests itself by the refusal to submit or to obey the authority responsible for this situation.[citation needed] Rebellion can be individual or collective, peaceful (civil disobedience, civil resistance, and nonviolent resistance) or violent (terrorism, sabotage and guerrilla warfare).

**Figure 6.6:** Display Text Form Item



The French Revolution as an Example

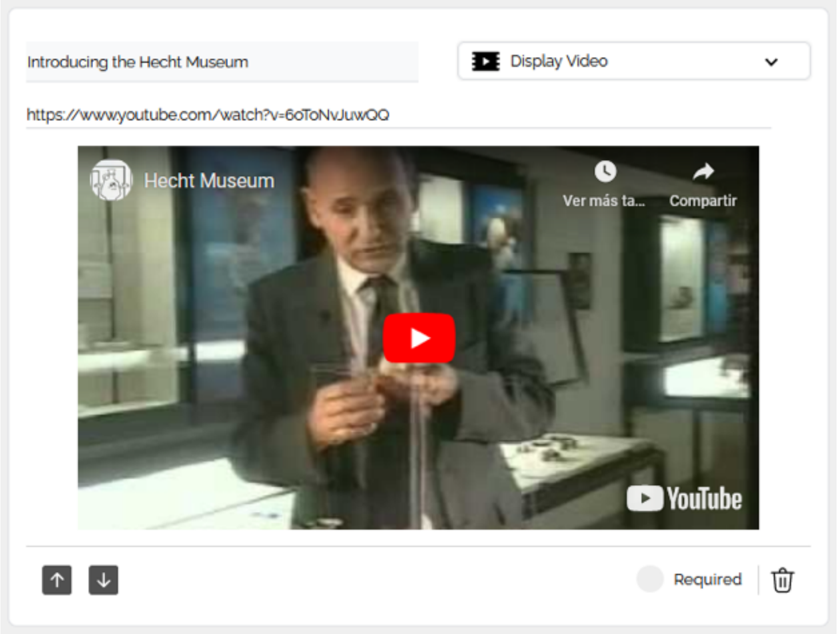
Display Image

_peuple.jpg/1024px-Eug%C3%A8ne_Delacroix_-_Le_28_Juillet._La_Libert%C3%A9_guidant_le_peuple.jpg

Select a size for this image: *

○ small
● medium
○ large

**Figure 6.7:** Display Image Form Item

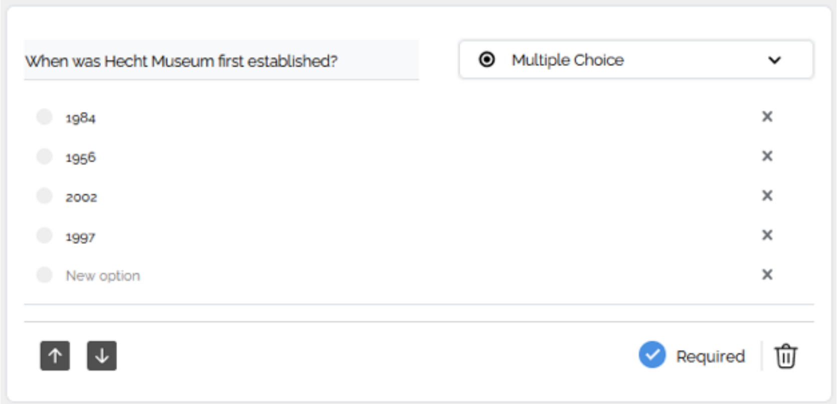


Introducing the Hecht Museum

https://www.youtube.com/watch?v=6oToNvJuwQQ

**Figure 6.8:** Display Video Form Item

Next are the multiple choice and checkbox elements, which can be used to request a user response with options preset by the curator. The main difference between both elements lies in the number of accepted answers: in the case of multiple choice, exactly one answer is expected from the user, while in the checkbox case a variable number of answers to the question is allowed. These components can be seen in figures 6.9 and 6.10, respectively.

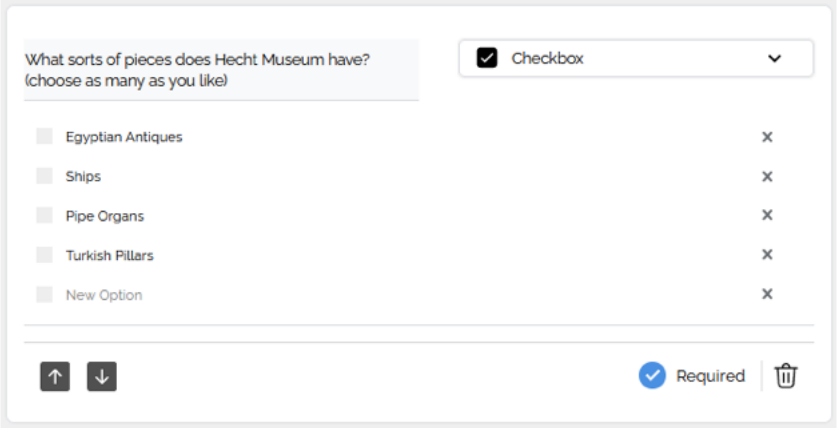


When was Hecht Museum first established?

◉ Multiple Choice

○ 1984
○ 1956
○ 2002
○ 1997
○ New option

**Figure 6.9:** Multiple Choice Form Item



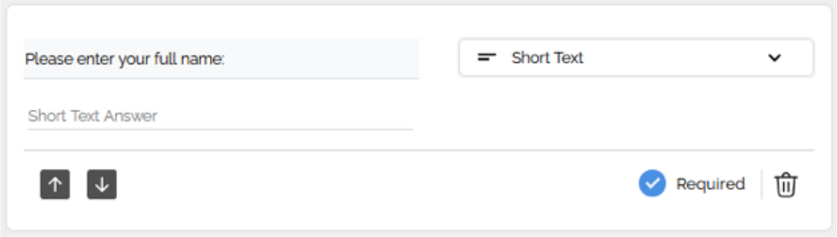
What sorts of pieces does Hecht Museum have? (choose as many as you like)

☑ Checkbox

□ Egyptian Antiques
□ Ships
□ Pipe Organs
□ Turkish Pillars
□ New Option

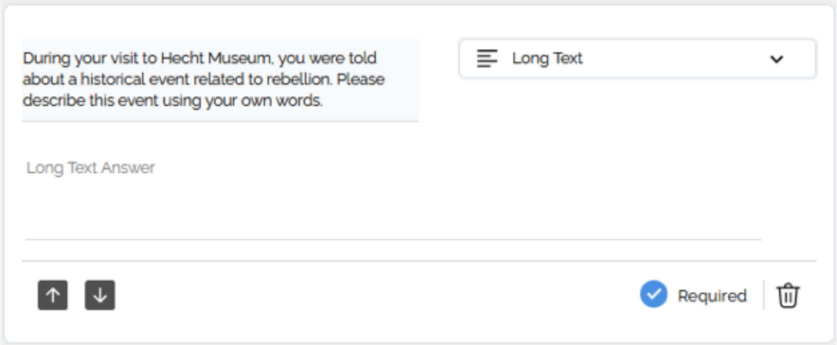
**Figure 6.10:** Checkbox Form Item

On the other hand, we offer support for three open ended response elements: short text, long text and date. These can be seen in figures 6.11, 6.12 and 6.13 and can be used both to request user data such as e-mail, name, date of birth, etc, and to request long and loosely-formatted answers to questions that require more elaborate developments.



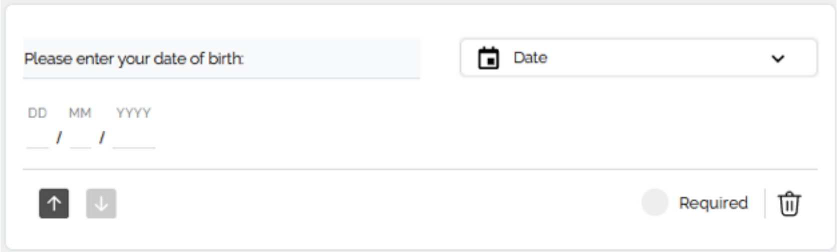
Please enter your full name:

**Figure 6.11:** Short Text Form Item



During your visit to Hecht Museum, you were told about a historical event related to rebellion. Please describe this event using your own words.

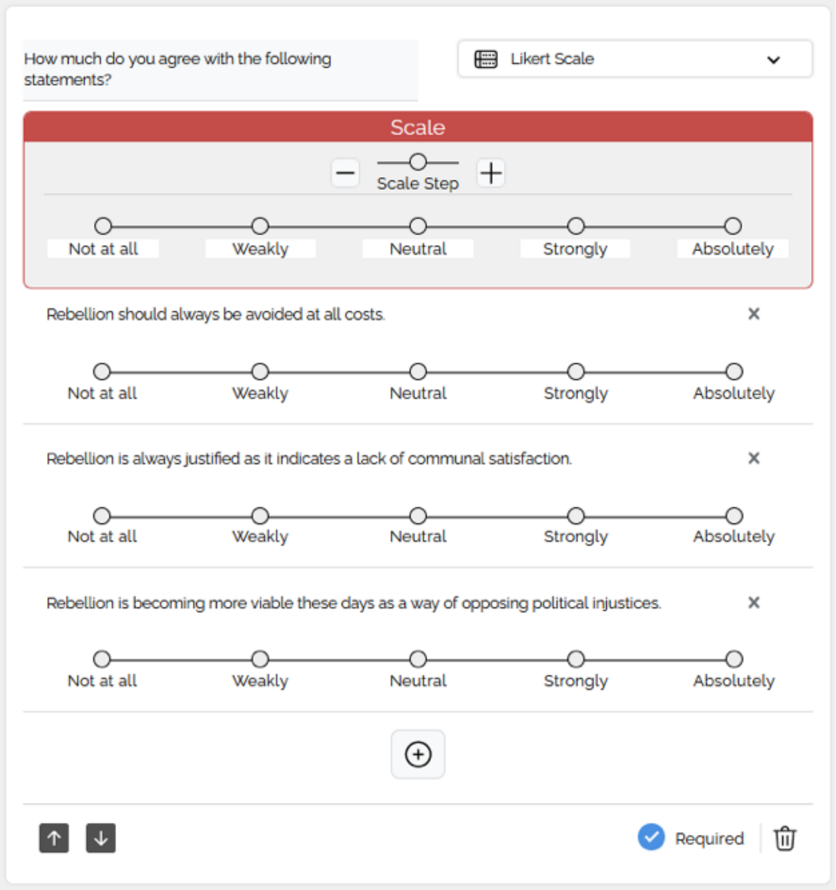
**Figure 6.12:** Long Text Form Item



Please enter your date of birth:

**Figure 6.13:** Date Form Item

The last two elements supported to date correspond to components that are recurrent in the Hecht Museum use case, and contemplate special types of questions with more specific inputs: Likert Questionnaires and Text Highlighting. In the case of Likert-style questionnaires (figure 6.14), the curator is allowed to specify a common scale that will be shared by all prompts that will appear afterwards, and is particularly useful for expressing degrees of conformity with respect to a battery of related issues. The size of the scale can be adjusted by adding or removing options via the +/- selector at the top of the component, while the text associated with each of the options can be modified by clicking on the corresponding entry. To add a new item to the list of prompts of the questionnaire, it is sufficient to click on the + button at the bottom of the card, allowing each of the prompts to be edited or deleted if necessary from the options of each item in the list.



How much do you agree with the following statements?

Likert Scale

Scale

Scale Step

○ Not at all ○ Weakly ○ Neutral ○ Strongly ○ Absolutely

Rebellion should always be avoided at all costs. ×

○ Not at all ○ Weakly ○ Neutral ○ Strongly ○ Absolutely

Rebellion is always justified as it indicates a lack of communal satisfaction. ×

○ Not at all ○ Weakly ○ Neutral ○ Strongly ○ Absolutely

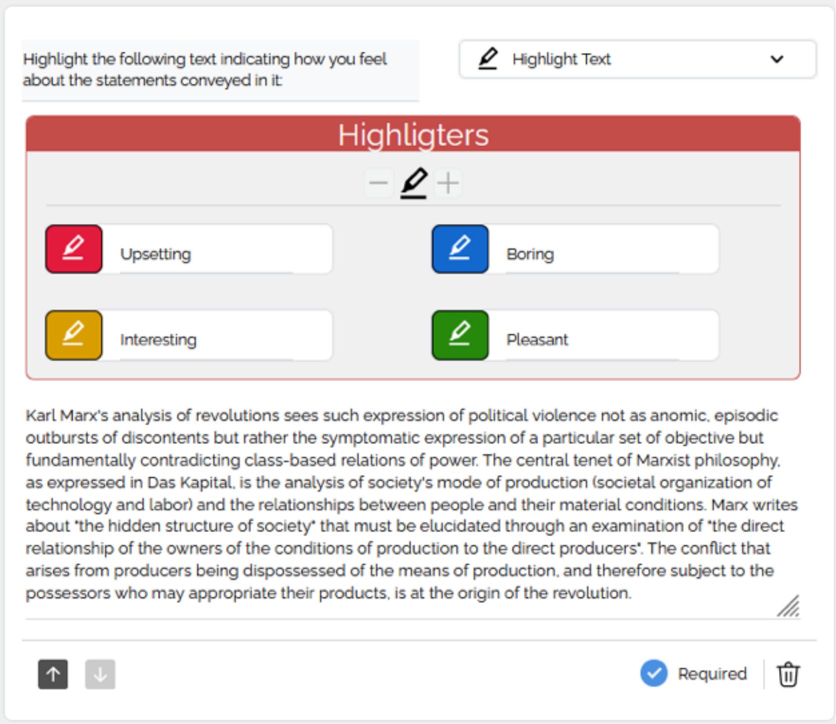
Rebellion is becoming more viable these days as a way of opposing political injustices. ×

○ Not at all ○ Weakly ○ Neutral ○ Strongly ○ Absolutely

☑ Required

**Figure 6.14:** Likert Scale Form Item

In the case of text highlighting (figure 6.15), the curator can enter any text to be annotated by the user using a series of markers that can be configured by the form creator. As was the case with Likert questionnaires the list of available markers can be customized from the +/- selector at the top of the component by typing the name of each marker in the text input next to each color. A maximum of 6 possible markers per question is established here.



Highlight the following text indicating how you feel about the statements conveyed in it:

Karl Marx's analysis of revolutions sees such expression of political violence not as anomic, episodic outbursts of discontents but rather the symptomatic expression of a particular set of objective but fundamentally contradicting class-based relations of power. The central tenet of Marxist philosophy, as expressed in Das Kapital, is the analysis of society's mode of production (societal organization of technology and labor) and the relationships between people and their material conditions. Marx writes about "the hidden structure of society" that must be elucidated through an examination of "the direct relationship of the owners of the conditions of production to the direct producers". The conflict that arises from producers being dispossessed of the means of production, and therefore subject to the possessors who may appropriate their products, is at the origin of the revolution.

**Figure 6.15:** Highlight Text Form Item

## 6.2 Multistage Form Consumption

The multi-stage form activity consumption module provides support for rendering the activities designed by the museum curator with the help of the tool introduced in the previous section into a web form. Being this an instance of the activity hosted within the inSPICE framework, in order for a user to access it they must log in via the link enabled for it and possess a session name and an anonymous user id (all provided by the curator, as specified in section 4.3). Continuing with the example of the instance created in the previous section, from the activity dashboard the curator may access the form generated on the basis of its configuration by clicking on the three vertical dots icon at the bottom right of the activity card, and then selecting the option "Open Form in new Tab" (see figure 6.16). The URL of the page opened at that time corresponds to the link that should be sent to the participants to access the form. Access to the sessions can also be done from the activity options, by selecting "Sessions", while if desired to continue editing the activity at hand from the creation tool, one can click on "Edit in new Tab" for that purpose.

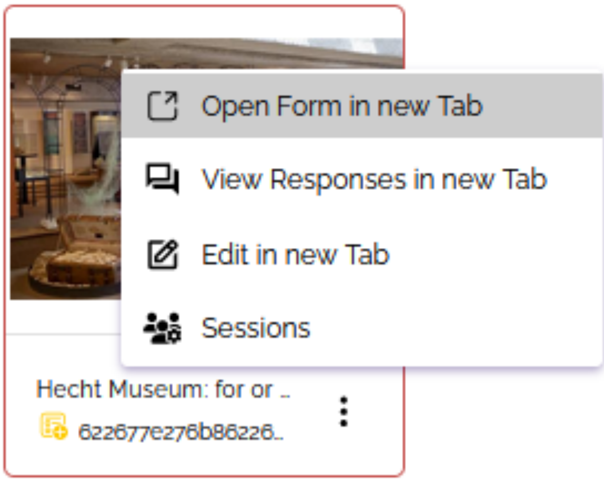
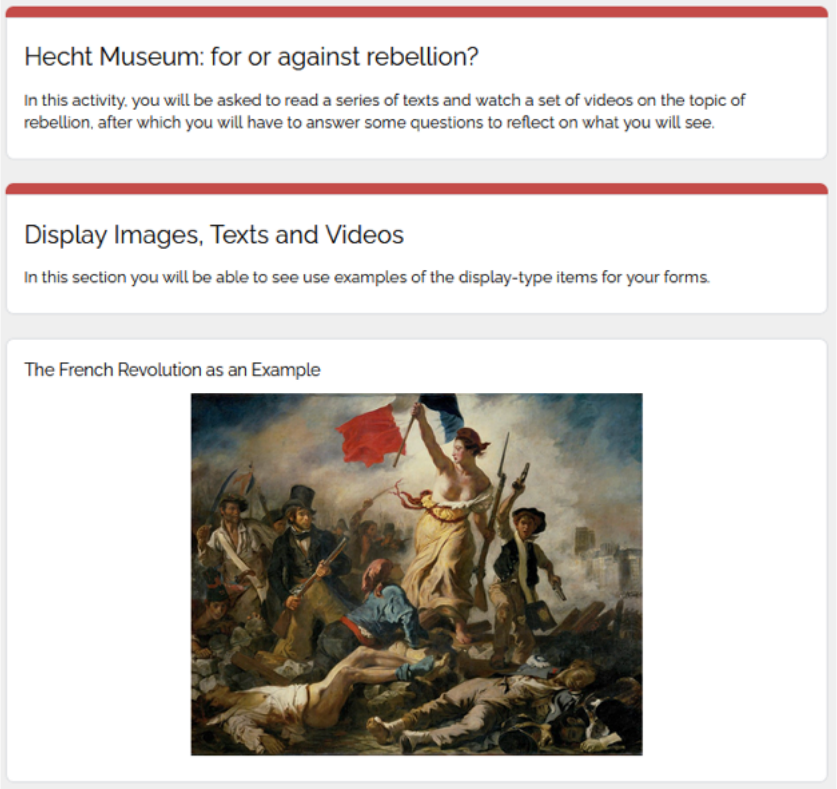


**Figure 6.16:** Accessing Generated Form from Dashboard

After completing the authentication through the session - user id pair, the user is brought to the first stage of the activity, as can be seen in figures 6.17 and 6.18 for the example form created in the previous section. This being the first stage of the form, the UI renders an additional card component on top of it with the title and description of the activity, which will not be present in further stages. Note that here we have created a separate stage for each of the element type blocks introduced when presenting the creation tool, and we will show each of the consumption side components of the form in the same order and with the same examples that we used previously. The display elements, not requiring any user interaction, merely render the resources that were specified at the time of creation as shown in the figures. To advance to the next section, it is enough to click on the "Next" button in the lower left corner.

The second form stage can be seen in figure 6.19 and depicts the user side of the closed response block components. Note here that the first card shown in the stage no longer presents the description of the activity and replaces this field with a reminder of the anonymous user code currently in use. Being in an intermediate section, the navigation button at the bottom, which previously only allowed moving forward, is now accompanied by a second button to return to the previous stage. As for the components themselves, all items marked as required in the creation tool are now marked with a red asterisk next to their prompt, and in the multiple choice and checkbox components the user can select the desired answers before proceeding to the next section (remembering the limitation to one answer for the multiple choice case).

The third form stage can be seen in figure 6.20 and shows the user perspective of the the open-response components. These act as traditional text and date inputs and may be accompanied by format validators, as can be seen



Hecht Museum: for or against rebellion?

In this activity, you will be asked to read a series of texts and watch a set of videos on the topic of rebellion, after which you will have to answer some questions to reflect on what you will see.

Display Images, Texts and Videos

In this section you will be able to see use examples of the display-type items for your forms.

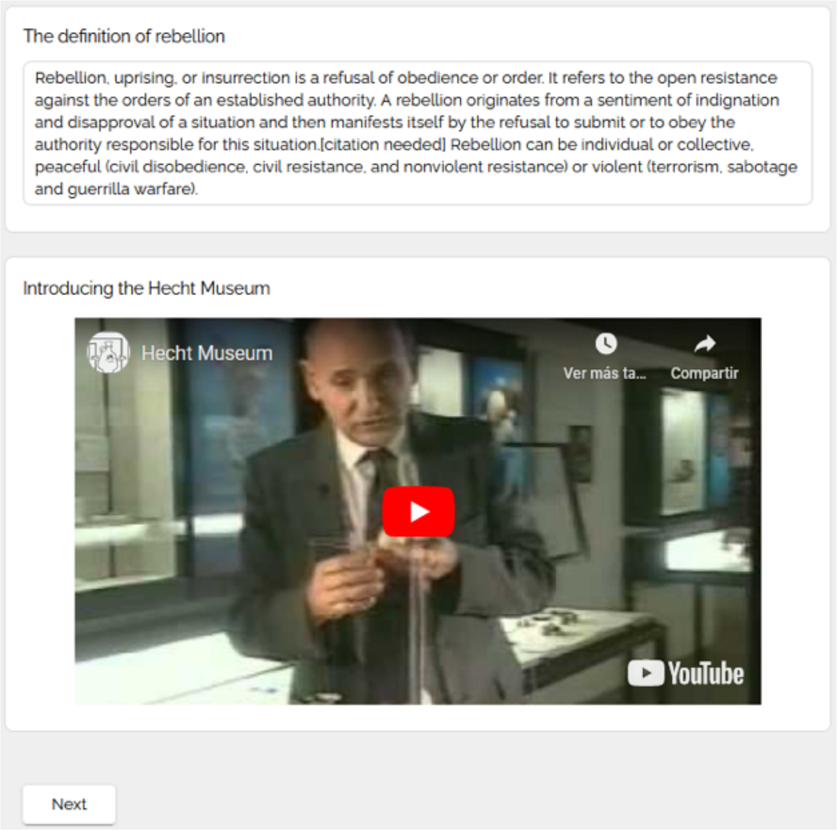
The French Revolution as an Example

**Figure 6.17:** First Stage: Activity and Stage Title. Display Image Component

in the case of the date card at the bottom of the figure.

The fourth and final stage can be seen in figures 6.21 and 6.22 contains examples of the Hecht use case specific components. The first figure shows a response to the Likert scale designed in the previous section, in which the user entered the degree to which they agreed with the prompts in the list, while the second reflects the use of the text highlighting component, whereby the user may select the various annotation markers via the marker palette at the bottom of the card to highlight the desired text fragment with the corresponding color. This marker palette additionally includes a deletion option to remove the highlighting of the next selected section. Since this corresponds to the end of the form, the user can proceed to click on "Submit Response" when they have finished filling in all the fields to send their response to the server.

Upon successful submission of the response, the user is redirected to the screen shown in figure 6.23, where they will be able to enter an additional response if desired. Subsequently, the responses collected through this form can be viewed one by one by the creator of the activity via the "View Responses in new Tab" option accessible from the instance options in the inSPICE dashboard, and which can be seen in figure 6.16. This opens a display view in which the curator is able to see the total responses collected for the form at hand in a panel in the top section (see figure 6.24) and choose the index of the response they wish to browse. Since the responses are anonymous by design, the only way to determine to which user each interaction corresponds is to enter an explicit prompt for name or other identifier, should this be necessary or desired. The responses themselves appear directly below this selection panel and are constructed by displaying the user's perspective components with the fields populated with the information entered during the interaction while blocking the ability to do any editing. That is, the display components are the response components after disabling focus and input of any type.

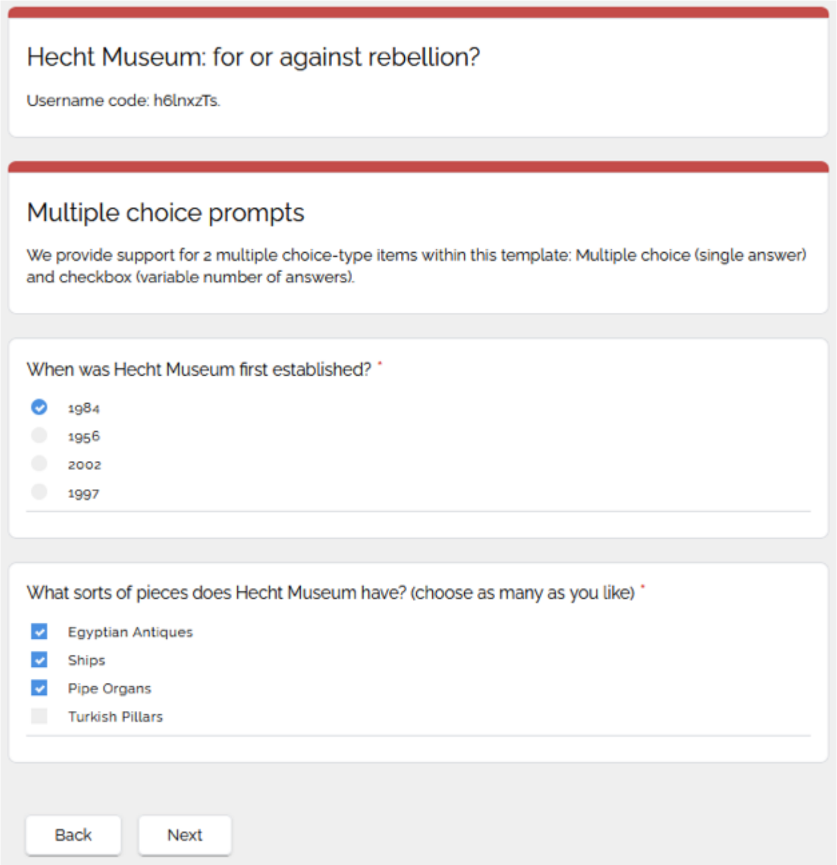


The definition of rebellion

Rebellion, uprising, or insurrection is a refusal of obedience or order. It refers to the open resistance against the orders of an established authority. A rebellion originates from a sentiment of indignation and disapproval of a situation and then manifests itself by the refusal to submit or to obey the authority responsible for this situation.[citation needed] Rebellion can be individual or collective, peaceful (civil disobedience, civil resistance, and nonviolent resistance) or violent (terrorism, sabotage and guerrilla warfare).

Introducing the Hecht Museum

**Figure 6.18:** First Stage: Display Text and Video Components



Hecht Museum: for or against rebellion?

Username code: h6lnxzTs.

Multiple choice prompts

We provide support for 2 multiple choice-type items within this template: Multiple choice (single answer) and checkbox (variable number of answers).

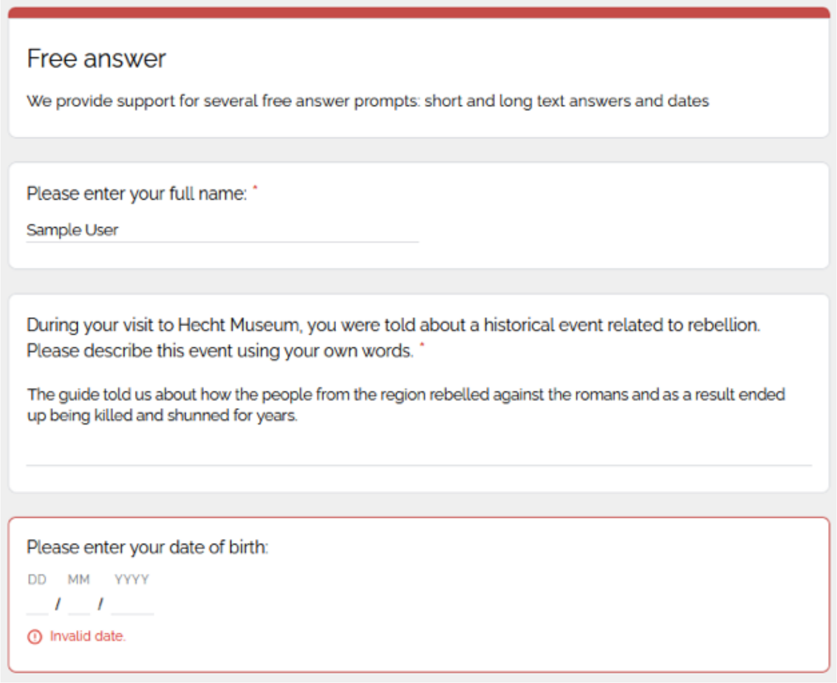
When was Hecht Museum first established? *

● 1984
○ 1956
○ 2002
○ 1997

What sorts of pieces does Hecht Museum have? (choose as many as you like) *

☑ Egyptian Antiques
☑ Ships
☑ Pipe Organs
□ Turkish Pillars

**Figure 6.19:** Second Stage: Closed Answers Components



Free answer

We provide support for several free answer prompts: short and long text answers and dates

Please enter your full name: *

Sample User

During your visit to Hecht Museum, you were told about a historical event related to rebellion. Please describe this event using your own words. *

The guide told us about how the people from the region rebelled against the romans and as a result ended up being killed and shunned for years.

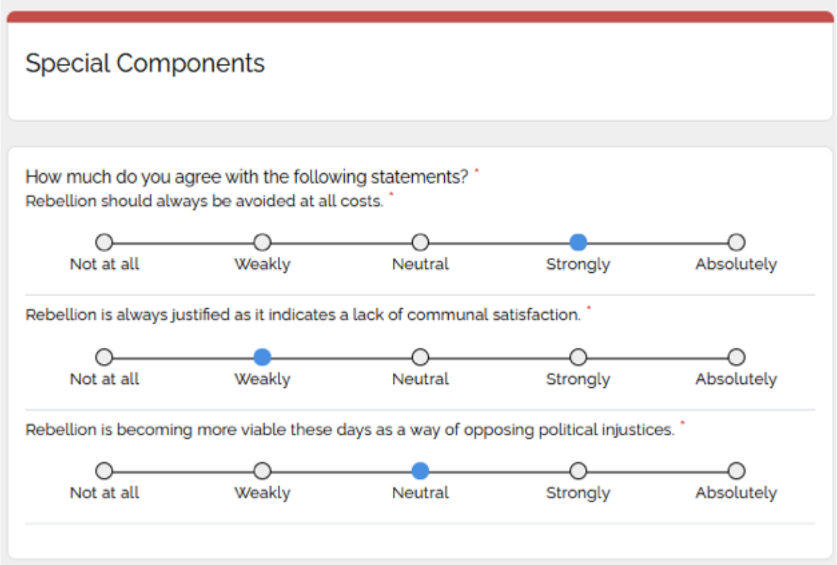
Please enter your date of birth:

DD MM YYYY

/ /

Invalid date.

**Figure 6.20:** Third Stage: Open-ended Question Components



Special Components

How much do you agree with the following statements? *

Rebellion should always be avoided at all costs. *

○ Not at all ○ Weakly ○ Neutral ● Strongly ○ Absolutely

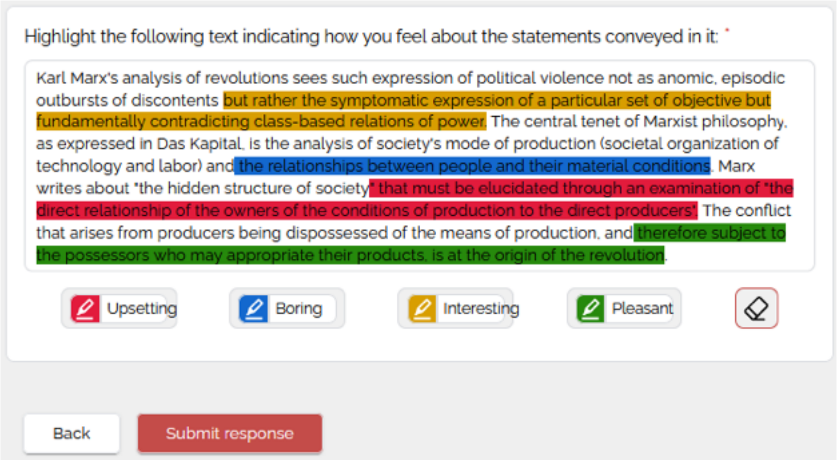
Rebellion is always justified as it indicates a lack of communal satisfaction. *

○ Not at all ● Weakly ○ Neutral ○ Strongly ○ Absolutely

Rebellion is becoming more viable these days as a way of opposing political injustices. *

○ Not at all ○ Weakly ● Neutral ○ Strongly ○ Absolutely

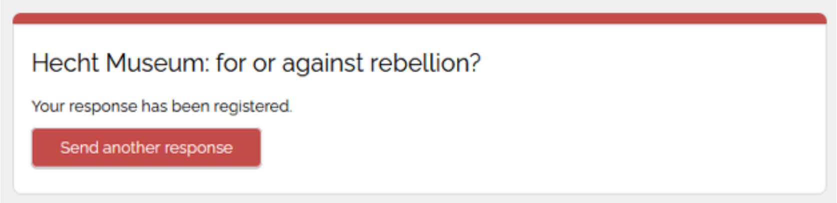
**Figure 6.21:** Fourth Stage: Likert Scale Component



Highlight the following text indicating how you feel about the statements conveyed in it: *

Karl Marx's analysis of revolutions sees such expression of political violence not as anomic, episodic outbursts of discontents but rather the symptomatic expression of a particular set of objective but fundamentally contradicting class-based relations of power. The central tenet of Marxist philosophy, as expressed in Das Kapital, is the analysis of society's mode of production (societal organization of technology and labor) and the relationships between people and their material conditions. Marx writes about "the hidden structure of society" that must be elucidated through an examination of "the direct relationship of the owners of the conditions of production to the direct producers". The conflict that arises from producers being dispossessed of the means of production, and therefore subject to the possessors who may appropriate their products, is at the origin of the revolution.

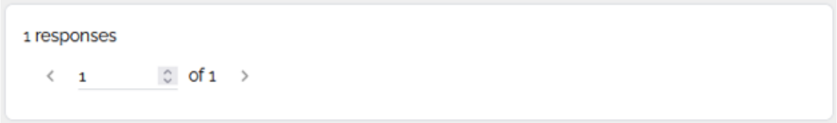
**Figure 6.22:** Fourth Stage: Highlight Text Component



Hecht Museum: for or against rebellion?

Your response has been registered.

**Figure 6.23:** End of Form: Response Sent



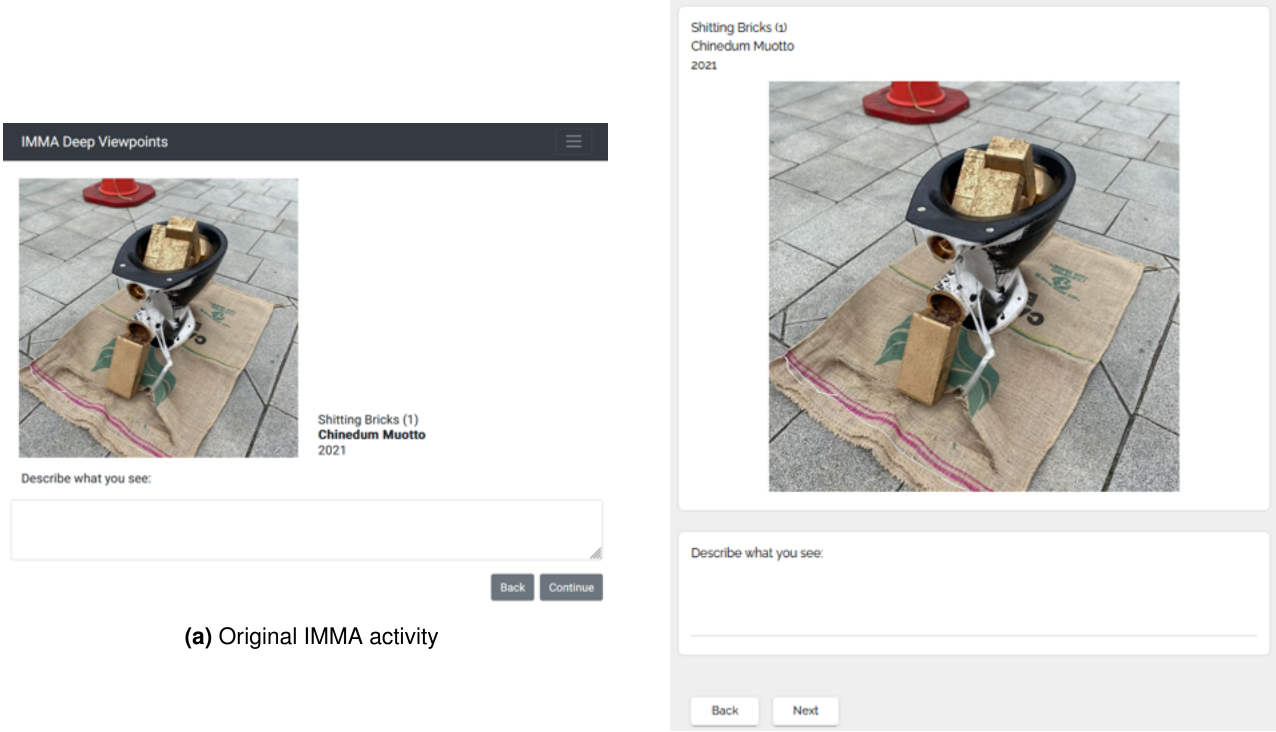
1 responses

**Figure 6.24:** Response View: Response Selection

## 6.3 Adapting Multistage Forms: IMMA as an example

The Multistage Forms activity template support the same type of interface provided by IMMA Deep Viewpoints and any activity framed within it can be easily transformed into a Multistage Form instance using the inSPICE tools.

As an example, we can choose an arbitrary IMMA Viewpoints activity such as the one given by the link https://spice.kmi.open.ac.uk/demos/imma-slow-looking/slowLooking/623b336fba2b2119626d0ec3 and convert it into a Multistage Form instance (in this case, the generated version can be found at http://spice.padaonegames.com/multistage-form/consumer/view/6422d7195e6ae3ce1e1f019d; the test credentials `sample - 0frHqal8` can be used for access). This activity focuses on a specific work from IMMA's collection: *Shitting Bricks* and seeks to guide the user through a reflective process by focusing on each of the most relevant aspects of the piece. Some screenshots of the original IMMA activity and its inSPICE counterpart can be found in figures 6.25a, 6.25b, 6.26a and 6.26b.

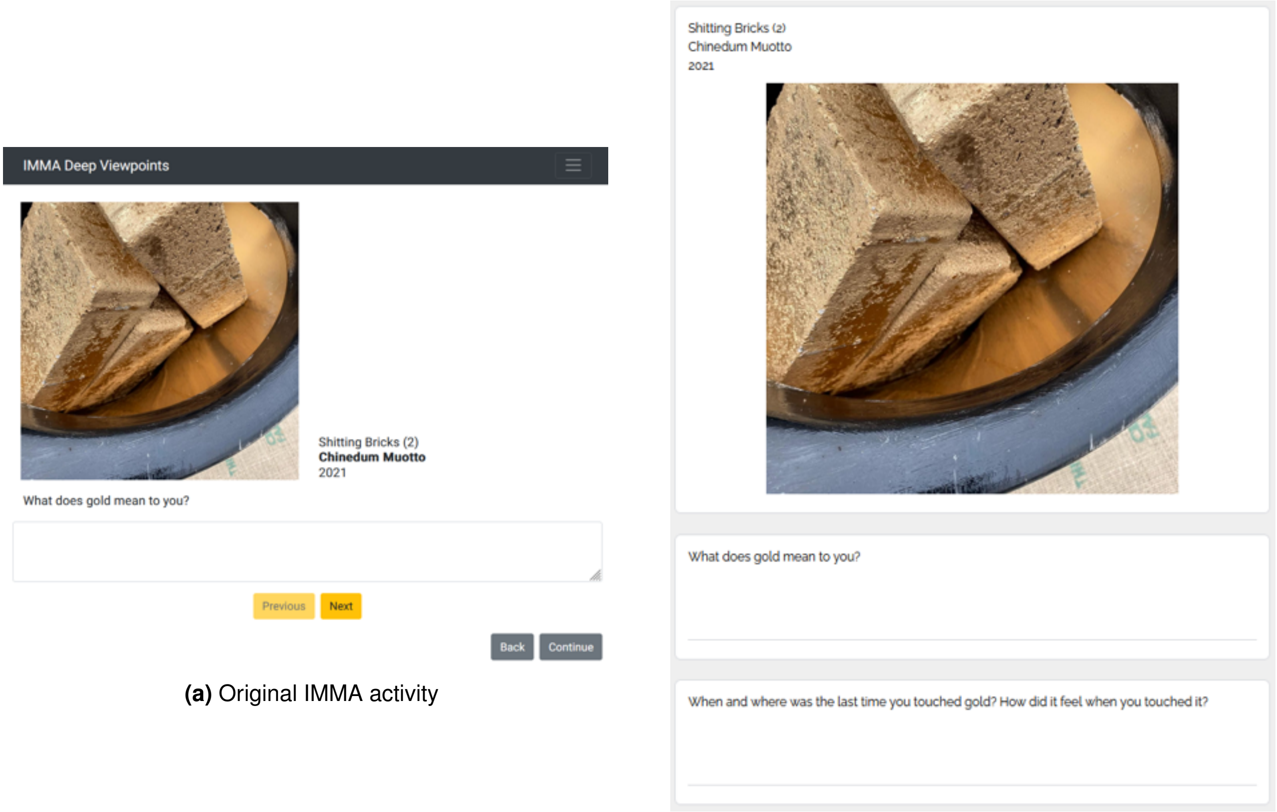


**(a)** Original IMMA activity

**(b)** inSPICE Adaptation

**Figure 6.25:** Shitting Bricks: What do you see?

As can be seen in these examples, the stages of an original viewpoints activity can be translated fairly closely into stages of the inSPICE activity template, with a slightly different user interface and some concessions such as the format in which the title of the images is displayed or changing the batteries of questions such as those in the "What does gold mean to you?" prompt to be sequential lists of items rather than a selector where one must press "Next" and "Back" to toggle between prompts. With this, we believe that this use case can be included in the more general template already available in inSPICE, allowing the generation of similar activities by any other museum curator.



IMMA Deep Viewpoints

Shitting Bricks (2)
**Chinedum Muotto**
2021

What does gold mean to you?

**(a)** Original IMMA activity

Shitting Bricks (2)
Chinedum Muotto
2021

What does gold mean to you?

When and where was the last time you touched gold? How did it feel when you touched it?

**(b)** inSPICE Adaptation

**Figure 6.26:** Shitting Bricks: What does gold mean to you?

# 7 inSPICE template: escape Room

The Escape Room activity template was inspired by the use case proposed by the National Museum of Natural Sciences in Madrid (see section 2.5) and was used to implement the tool that is currently being used to produce new adventures to be used on the Unity 3D escape room games for museum visits and research projects. Structurally, this template has two very distinct constituent parts:

- A **web editor** included in the inSPICE suite of curation tools for conveniently configuring the structure of the adventure that will then be run on participants' mobile devices, enabling the inclusion of multimedia resources and easy design of all the elements needed to create an Escape Room (rooms, questions, dialogues, artifact hunts, etc.). The result of the configuration process is a JSON file that can then be used to generate an application .apk file executable on an Android device.
- An **application developed in Unity3D** generated from the JSON data of the previous point that executes the design produced by the museum curator, and with the structure explained above. This template is at the time of writing the only activity whose execution is performed from an external application to inSPICE (mostly to take advantage of all the possibilities that a game engine like Unity3D offers in terms of interactive puzzles or AR), but its creation is delegated to the system in order to make the design accessible to any non-technical user, and speed it up for users who are already familiar with the engine.

Next we will elaborate on the options available from the web editor, showing for each of them how they are reflected in the application generated from the JSON specification.

The game designer's view of the Escape Room Creation Stage home screen (figure 7.1). Clicking on the Escape Room tab in the top left corner of the screen will display the settings for the new activity. To create a new stage for the game, select the + Add Stage button in the bottom left corner.

Escape Room Activity Settings screen (figure 7.2) for the Escape Room activity from the game designer's perspective. Here, the game designer can set the main information about the escape room, such as the activity title, that will be used as the application name, the app APK ID and the version of the app that will be used for this build.

More details that the game designer can set on the Escape Room Activity Settings screen (figure 7.2). Here the game designer can set the app icon that players will see on their devices when they want to open the app. To create the app icon, use the Select Image button in the App Icon area. This allows you to upload and select any image. In addition to the icon, the game designer can create new characters and diary pages by clicking on the appropriate buttons.

The Character Creation screen (figure 7.4) can be accessed by clicking the Create Character button on the Escape Room Activity Settings screen (figure 7.3). The game designer can upload and select an image for the new character that is going to be created. The character name and description can also be set from this screen. The game designer must click on the 'Save Changes' button in the bottom right corner or the character won't be saved. There is no limit to the number of characters that can be created by simply clicking on the Create New Character button at any time. The characters created can be edited if necessary.

The Character created on (figure 7.4) screen, will be shown to the player shown on figure 2.44, image 1. The character will always be shown next to a text box.

The Diary Pages creation screen can be accessed by clicking the New Diary Page button in the Escape Room Activity Settings screen (figure 7.2). Diary pages can be used to display important information to the player. The game designer must specify a Diary Page name and insert text, images or both. The Diary Page is divided into a left and right side, where you can choose where the information is displayed. To create the Diary Page, the game designer must click the Save Changes button in the bottom right corner, otherwise the page won't be saved. There is no limit to the number of Diary Pages that can be created by simply clicking on the New Diary Page button at any time. These pages can also be edited at any time.

To create the game, the game designer needs to add stages. These stages can only be made from a list of types and follow a specific order. In the bottom left corner of the Escape Room Creation Stage home screen (figure 7.1),

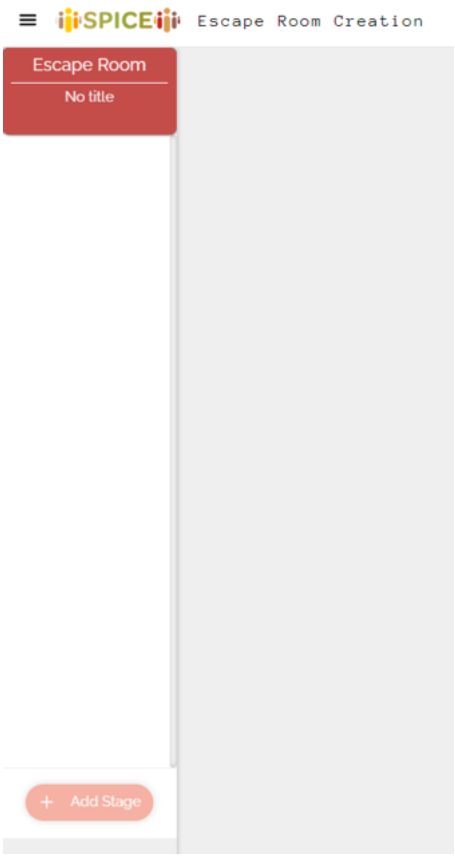


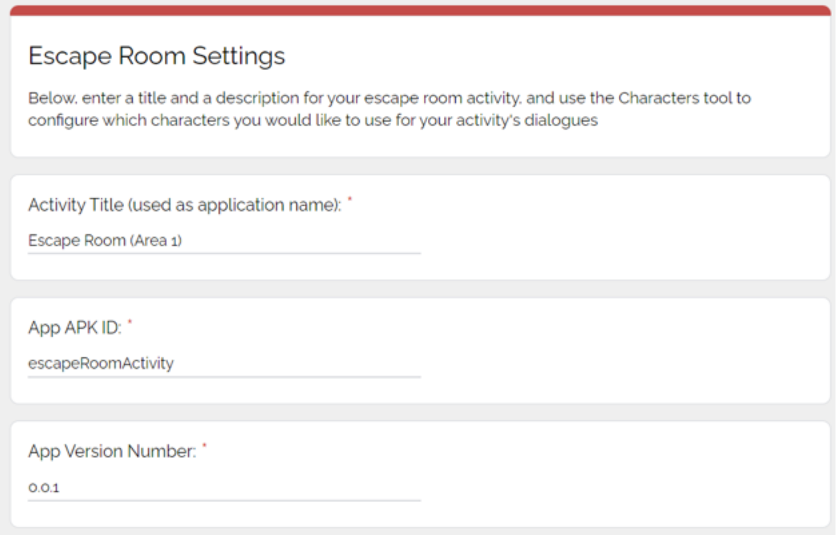
**Figure 7.1:** Interface of the Escape Room Creation screen.

the game designer will find the Add Stage button (figure 7.6). There is no limit to the number of stages that can be created. You can use the up and down arrows to the right of the stage to change the order of the stages. The Duplicate button on the left side of the Stage allows the game designer to duplicate an exact copy of the Stage and the Trash button can be used to delete an entire Stage if required.

The types of Stages that can be added in Figure 7.6 can be of different types. On the selected Stage screen, in the top right hand corner, the game designer will find the Stage Type drop down menu with all the different types of Stages that can be added. These stages will be: Narrative, Pack Puzzle, Object Obtained, Diary Page, Room, Test (Multiple Choice), Free Answer (Multiple Choice), Waiting Code, QR Scan, AR Scan, AR Overlay, Load Scene, Narrative, Unlock Password and Session Code. Each stage is completely different and can be used as required. There is no limit to the number of times each type can be used.

To create an Escape Room, the stage type required is: Room. The Room stage is always be made up of "Blocks", and "Blocks" are filled with puzzles that the player must solve in order to escape the room. The game designer can add up to 4 Blocks to the room, but must also edit an additional Block called the 'Exit block'. This block allows the player to leave the room and progress through the game.
The first thing to do in the Escape Room is to configure it. Add as many hints as needed, so that players know all the specific information about the Escape Room. Also, make sure to lock the Exit Block so that it is only available to the player once they have completed all the other blocks.

Once the Room Stage has been created, the game designer needs to add blocks to make the room playable. The Settings and Exit Block screen (figure 7.9) allows the game designer to adjust the settings required for this room. Also, the Exit Room is mandatory, so it will always be displayed in the Escape Room. If the game designer needs



Escape Room Settings

Below, enter a title and a description for your escape room activity, and use the Characters tool to configure which characters you would like to use for your activity's dialogues

Activity Title (used as application name): *

Escape Room (Area 1)

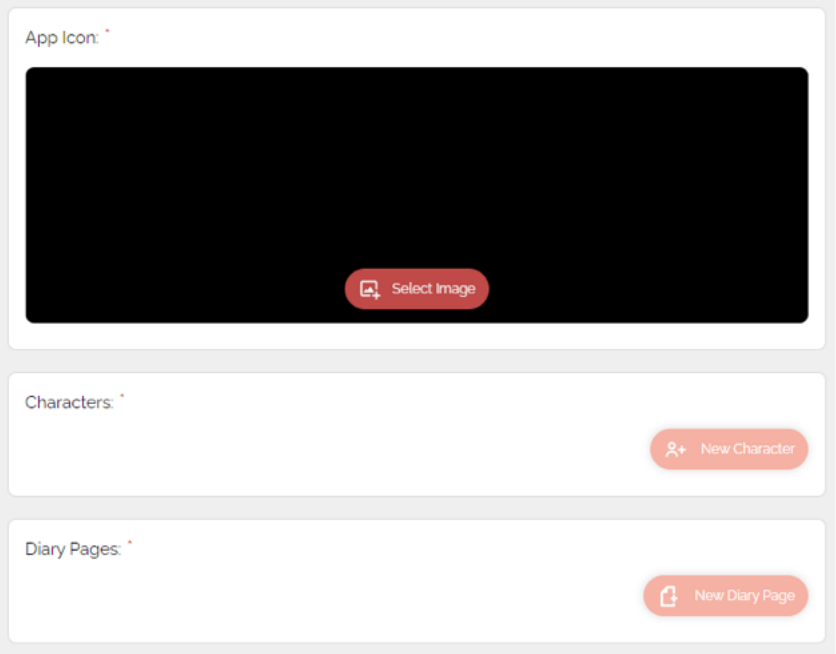
App APK ID: *

escapeRoomActivity

App Version Number: *

0.0.1

**Figure 7.2:** Interface of the Escape Room Settings screen.



App Icon: *

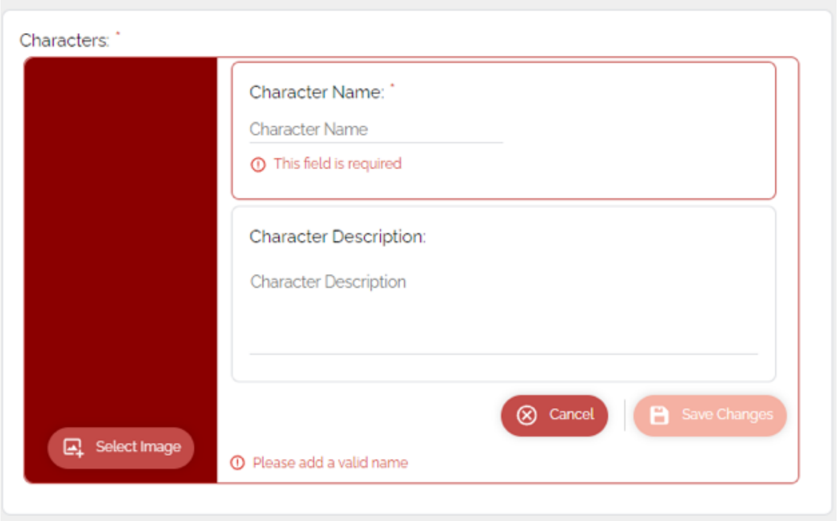
Characters: *

Diary Pages: *

**Figure 7.3:** More details from the Escape Room Settings

to add more blocks, they can add up to 4 blocks by clicking on the ”+” button. If one is added by mistake, it can be deleted with all its contents and also moved out of position.

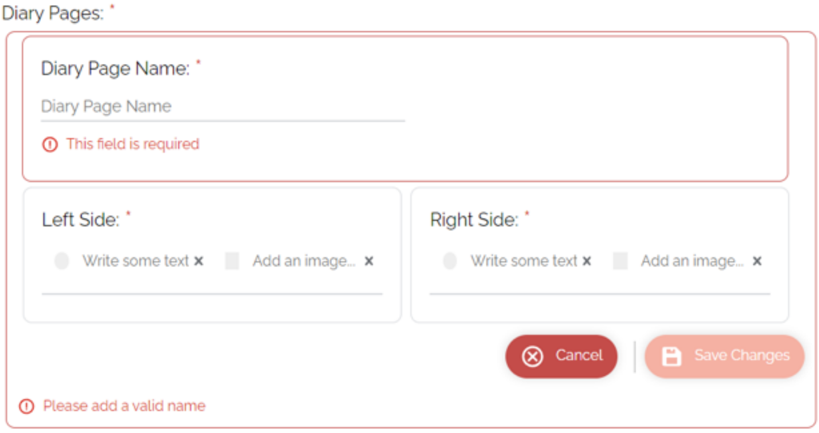
The blocks are what is inside of the rooms in the Escape Room. The Manage blocks for the Escape Room screen (figure 7.10) allows the game designer to navigate between the different blocks used in the room, the Settings of the room and the Exit Block. Using the ”+” Button allows the game designer to add new blocks to the room. There is a duplicate button that can be used to make an exact copy of the block, a delete button to delete an entire block and also arrows to move the order in which the blocks can be displayed.



This field is required

Please add a valid name

**Figure 7.4:** Interface of the Character creation screen.



This field is required

Please add a valid name

**Figure 7.5:** Interface of the Diary Pages creation screen.

Figure 2.47, image 1 shows how the Escape Room is displayed in game. There are 4 boxes showing the 4 blocks inside of the escape room and in the middle is the Exit Block. The player can enter any of the 4 unlocked blocks, but must complete them to unlock the exit block. On the 4 main blocks, the player will see an image or text depending on what the game designer has chosen. Clicking on one of the blocks will bring up a text box telling the player what the block contains and whether or not they want to enter it. These blocks are randomly placed, so not all players have the same distribution of blocks. This means that not all the players will be doing the same tasks at the same time. It is recommended to not use a numerical system to name the blocks, so that the players do not have a specific order in which to solve the blocks.

Each block can be modified individually. Once a new block has been added using the "+" button shown in the Manage Blocks for the Escape Room screen (figure 7.10), the Block Information screen (figure 7.11) will be displayed. This screen allows the game designer to configure various aspects of the Escape Room Block. The game designer can choose wether the block shows the player a title or an image, and the block can show a description of what is inside the block. When the block is completed by the player, the game designer can choose to show a new title or image for the block. Finally, at the bottom of the screen, the game designer can use the "New Puzzle" button to start adding puzzles to the block.

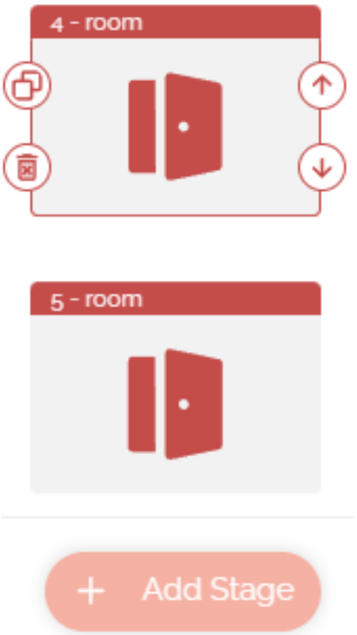


**Figure 7.6:** Add Stage to the game.

The "New Puzzle" Button at the bottom of the Block Information screen (figure 7.11) will opens a new puzzle screen. As shown on the Adding a new puzzle to the block screen (figure 7.12), Puzzle number 1 can be any puzzle selected from the drop down list. This list includes: Narrative, Pack Puzzle, Object Obtained, Diary Page, Room, Test (Multiple Choice), Free Answer (Multiple Choice), Waiting Code, QR Scan, AR Scan, AR Overlay, Load Scene, Narrative, Unlock Password and Session Code.

Narrative is one type of puzzle that can be selected from the drop down list showed on the Adding a new puzzle to the block screen (figure 7.12). The narrative stage screen is used to provide text information to the players. The Add Dialog button allows the game designer to create an unlimited number of text windows. These text windows will appear on the left side of the stage and they can be rearranged, duplicated or deleted. Each window can be modified to display different text and different characters. The created dialogs created can be edited, duplicated, deleted and rearranged in any order.

Each dialog box can be individually customized by the game designer. It is possible to select any character created in the Character creator screen (figure 7.4). There is a drop down menu to select the required character. Below the character selection, there is a text box where the game designer can enter the text for that particular dialog (figure 7.14). In game, the narrative stage would look like figure 7.15.

Object Obtained (figure 7.16) is another type of puzzle that can be selected from the drop down list shown in the Add a new puzzle to the block screen (figure 7.12). This allows the game designer to select an object to give to the player. The Select Image Button allows the game designer to decide which image that will be revealed to the player at this stage. Below the image selected to be given to the player, there is a box where the game designer can write a short text for the player.

Figure 2.51, image 1, shows the obtained object in the game. In the center of the screen, the image of the object obtained will appear with an animation that enlarges the image. A small text will appear below the object.

The Pack Puzzle stage (figure 7.17) allows the game designer to add all the pieces needed to solve a jigsaw puzzle. The first step is to set the amount of time the player will wait after solving the puzzle before moving on to the next stage. The time is set in seconds. Then, the image of the piece can be uploaded using the Select Image button. The system will automatically recognize the coordinates occupied by the image. Select the area of the game where you

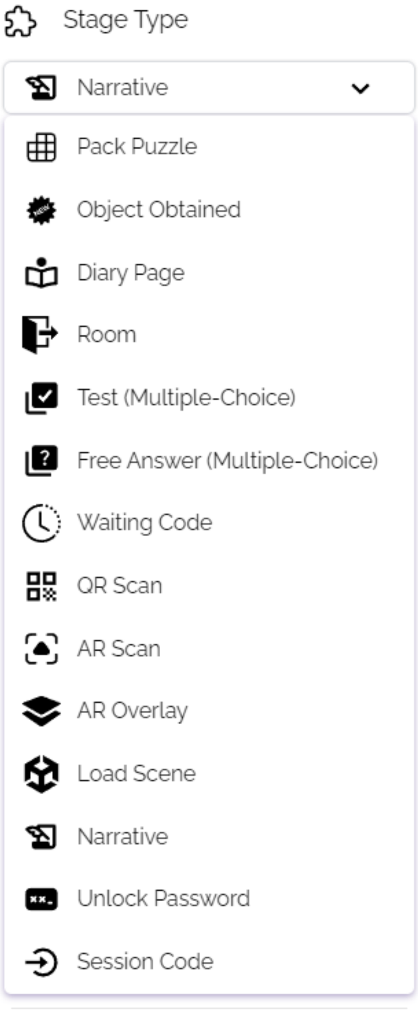


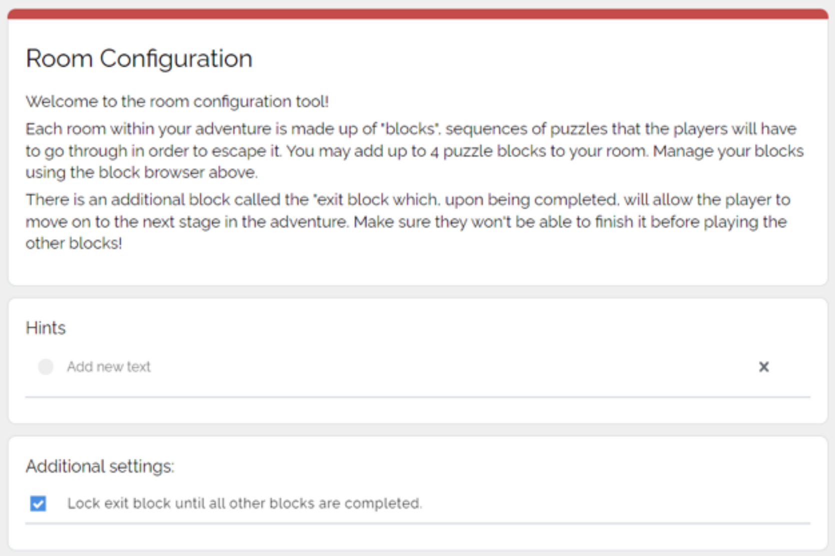
**Figure 7.7:** Types of Stages that can be added to the game.

want the piece to be placed in the Start Position area and the size of the piece in the Piece Size area. If any of this information changes, you can also edit or even delete the puzzle piece on this screen.

Figure 2.55, images 1 and 2, shows the look of the Pack puzzle in game. The screen shows the box where the player must place the pieces on the left and the pieces they can use on the right. The player can pick up and drag them into the box. Once the puzzle is solved, the player must wait the time set by the game designer in order to advance to the next stage. Make sure that the pieces can only be positioned in one way, so that there is no chance of the player solving the puzzle in an unintended way and getting stuck on that stage.

The AR Scan stage (figure 7.18) is used to track a specific image with a device's camera. This screen allows the game designer to select a trackable image for the player to search for. The Select Image button allows the game designer to select the image to be tracked. The game designer can also specify the physical width of the image to be tracked, in meters. Also, a short text with hints to help the player find the image to track.

Figure 2.45, image 1 shows the explorer's spyglass from the players perspective. The camera on the device using the game is opened. At the top center of the screen, the player sees the word "Searching" with an image of a compass. And at the bottom center of the screen, the clue provided by the game designer as to what needs to be



Room Configuration

Welcome to the room configuration tool!

Each room within your adventure is made up of "blocks", sequences of puzzles that the players will have to go through in order to escape it. You may add up to 4 puzzle blocks to your room. Manage your blocks using the block browser above.

There is an additional block called the "exit block which, upon being completed, will allow the player to move on to the next stage in the adventure. Make sure they won't be able to finish it before playing the other blocks!

Hints

○ Add new text ×

Additional settings:

☑ Lock exit block until all other blocks are completed.

**Figure 7.8:** Types of Stages that can be added to the game.

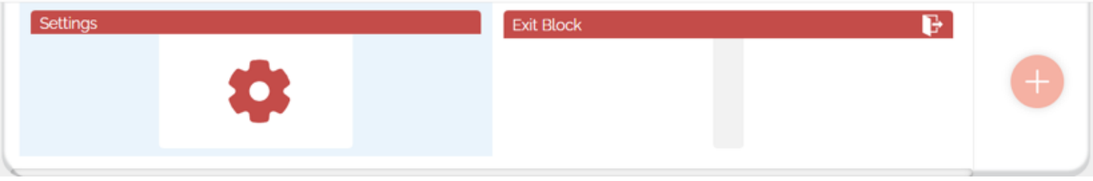


**Figure 7.9:** Settings and Exit Block.

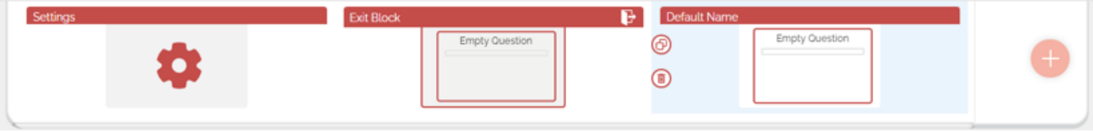


**Figure 7.10:** Manage blocks for the Escape Room.

found. When the player tracks the correct image, the compass will focus on the center of the image and change color. Also the top text will change from "Searching" to "Found". In Figure 2.45, image 1, the player's camera has been activated and the text indicates "Hint: Use the camera and aim at the smallest tree in the panel" and players must look for that tree in the museum to advance in the game.

AR Overlay uses the same system as the AR Scan stage (figure 7.19) which is used to give the player something in return for tracking an image with the device's camera. This screen allows the game designer to select a trackable image for the player to search for. The Select image button allows the game designer to select the image to track. The game designer can also specify the physical width of the image to be tracked in meters, as well as a short text with hints to help the player find the image to track. The game designer can then select which image to use as an overlay over the trackable. This image will be placed on top of the trackable image.

Figure 2.45, image 2 is how the AR Overlay stage looks in the game. The camera of the device using the game is opened. Once the player has tracked and focused on the correct image, the image selected as the overlay will be displayed on top of the trackable image. The player will also see a clock in the top left corner, indicating how much time they have to focus on the image to move on to the next stage.

The Question Free stage (figure 7.20) is used to test the player with a question that does not have an answer. There is no correct answer to the question asked and is used to learn something from the player. Here the game designer can decide the text for the question, the number of answers, the answers, the minimum and maximum answers to be selected, and also the one click answer. The one-click answer means that the first answer selected is locked in immediately, leaving no time for the player to reconsider.

Figure 2.44, image 2 shows how the Free Answer question is displayed in the game. At the top of the screen is a box with the text of the question the player will be asked. Below this are the options that the player can choose from. As there is no correct answer to this type of question, any button selected will be sufficient for the player to move on to the next stage. In Figure 2.44, image 2, the text states "Your group made up of?" and players must select an answer between "Boys, Girls or Both?", with no answer being correct.

The Test Stage (figure 7.21) is used to test the player with a question that has an answer, this is used to test the player's knowledge, as it is intended that they answer correctly. Here the game designer can decide the text for the question, the number of answers, the answers, which one is the correct answer, the minimum and maximum answers to be selected, and also the one click answer. The one-click answer means that the first answer selected is locked in immediately, giving the player no time to reconsider.

Figure 2.49, image 1, shows how the Test answer question is displayed in the game. At the top of the screen there is a box with the text of the question that is being asked to the player. Below that are the options that the player can choose from. This type of question has a correct answer, so after the player has chosen and answered, they will be told whether they have answered correctly or not, but they can still move on to the next stage of the game.

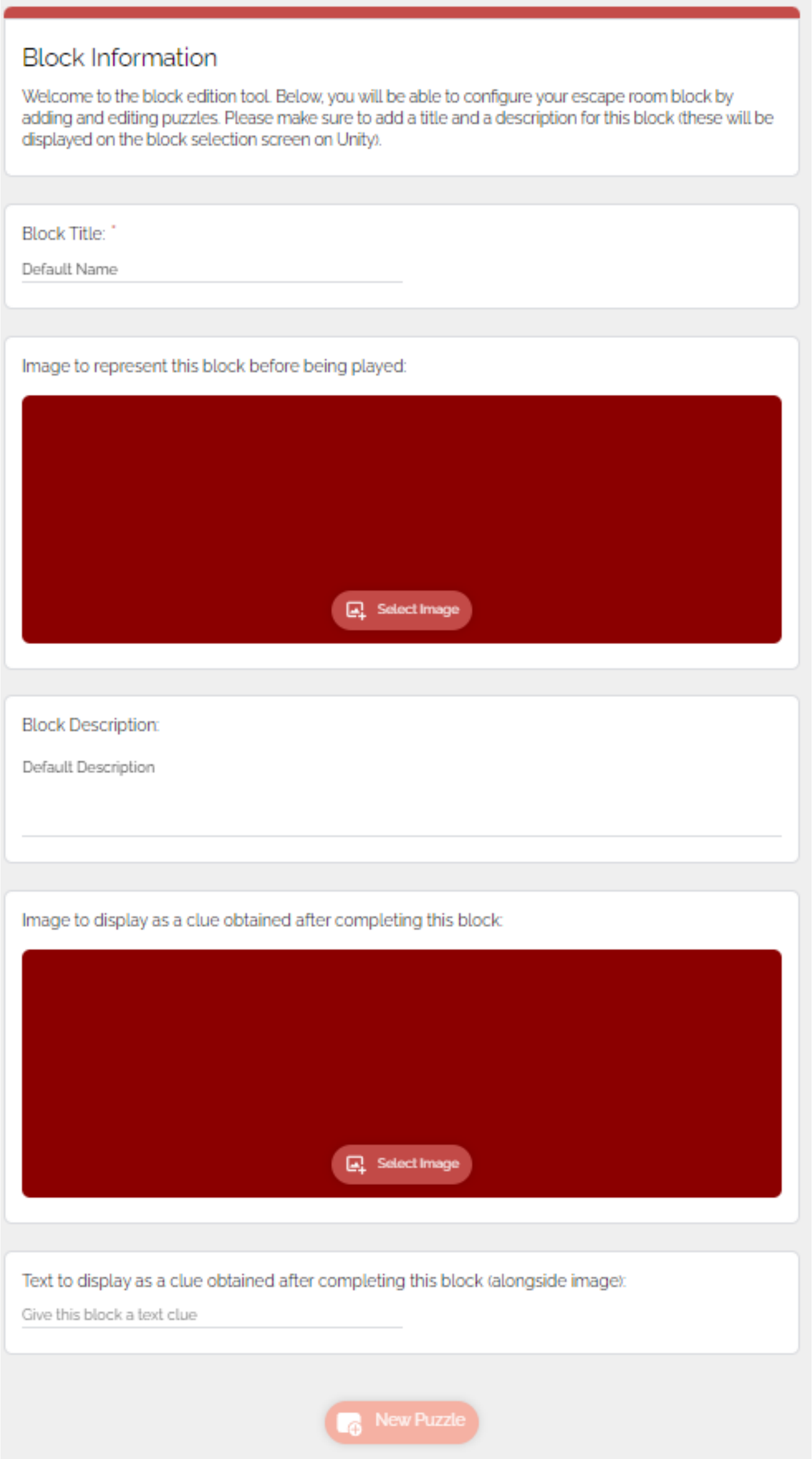
The session code stage (figure 7.22) assigns a unique code to the player so that the game designer can track the game session. On this screen, the game designer decides the text that will be displayed to the player when they receive their personal code. Also the text that appears before the user number. This way, if the game designer is running more than one group at a time, it can be split and easily tracked later. The number of user codes created for each session can also be easily set using the + and - buttons. The game designer can also download the list of codes into an ".XLS document". The Add New Session button allows the game designer to have different sessions of the same game and run different tests with different groups.

At the Unlock Password Stage (figure 7.23), it is possible to set a 4 digit code. The game designer can choose the text that is displayed, the 4-digit code that can be displayed as a 4-digit lock or in hourly format, and the text that is displayed if the entered code is incorrect.

Figure 2.50, image 1 shows what the Unlock Password stage looks like to the player. At the top of the screen, there is a text box to show the information the game designer wants. Below, there are 4 scrollable wheels with numbers from 0-9. The player can choose any number. If the answer is wrong, a message is displayed and if the answer is correct, the player can proceed to the next stage. In Figure 2.50, image 2, the text reads "In which year was the word biodiversity first used?" and players must find the exact year on an information panel in the museum to answer correctly.

The waiting code stage screen works with a text-based code that must be entered to solve the stage. The game designer can write the text that is displayed to the player, the codes to solve that stage, and decide whether the codes are case-sensitive. There can be more than one code to solve the level.

Figure 2.56 shows what the Waiting Code stage looks like in the game. It shows the player the text written by the game designer and an empty text box to enter the answer. Clicking on the empty text box opens the device's keyboard to enter the answer. If the entered answer is incorrect, the player will have to try again, and if the answer is correct, the player will proceed to the next stage. In Figure 2.56, the text indicates "Wait for the rest of the players to finish to receive the code and move on to the next area". This way, the players who finish quickly, wait for the players who take longer, and move on as a group.



Block Information

Welcome to the block edition tool. Below, you will be able to configure your escape room block by adding and editing puzzles. Please make sure to add a title and a description for this block (these will be displayed on the block selection screen on Unity).

Block Title: *

Default Name

Image to represent this block before being played:

Block Description:

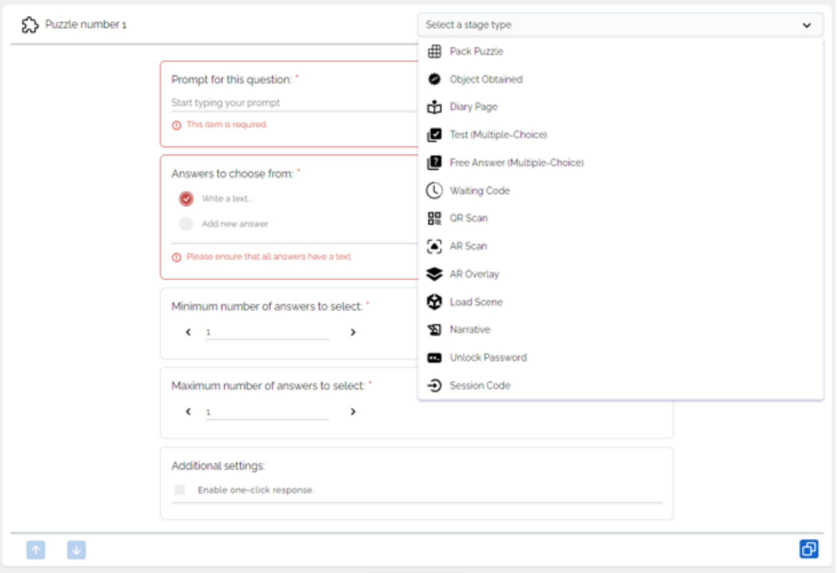
Default Description

Image to display as a clue obtained after completing this block:

Text to display as a clue obtained after completing this block (alongside image):

Give this block a text clue

**Figure 7.11:** Block information screen used to modify each block individually.



Puzzle number 1

Prompt for this question: *
Start typing your prompt
This item is required.

Answers to choose from: *
● Write a text...
○ Add new answer
Please ensure that all answers have a text.

Minimum number of answers to select: *
‹ 1 ›

Maximum number of answers to select: *
‹ 1 ›

Additional settings:
□ Enable one-click response.

**Figure 7.12:** Adding a new puzzle to the block.

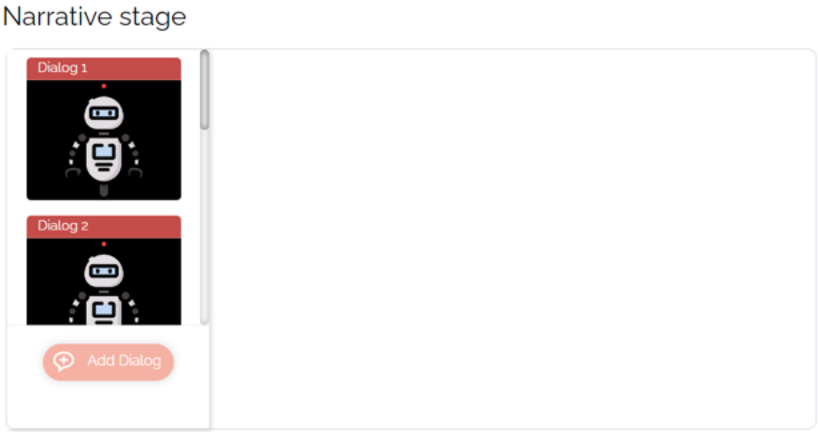
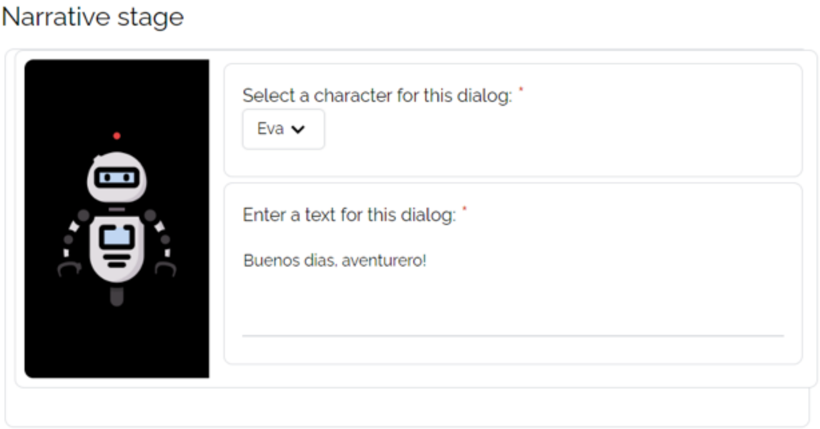


**Figure 7.13:** Narrative stage screen.

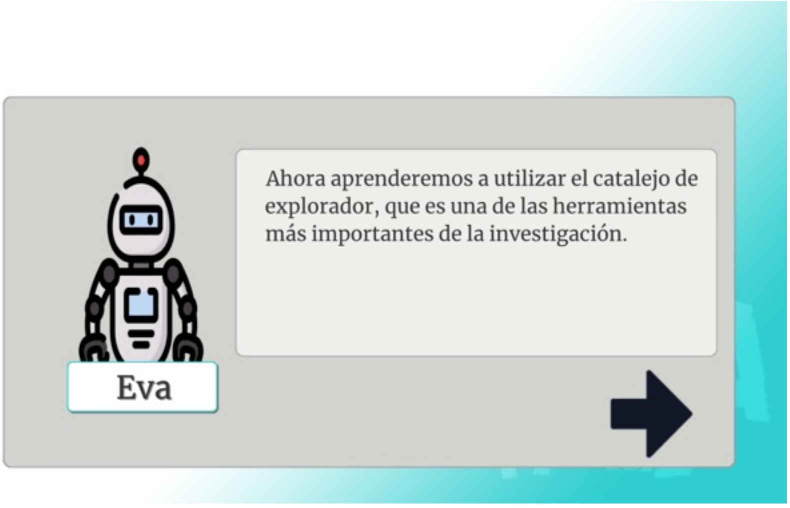


Narrative stage

Select a character for this dialog: *
Eva

Enter a text for this dialog: *
Buenos dias, aventurero!

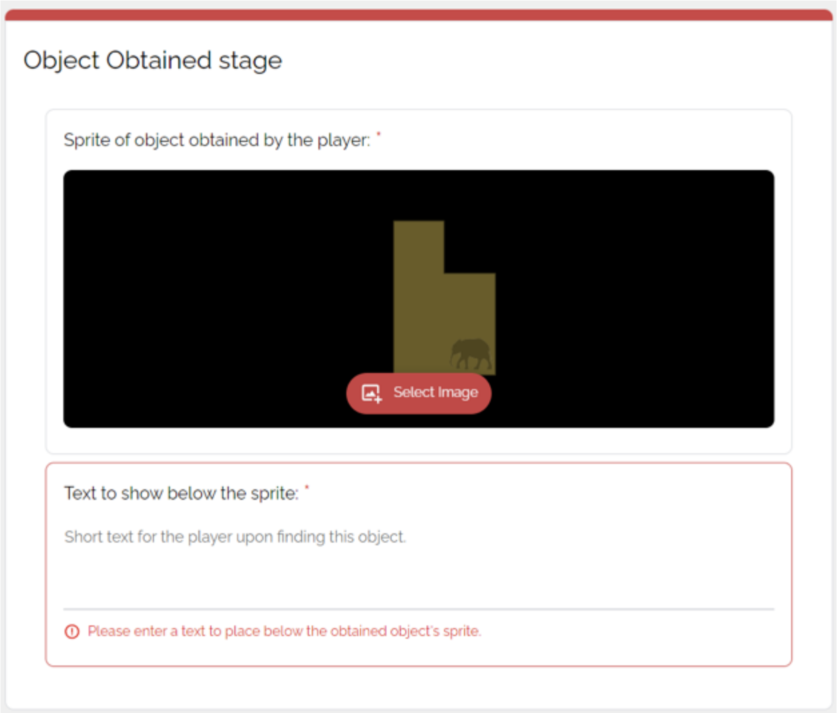
**Figure 7.14:** Individual customization to the Narrative stage screen.



Eva

Ahora aprenderemos a utilizar el catalejo de explorador, que es una de las herramientas más importantes de la investigación.

**Figure 7.15:** In game character in a narrative stage.



Object Obtained stage

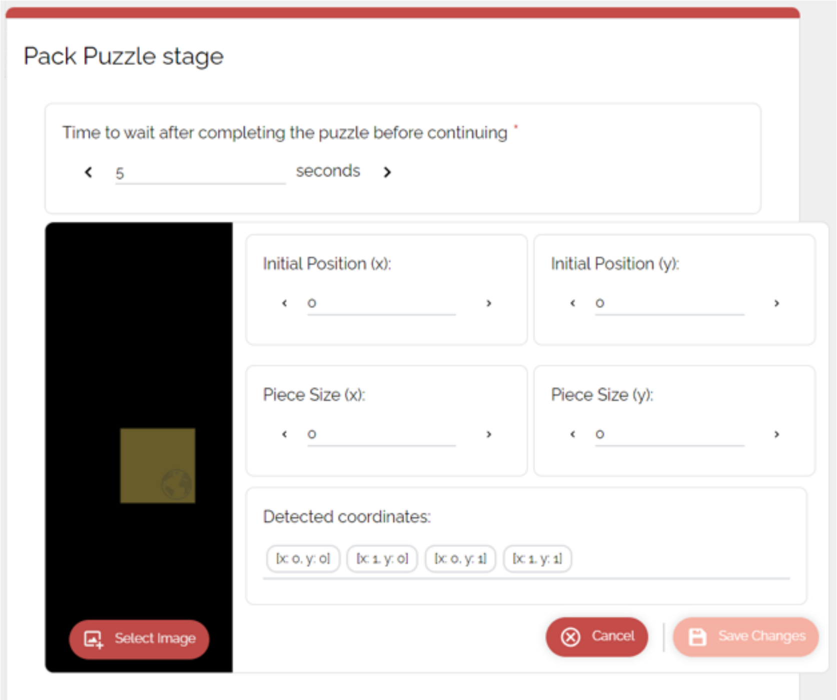
Sprite of object obtained by the player: *

Text to show below the sprite: *

Short text for the player upon finding this object.

Please enter a text to place below the obtained object's sprite.

**Figure 7.16:** Setting up the object the player will obtain by solving a puzzle.



Pack Puzzle stage

Time to wait after completing the puzzle before continuing *

‹ 5 seconds ›

Initial Position (x): ‹ 0 ›

Initial Position (y): ‹ 0 ›

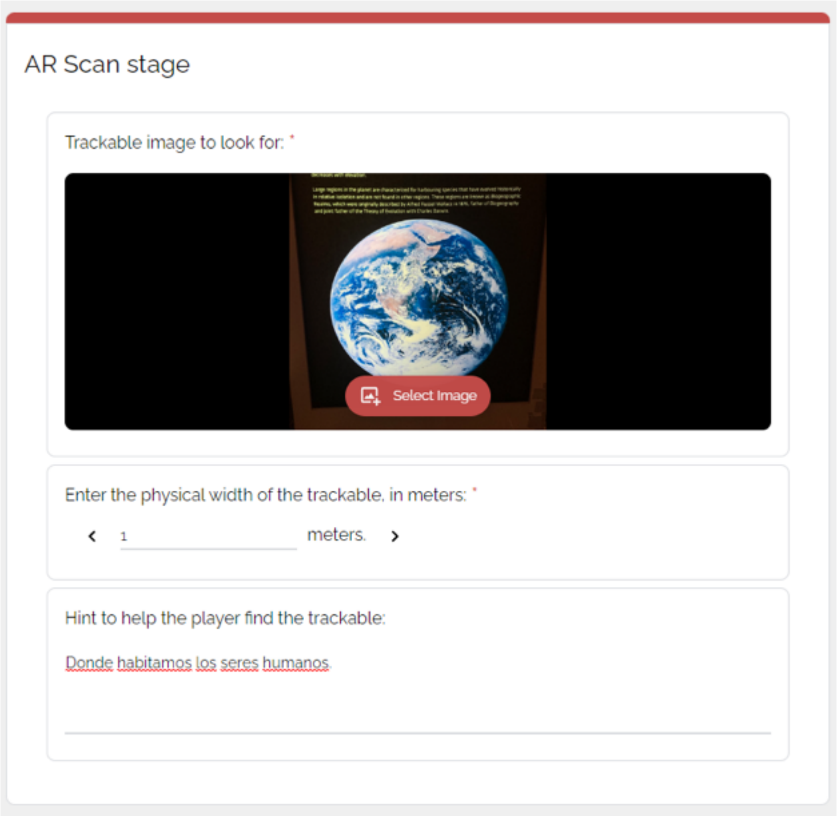
Piece Size (x): ‹ 0 ›

Piece Size (y): ‹ 0 ›

Detected coordinates:

[x: 0, y: 0] [x: 1, y: 0] [x: 0, y: 1] [x: 1, y: 1]

**Figure 7.17:** Pack puzzle stage shows how to add pieces of a jigsaw puzzle.



AR Scan stage

Trackable image to look for: *

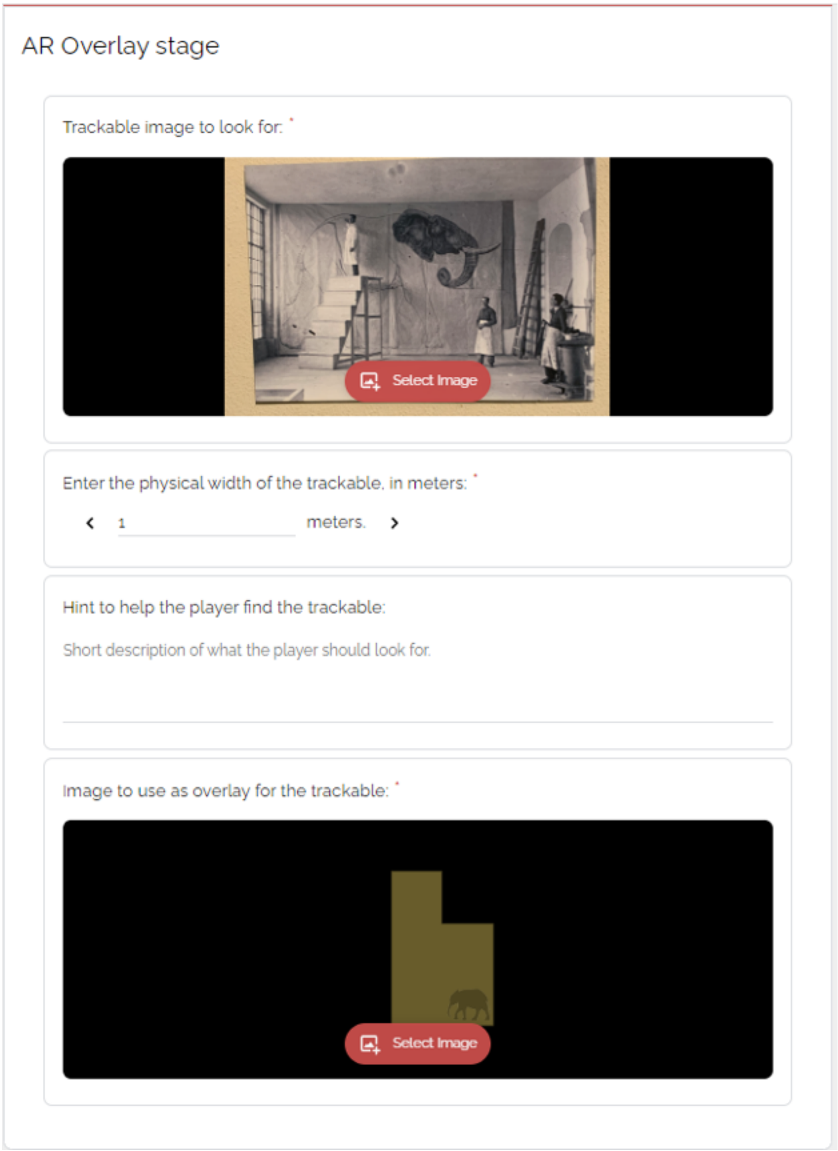
Enter the physical width of the trackable, in meters: *

‹ 1 meters. ›

Hint to help the player find the trackable:

Donde habitamos los seres humanos.

**Figure 7.18:** AR Scan stage.



AR Overlay stage

Trackable image to look for: *

Enter the physical width of the trackable, in meters: *

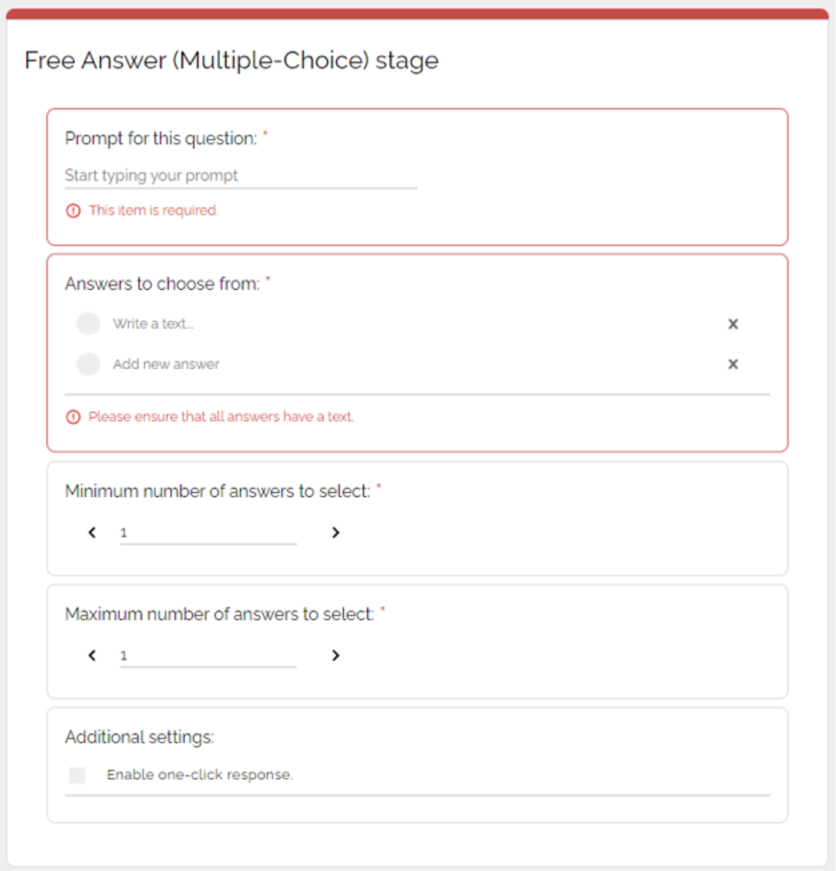
‹ 1 meters. ›

Hint to help the player find the trackable:

Short description of what the player should look for.

Image to use as overlay for the trackable: *

**Figure 7.19:** AR Overlay stage screen.



Free Answer (Multiple-Choice) stage

Prompt for this question: *

Start typing your prompt

This item is required.

Answers to choose from: *

○ Write a text... ×

○ Add new answer ×

Please ensure that all answers have a text.

Minimum number of answers to select: *

‹ 1 ›

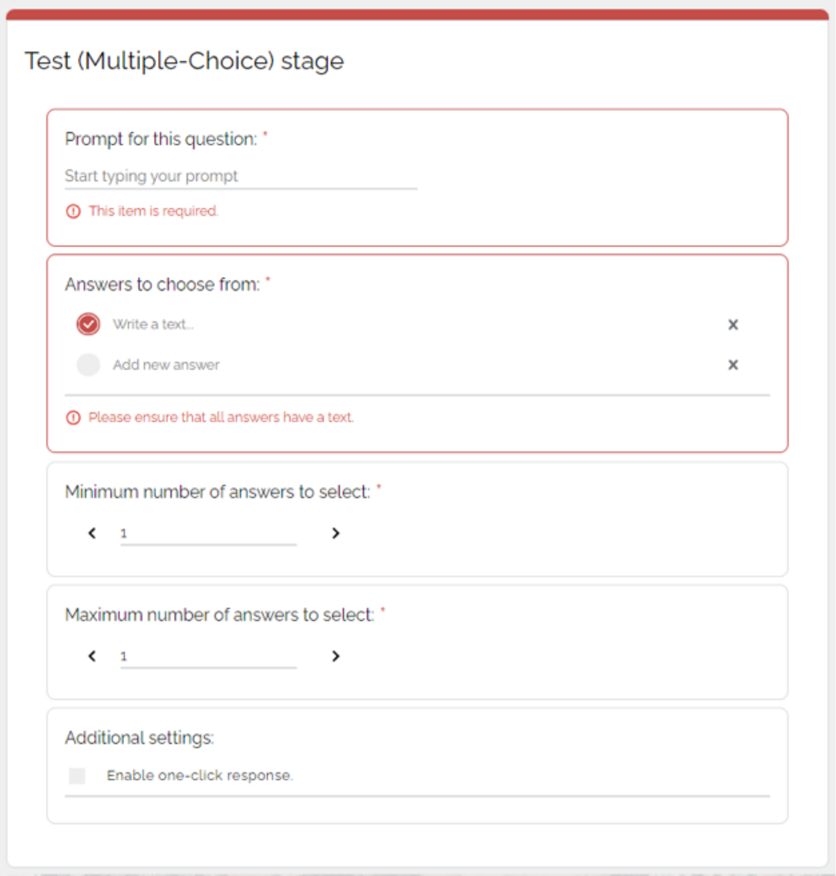
Maximum number of answers to select: *

‹ 1 ›

Additional settings:

□ Enable one-click response.

**Figure 7.20:** Multiple Choice question with Free answer stage.



Test (Multiple-Choice) stage

Prompt for this question: *

Start typing your prompt

This item is required.

Answers to choose from: *

Write a text...

Add new answer

Please ensure that all answers have a text.

Minimum number of answers to select: *

1

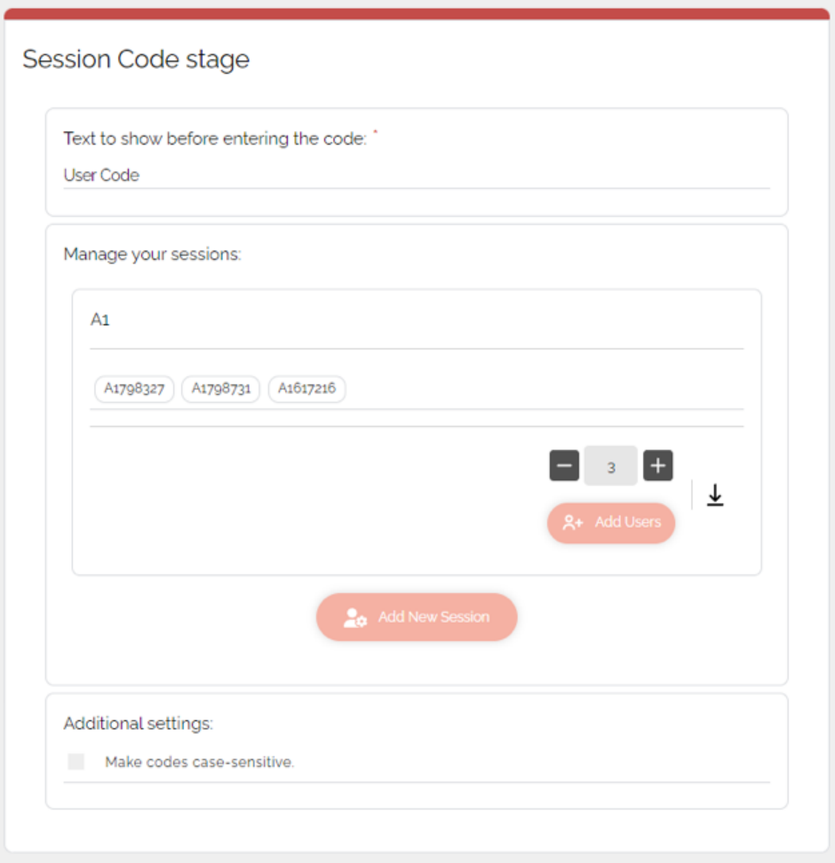
Maximum number of answers to select: *

1

Additional settings:

□ Enable one-click response.

**Figure 7.21:** Multiple Choice question Test stage



Session Code stage

Text to show before entering the code: *
User Code

Manage your sessions:

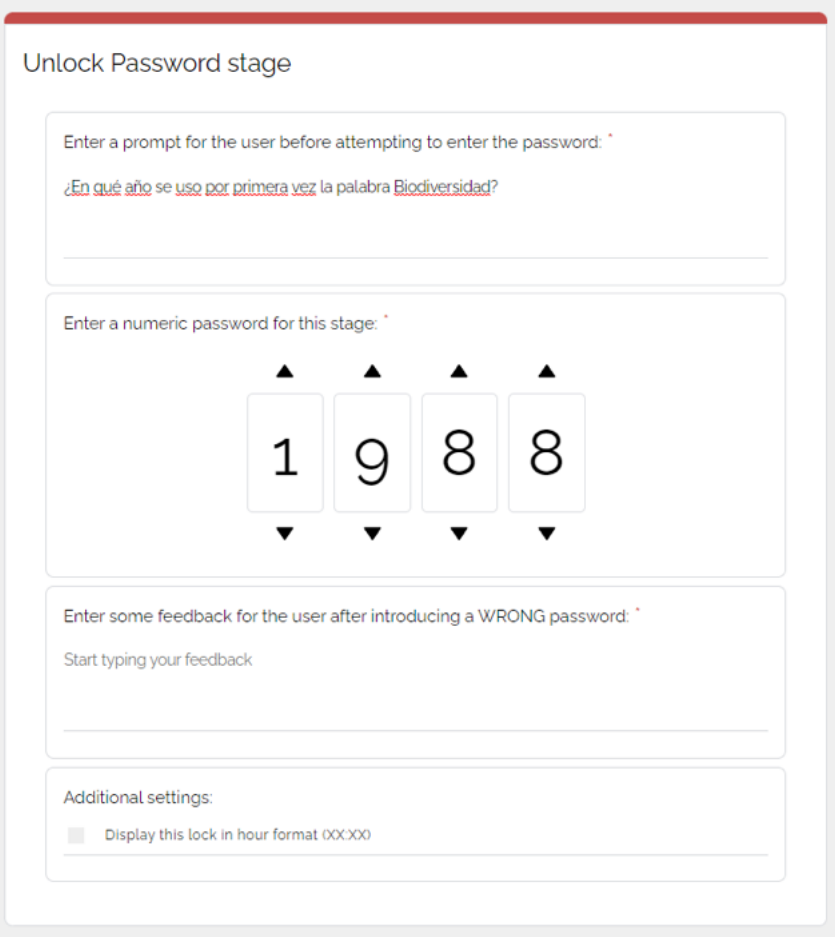
A1

A1798327 A1798731 A1617216

Additional settings:

□ Make codes case-sensitive.

**Figure 7.22:** Session code stage screen to assign each player an individual code.



Unlock Password stage

Enter a prompt for the user before attempting to enter the password: *

¿En qué año se uso por primera vez la palabra Biodiversidad?

Enter a numeric password for this stage: *

1 9 8 8

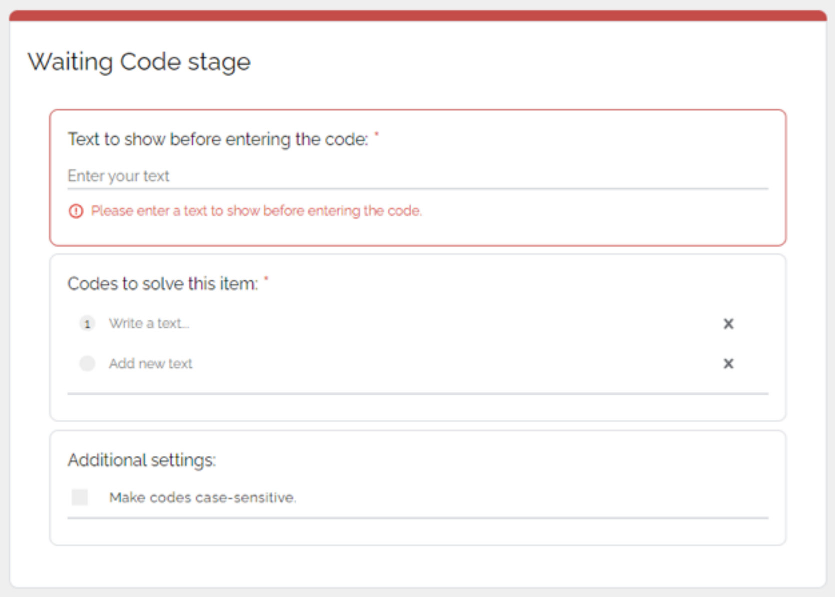
Enter some feedback for the user after introducing a WRONG password: *

Start typing your feedback

Additional settings:

□ Display this lock in hour format (XX:XX)

**Figure 7.23:** Unlock password stage screen.



Waiting Code stage

Text to show before entering the code: *

Enter your text

Please enter a text to show before entering the code.

Codes to solve this item: *

1 Write a text... ×

○ Add new text ×

Additional settings:

□ Make codes case-sensitive.

**Figure 7.24:** Waiting Code stage screen.

# 8 inSPICE Framework

## 8.1 General Architecture

In this chapter we will present an overview of the architecture used in inSPICE across the different layers that constitute the framework, as well as the most important concepts necessary to understand how they work and their expected usage patterns.

The inSPICE framework is structured in two fundamental blocks used to mediate the communication between the users of the offered templates and the different services and persistence layers belonging to the other work packages within SPICE.

The **first block** comprises a single-page web application developed in React + Typescript, which contains all the necessary building blocks to build and define new templates in a modular way, as well as the higher-order components that combine these atomic pieces to produce specific pages within the application that represent flows associated with particular use cases.

The **second block** is given by a server developed in NodeJS (also using Typescript instead of Javascript), intended to expose a series of mechanisms and endpoints that enable communication between web applications and the various services offered within SPICE. In particular, at the time of writing, the inSPICE server allows communication with the WP6 reasoning services for the recommendation of works and Narrative Game Stories that are similar / opposite to a given one in terms of expressed emotions, with the WP4 LDH as the main persistence mechanism for a large majority of the data needed to support the operation of the different templates, and with the WP3 community reasoners to provide visualizations for the implicit communities and patterns derived from user-generated content. Additionally, the inSPICE server counts with its own private persistence layer, built on a MongoDB database, aimed at storing any sort of sensitive information that due to privacy and security considerations should not be saved directly on the LDH (information related to user records and credentials, for instance). A general overview of this structure for one of the templates included in the framework (Narrative Game Activities) can be found in figure 8.1.

## 8.2 Web Infrastructure: Templates

We will now present the infrastructure of the first building block of the framework in more detail, describing the technologies used and the general structure/philosophy of this sub-project.

### 8.2.1 React and Typescript

React is a “JavaScript library for building user interfaces”, while TypeScript is a “typed super-set of JavaScript that compiles to plain JavaScript.” By using them together, we essentially build our UIs using a typed version of JavaScript. The reason to use them together would be to get the benefits of a statically typed language (TypeScript) for your UI. This means more safety and fewer bugs shipping to the front end. TypeScript compiles the React code to type-check the code. It doesn’t emit any JavaScript output (in most scenarios). The output is still similar to a non-TypeScript React project.

Components let you split the UI into independent, reusable pieces, and think about each piece in isolation. Conceptually, components are like JavaScript functions. They accept arbitrary inputs (called “props”) and return React elements describing what should appear on the screen. Using TypeScript with React allows to develop strongly-typed components that have identifiable props and state objects, which will ensure any usages of your components are type checked by the compiler.

During the development of the inSPICE frontend, React was used as the main framework for the structuring and construction of the different web interfaces and the components that make them up. As development progressed and new activity templates were gradually incorporated into the platform, inSPICE has accumulated a number of

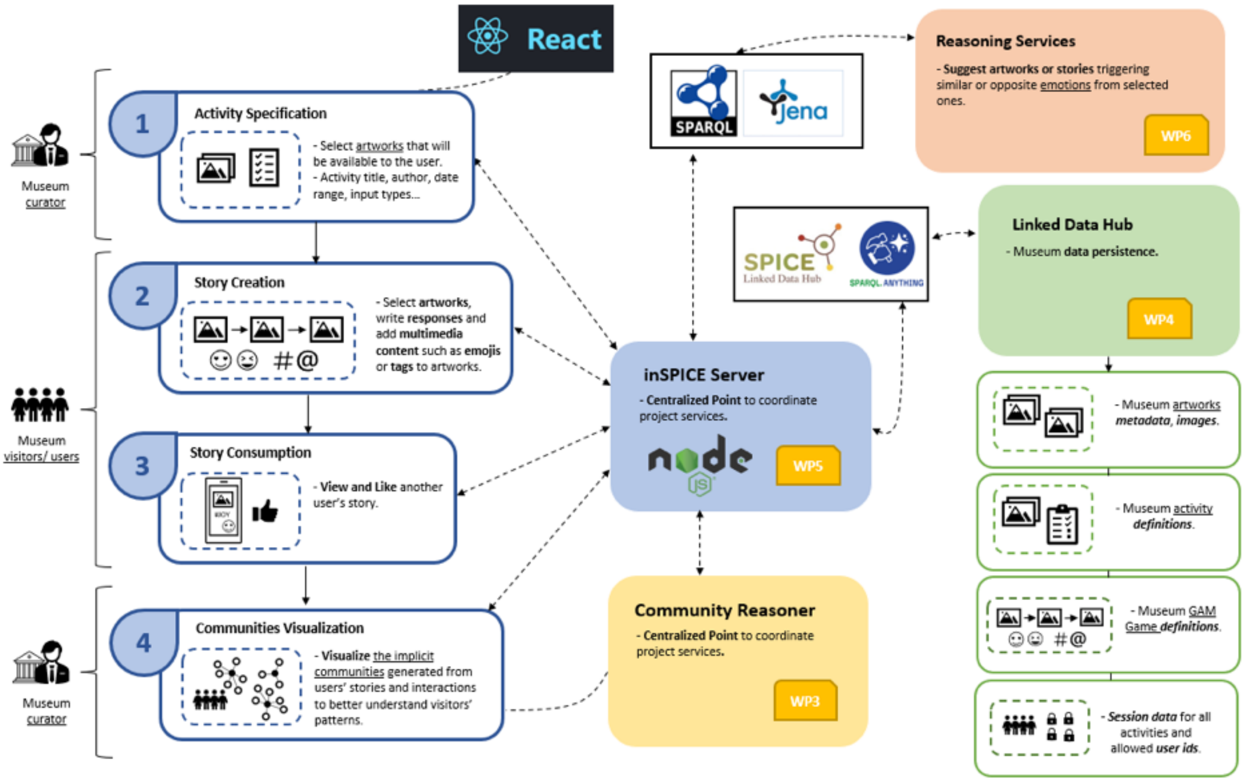

React
Museum curator
1
Activity Specification
- Select artworks that will be available to the user.
- Activity title, author, date range, input types...
2
Story Creation
- Select artworks, write responses and add multimedia content such as emojis or tags to artworks.
#@
Museum visitors/ users
3
Story Consumption
- View and Like another user's story.
Museum curator
4
Communities Visualization
- Visualize the implicit communities generated from users' stories and interactions to better understand visitors' patterns.
SPARQL
Jena
Reasoning Services
- Suggest artworks or stories triggering similar or opposite emotions from selected ones.
WP6
SPICE Linked Data Hub
SPARQL.ANYTHING
Linked Data Hub
- Museum data persistence.
WP4
inSPICE Server
- Centralized Point to coordinate project services.
node JS
WP5
- Museum artworks metadata, images.
- Museum activity definitions.
#@
- Museum GAM Game definitions.
- Session data for all activities and allowed user ids.
Community Reasoner
- Centralized Point to coordinate project services.
WP3

**Figure 8.1:** General Architecture of inSPICE from the perspective of the Narrative Game use case.

recurring components for different use cases that end up defining a proprietary library of UI elements for the view layer, facilitating the development of subsequent activities that present similar features to those included in existing templates.

### 8.2.2 Component-driven Design. Storybook

Before delving into details about the components themselves, however, it is useful to give a general idea of the workflow followed for the creation and design of the components at hand, which adopts a bottom-up strategy whereby we start from the particular use cases, and progressively adapt the tools designed to solve them so that they become more general-purpose components, and not just tailored to suit their original use cases. The workflow followed is thus activity (use case) driven, and can be summarized in the following steps:

1. For the considered activity, define its view layer requirements in terms of required components and the interaction between them, as well as the types of data with which the activity in question works.
2. Once the functional and component requirements are clear, identify which components from our collection could be used, after a potential functionality extension step, to represent those specified in step 1.

   Here we also consider the problem of "translation" of data types between activities: indeed, each activity may define different data types on potentially very similar entities (e.g. data types related to artworks, fundamentally identical between use cases save for subtle differences in naming and a few fields specific to each activity), so that the components that served to manage the view layer of an entity in a use case can often be extended to be able to support the new requirements induced by incorporating the new activity. Additionally, particular data types can be converted to a common data type that generalizes the others, by means of mapping functions defined to solve the problem of incompatibility between use cases.

3. After this identification step, implement from scratch those components that cannot be obtained as a generalization of other components in our catalog, and incorporate the necessary extensions in those that can be generated from the previous ones.

Since in practice the above process usually starts from some kind of mock-up or preliminary prototype interface that precedes development, the above steps can be adapted more concretely in the following sequence of stages:

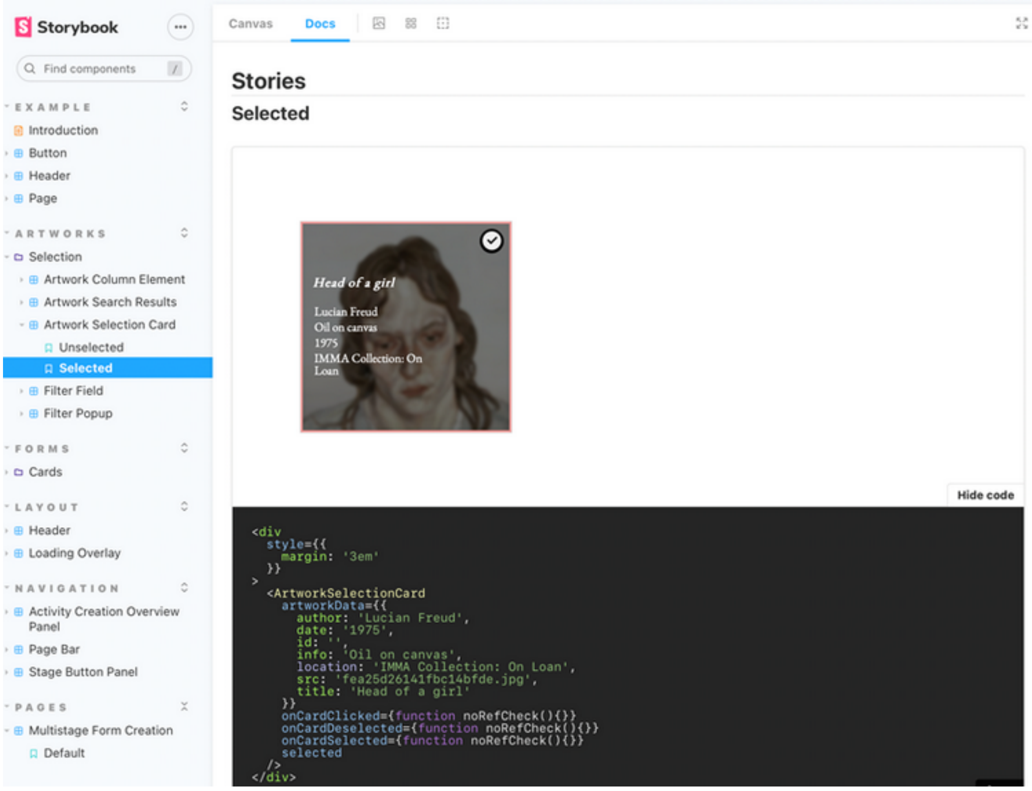
1. Create mock-ups that provide an overview of the workflow to be developed and the interfaces required within the template at hand.
2. Within these mock-ups, identify those elements for which it is possible to find a component that already exists within the current library and which, possibly after a generalization phase, could be used in the context described in the corresponding mock-up. As an example, if a mock-up makes use of an interface element that displays a thumbnail of an artwork along with its most important information, and there is already a general component within our library dedicated to rendering such thumbnails, except perhaps for some fields of interest, this can be generalized by adding the possibility of incorporating additional fields, and used to build the UI of the given mock-up.
3. For all those elements that do not seem to have a sufficiently similar component within the framework library, create new dedicated components and incorporate them into the project repository.
4. Once all the components needed to build the interface described in the mock-up are implemented, combine them into higher-order components (or “pages”), which should normally be independent of external data. By this we mean that the pages referred to in this step are limited to rendering content and exposing a series of callbacks in their props to notify their parent components of the various end-user interactions with the interface, but do not make any actual API calls themselves.

In order to isolate and simplify the generalization of existing components in point 2 and the development of new components in point 3 as much as possible, the project makes use of *Storybook*, an open source tool for building UI components and pages in isolation. In practice, this means that it is possible to test and visualize the different components in the library without the need to integrate them into any larger part of the application. This is convenient not only for development (the programmers/designers in charge of the creation of atomic components do not have to interact directly with the rest of the framework to know that their work is functional), but also for the distribution of the project, since it essentially acts as an interactive gallery of components that can be easily distributed to third parties to dynamically display the developed elements, and even provide code samples to exemplify their use. With this, Storybook also serves as UI documentation, additionally enabling the inclusion of illustrative notes and explanations based on the comments embedded in the code.

At the functional level, Storybook relies on the use of “stories”, defined as functions that return the rendered state of a component given a set of compatible props as a parameter. In practice, this means that each component that should be included in the Storybook catalog needs to at least expose a story to the framework that specifies how to render that component when it appears in the documentation. In general, most stories simply return an instance of the component at hand with a set of default parameters, but in higher-order components it may be necessary to provide additional mocking of services (e.g. stories concerning complete pages within the application), or of global contexts (theme, styles, language, etc.). An example of a story with auto-generated reference code can be found in figure 8.2, and the associated menu to dynamically interact with the different props that are passed to the component in figure 8.3.

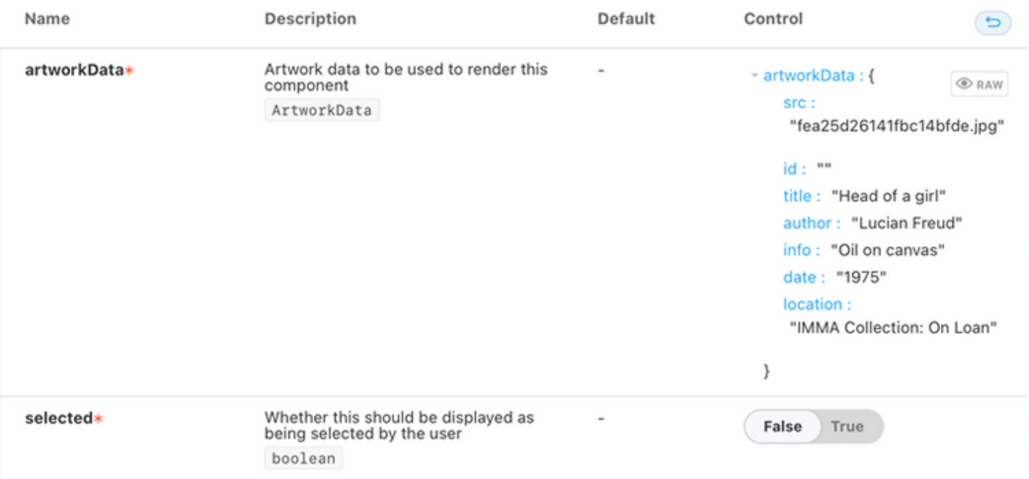
### 8.2.3 Handling of Services

As mentioned earlier, the application “pages” or “screens” associated with specific flows should be as isolated as possible from any type of logic that requires calling external services, so that it is possible to fully develop a complete interface with mocked data without the need to understand how this data is obtained or how the user’s actions translate into communication processes with the server.



```
<div
  style={{
    margin: '3em'
  }}
>
  <ArtworkSelectionCard
    artworkData={{
      author: 'Lucian Freud',
      date: '1975',
      id: '',
      info: 'Oil on canvas',
      location: 'IMMA Collection: On Loan',
      src: 'fea25d26141fbc14bfde.jpg',
      title: 'Head of a girl'
    }}
    onCardClicked={function noRefCheck(){}}
    onCardDeselected={function noRefCheck(){}}
    onCardSelected={function noRefCheck(){}}
    selected
  />
</div>
```

**Figure 8.2:** Story with auto-generated reference code in *Storybook*



| Name | Description | Default | Control |
|---|---|---|---|
| artworkData* | Artwork data to be used to render this component<br>ArtworkData | - | artworkData : {<br>src : "fea25d26141fbc14bfde.jpg"<br>id : ""<br>title : "Head of a girl"<br>author : "Lucian Freud"<br>info : "Oil on canvas"<br>date : "1975"<br>location : "IMMA Collection: On Loan"<br>} |
| selected* | Whether this should be displayed as being selected by the user<br>boolean | - | False True |

**Figure 8.3:** Property inspector and editor for a component in *Storybook*

As a result, all "screen" type components are usually divided into two nested parts: a parent element that manages the use logic of services and calls to external APIs, and a child element that receives the relevant data from the parent and uses it to render the interface, possibly calling a series of callback methods to notify the parent component of the user's actions. Upon receiving these actions, the parent component in charge of communicating with the services may trigger a series of API calls to submit information or update the data rendered in the child.

These components dedicated to encapsulate rendering elements and manage communication with services make use of their own hook, `useAsyncRequest`, to execute requests to external APIs from services. This hook is reused throughout the framework to centralize the asynchronous function triggering logic, and has a number of interesting properties that justify its use over the direct use of a service function within a `useEffect` hook:

- Every asynchronous request handled by the hook is wrapped in a union data type which can be seen below that allows specifying in which particular state the request is in. This is also convenient in that when the request ends up in a success or failure state, the result can be easily retrieved and assumed to be of the type specified when declaring the request function.

```
export type AsyncProgress<ResultType = any, ErrorType = any> =
  | { kind: ’idle’ }
  | { kind: ’running’ }
  | { kind: ’success’, result: ResultType }
  | { kind: ’failure’, reason: ErrorType }
  ;
```

  More specifically, the hook keeps an object adhering to the above type as its internal state, and updates it as the request progresses. This means that any change in that state triggers a re-rendering in a React component that makes use of the hook, allowing conditional renderings as in the following example:

```
const [fetchActivityArtworksStatus] =
useAsyncRequest(fetchActivityArtworks, []);
if (fetchActivityArtworksStatus.kind === ’running’) {
  return <LoadingOverlay message=’Fetching activity artworks’ />;
}

if (fetchActivityArtworksStatus.kind === ’failure’) {
  return <ErrorPanel message={‘There was an error when fetching the
                              activity artworks:
                              ${fetchActivityArtworksStatus.reason}
                              ‘} />;
}

// cache the value of our activityArtworks after they are fetched.
const artworks = fetchActivityArtworksStatus.result.data;

if (artworks !== undefined) {
  return (
    <GamGameUserFlow
      activityDefinition={activityDefinition}
      artworks={artworks}
      artworkCount={artworks.length}
    />
  );
}

return <ErrorPanel message=’Found no activity artworks’ />;
```

  This allows for a very exhaustive management of the different scenarios in which a call may derive, and to modify what is shown to the user in each situation in a conditional and declarative way.

- The hook supports a list of dependencies as a second parameter and re-executes the associated request each time these dependencies are modified. This is especially relevant if we are working with some type of page in which the content received from the services must change continuously throughout the life cycle of the component, for example with elements that make active use of pagination systems, or when we want to execute an asynchronous request conditioned to some variable belonging to the internal state of our page (for example, submitting template definitions to be stored in persistence, only when certain conditions over the state of the page are met). The most typical example with a search and pagination component would be:

```
// API Requests to fetch artworks and unique filtering fields
const [fetchDataStatus] = useAsyncRequest(fetchStepData, [page,
                                         itemsPerPage, appliedFilter]);
```

- Lastly, it is possible to make the request passed to the hook only be executed when a method acting as a trigger is explicitly called, which can be accessed from the array in which the hook is declared, as in the example below. Here, the request to perform a login attempt is only executed when the `triggerRequest` method is explicitly called from some point in the component definition.

```
    // Perform login request only after actively calling triggerRequest
    const [performLoginRequestStatus, triggerRequest] =
        useAsyncRequest(performLogin, [], false);
```

The vast majority of asynchronous requests used from this hook stem from the need to use functions belonging to template-structured services that connect to the corresponding endpoints within the inSPICE server layer. The services required by the application are initialized when it is launched for the first time, and from that moment on they can be accessed globally from any point of the application.

### 8.2.4 Global Contexts. Styling and Multi-language support

Another of the most important aspects to manage within the framework is the support for global configurations that allow defining both the language and the general style of a given part of the application. Indeed, each of the templates may wish to use a different visual style for the general-purpose components of the application, and additionally each museum may require its own style when deploying its own instance of inSPICE. On the other hand, the interface of a given template (and of the common parts of the framework) should be, in most cases, available in at least two different languages (the language of the country hosting the use case on which the template is based, in addition to English as the standard language), and again, the language options available could be specific to each of the independent instances of inSPICE.

In order to address the theming requirement, in the framework we make use of global contexts provided by `styled-components` (the library used to manage the project's styles). In summary, within the project there exists a component whose fundamental role is to act as a provider of a general theme context for all of its children (here context is interpreted in React terminology as a shared state to the component tree under the element that acts as provider), so that all components that use `styled-components` and are within the scope of this provider will have direct access to the theme variables.

The theme in question, i.e. the state that is shared with all the child components of the provider, has the following signature:

```
    interface IThemeContext {
      theme: keyof AvailableThemes;
      switchTheme: (theme: keyof AvailableThemes) => void;
    }


    export interface AvailableThemes {
      light: DefaultTheme;
      dark: DefaultTheme;
    };
```

where `AvailableThemes` is an interface that declares the themes supported in this given instance of the application (in this example, light and dark). `DefaultTheme` in turn is an interface that declares a series of properties to be defined for each of the specific themes to be added to the application (such as background color or fonts to be used for each type of text). The shared state object is basically composed of a key that specifies the identifier of the theme to be used within the available themes object, and a theme change function by means of which any child component is able to update the global configuration.

The theme provider itself can be seen in the code:

```
    const Theme: React.FC = ({ children }) => {
      const { theme } = useContext(ThemeContext);
      return (
        <ThemeProvider theme={themes[theme]}>
          <GlobalStyle />
          {children}
        </ThemeProvider>
      );
    };
```

where ThemeContext is a concrete React context created through a React.createContext call. On the other hand, the GlobalStyle element acts as a general style to be used throughout the application and serves as a base with global settings, which can later be overwritten by specific themes or styles. A usage example of these global themes from a particular component could be:

```
export const InputText = styled.input`
  font-size: 0.9em;
  font-weight: 200;
  font-family: ${props => props.theme.contentFont};
  line-height: 135%;
  width: 85%;
  margin-top: 0.2em;
  color: ${props => props.theme.textColor};
  border: none;
  border-bottom: 2px solid transparent;
  outline: none;
  padding: 2px 0;
  background-color: transparent;
  transition: all 0s;
`;
```

Here the access to the theming is done from props.theme, where styled-components injects the theme set in the Theme component shown above. The theme changes in the current version of the framework are performed through the Header component, where the switchTheme function is used to alternate between light and dark theme to exemplify the use of this functionality.

The approach used to manage the problem of languages and content internationalization is very similar to the one used in the case of global theming and styles, in that it essentially uses a component that exposes a global context with an object designed to manage the key-value mappings and translations for the language selected at the time, which its children can access whenever they need to. In this case, the provider is given by a component supplied by the react-i18next library, in charge of implementing the i18n internationalization mechanism within the application. The usage model for this context is, however, different from the approach used in the case of the styling. At the configuration level, it is first necessary to include key-value JSON files for each of the namespaces to be supported (in this particular case, one for the general elements of the application, and another for each template or activity to be implemented), and one for each language to be supported within that namespace. A fragment of such a file for the "gamGame" namespace, for English and Italian languages is shown here:

```
{ // gamGame/en.json
  ...
  "youreAboutToChooseArtwork": "You're about to choose {{artwork}} as your
   next artwork. Continue with this choice?",
  ...
}

{ // gamGame/it.json
  ...
  "youreAboutToChooseArtwork": "Hai scelto {{artwork}}. Continuare?",
  ...
}
```

Secondly, at the usage level, it is necessary to utilize the useTranslation hook from any component that wishes to access the internationalization services before being able to make use of the translation or language change functions. This hook must be declared with the name of the namespace on which to instantiate the relevant translation functions. On a practical level, a sample code for a component within the Narrative Game use case might look like:

```
    const { t } = useTranslation('gamGame');

    // returns interpolated translation in selected language
    const localisedText = t('youreAboutToChooseArtwork', { artwork: artwork.title });
```

As can be observed in the example, it is sufficient to call the function `t` obtained from the globally exposed internationalization hook to retrieve a string localized to the currently selected language. Note that this infrastructure also supports interpolation mechanisms, by means of which it is possible to include variables within localized strings, and even apply rules concerning gender, pluralization, etc.

## 8.3 Accesibility

Ensuring that a webapp is accessible is crucial and should be prioritized to enable all users, regardless of their physical, cognitive, or sensory abilities, to effectively and comfortably access, comprehend, and navigate the content. At inSpice, we recognize the importance of this matter and have taken proactive measures to implement inclusive design practices and adhere to the most stringent accessibility standards, such as compliance with the Web Content Accessibility Guidelines (WCAG).

### 8.3.1 WCAG standard for web apps

The WCAG standard represents a set of guidelines conceived by the Web Accessibility Initiative (WAI) belonging to the World Wide Web Consortium (W3C), whose purpose is to ensure the accessibility of online content for all people. The most recent version, WCAG 2.1, establishes three levels of compliance, these being: A (minimum), AA (recommended), and AAA (optimal), and the recommended AA accessibility level has been chosen to be integrated into this project.

In relation to the guidelines that have been implemented in the project, the following can be highlighted:

- **Text alternatives**: textual alternatives are provided for all non-textual content, such as images and videos, through the use of “alt” tags and detailed descriptions. This approach improves accessibility for people with visual impairments who use screen readers and facilitates content understanding for users with reading and learning difficulties.
- **Navigation and structure**: the webapp follows a logical and coherent content structure, using headers, lists, and semantic elements to simplify navigation through keyboard and screen readers. This makes it easier to access information in an organized and agile way.
- **Color contrast and font size**: minimum color contrast and font size requirements set at the AA compliance level are ensured, guaranteeing that content is readable for users with visual impairments. This aspect is of great importance as it facilitates text reading for users with low vision or color blindness and generally improves the readability of content on different devices and lighting conditions.
- **Screen reader compatibility**: the screen reader is an accessibility tool that enables people with visual disabilities to interact with a computer or mobile device. Essentially, it transforms screen content into text or voice, allowing blind or low vision users to access information and use the device’s functions. In this case, the webapp is compatible with popular screen readers, such as VoiceOver on iOS devices or TalkBack on Android devices, which has required the use of appropriate ARIA attributes and roles for proper implementation.

By applying these guidelines, greater accessibility has been achieved in the project, allowing a wider audience to access and enjoy the content and experience offered.

### 8.3.2 Accesibility and Usability in Visual Stories

As previously mentioned, the use case for the GAM Game is fully supported by the Visual Story activity template, which underwent multiple iterations to ensure the usability and accessibility of the application for the target user groups. Specifically, the GAM Game is largely aimed at deaf visitors to museum exhibitions, and therefore poses a challenge in terms of accessibility, requiring stricter compliance with regulations and extensive usability testing to ensure that the application meets the needs of the end user. The following are the most important points and conclusions reached during the various iterations of the system:

1. Whenever possible, simple visual elements in the form of strategically placed icons are preferred over text. A clear example is provided by interfaces where the user must specify their response to prompts such as "it makes me feel..." or "it reminds me of...," where the initial design featuring complete text on the prompt selection buttons was gradually replaced with progressively shorter labels, ultimately opting for easily recognizable icons for users. In the case of menus, such as the side navigation menu, each navigation keyword is always accompanied by a visual icon to reinforce understanding of the associated concept.
2. The application's texts should be as concise as possible to facilitate user understanding. One of the most frequently detected problems in the development iterations was that users had difficulty understanding the instructions written for the story generation phases in the GAM Game. After a more thorough analysis, it was found that, for this user profile, information should appear in the most condensed and clear form possible due to the special needs of the participants. This led to a rewriting of the texts in both English and Italian to reduce them to the minimum length that would allow the original message to be expressed.
3. The difference between enabled and disabled elements should be as evident as possible, applying strategies of contrast through colors, opacities, or shadows among others, and the same applies to distinguish interactable from non-interactable elements, or selected from non-selected ones.
4. To the extent possible, every time an instruction text mentions an application functionality, a hyperlink to the corresponding page or tool is included so that the user can be redirected to it by clicking on the text. Initially, the location of the different options was simply indicated with expressions such as "you can find the access to the collection in the side menu", whereas now each of these phrases is properly equipped with a clickable and appropriately labeled and underlined link to reduce frustration for those users with more difficulties finding them.

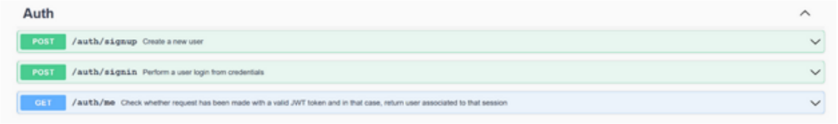
## 8.4 Interaction between Client and Server projects

Although we will not go into detail about the implementation or architecture of the inSPICE server, since it is a fairly standard backend from an architectural point of view, it is worth clarifying some considerations about its use, especially with regard to authentication and performance.

One of the major problems that arise when trying to access an API for which some kind of key or user authentication protocol is required from a JS-based frontend is that, if one wishes to be able to make the request from the web application itself, the keys to be used must be either supplied by the users themselves from the browser at some point in the flow (which could only be sensible if all users were administrators, but museum users need not have API keys to access the LDH), or set as compiler variables that are "saved" in the final code that is served to the client in the browser (which raises a security concern by essentially rendering these credentials public).

The simplest way to manage this problem is to delegate all the access logic to protected services, such as the LDH, to a dedicated server with its own credential management system and to issue access tokens to users who are properly authenticated within the application. Thus, all the API keys for access to protected services are kept secure within the backend of our application, and the frontend is restricted to making requests directly to this server every time it needs to access any of its functionalities, without compromising confidential keys.

In this context, some endpoints are publicly available to any user regardless of whether or not they are logged into the application (for instance, obtaining a list of artworks accessible from an activity is considered a publicly accessible query), while others are restricted to authenticated users (viewing content generated by the current user, uploading one' s own content, etc.). Any flow limited to authenticated users is locked behind a `GuardedRoute`, an auxiliary component that wraps any element that requires authentication and redirects the user to the login page if it is detected that they are not yet authenticated at rendering time. Additionally, the application exposes a global context intended to make the current user's authentication data (backend token, current user profile, etc) accessible, so that any component may retrieve this information when needed (e.g. to query user profile data in prompts). Some examples of inSPICE server endpoints, for authentication and Narrative Game related services, may be found in figures 8.4 and 8.5, respectively.



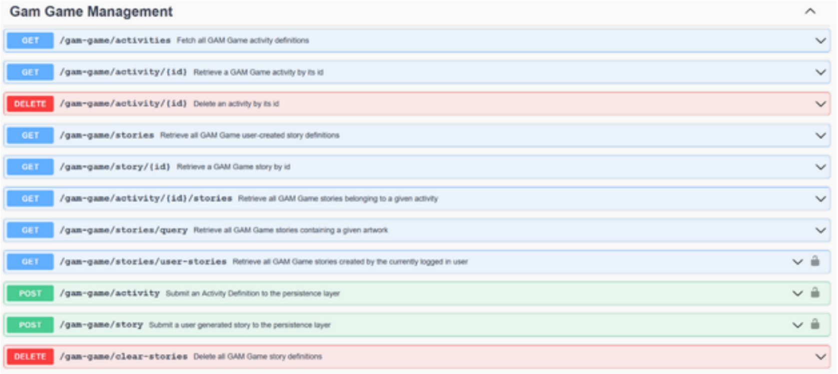
Auth

POST /auth/signup Create a new user

POST /auth/signin Perform a user login from credentials

GET /auth/me Check whether request has been made with a valid JWT token and in that case, return user associated to that session

**Figure 8.4:** Auth server-side endpoints.



Gam Game Management

GET /gam-game/activities Fetch all GAM Game activity definitions

GET /gam-game/activity/{id} Retrieve a GAM Game activity by its id

DELETE /gam-game/activity/{id} Delete an activity by its id

GET /gam-game/stories Retrieve all GAM Game user-created story definitions

GET /gam-game/story/{id} Retrieve a GAM Game story by id

GET /gam-game/activity/{id}/stories Retrieve all GAM Game stories belonging to a given activity

GET /gam-game/stories/query Retrieve all GAM Game stories containing a given artwork

GET /gam-game/stories/user-stories Retrieve all GAM Game stories created by the currently logged in user

POST /gam-game/activity Submit an Activity Definition to the persistence layer

POST /gam-game/story Submit a user generated story to the persistence layer

DELETE /gam-game/clear-stories Delete all GAM Game story definitions

**Figure 8.5:** Narrative Game server-side endpoints.

Authentication follows a user/password scheme, where the application makes the login request to the server with the credentials provided by the user and, if valid, receives a JWT token that can be used in subsequent requests to access protected services (and which is stored in the global context mentioned above). The user data, including the hash of the password set at registration, is kept in a MongoDB database managed by the same server, and is never included in the LDH, in order to keep this information as isolated as possible from the general data persistence. Entries in such a database must be kept consistent with entries in anonymized user profile collections in the LDH, using a common identifier in order to be able to access the information provided by that model when needed. An overview of the authentication process can be seen within the diagram in figure 8.6.

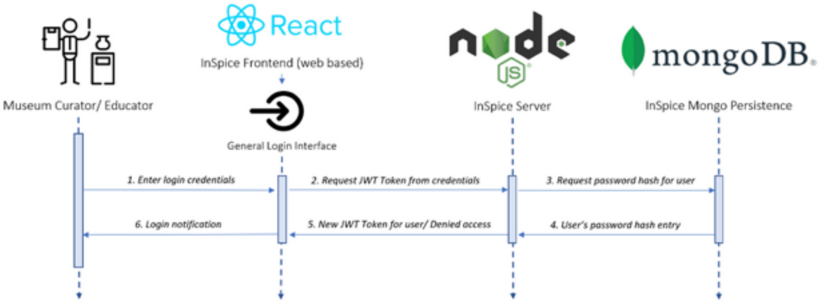
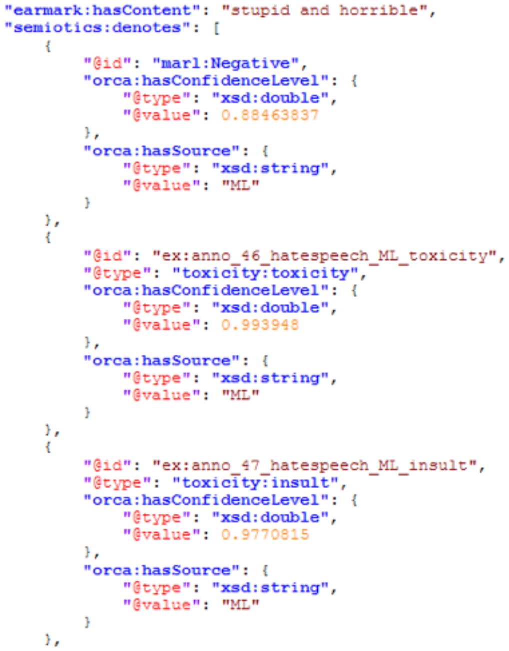

React
InSpice Frontend (web based)
mongoDB.
Museum Curator/ Educator
General Login Interface
InSpice Server
InSpice Mongo Persistence
1. Enter login credentials
2. Request JWT Token from credentials
3. Request password hash for user
6. Login notification
5. New JWT Token for user/ Denied access
4. User's password hash entry

**Figure 8.6:** Flow Diagram for the authentication process of inSPICE.

## 8.5 Linking to Community Models

Among the tasks assigned to WP3 (Modelling and Recommendation) is the development of tools to support the exploration of user interpretations of museum objects. One of these tools is the community modeler and visualizer of implicit communities in the user interaction data with the artifacts of the museums participating in the project, for which several demos have been presented in recent months to showcase its capabilities. Although we will not go into details about the operation of this tool, it should be noted that it has recently begun to be integrated into the framework for the visualization of communities generated from records of the linked data hub. The communication process between inSPICE and this tool can be described in the following fundamental steps:

1. The museum curator can request a visualization of implicit communities for one of the activities they have created, from an option enabled for this purpose in the inSPICE activity dashboard.
2. The inSPICE server receives the request, and proceeds to preprocess the data associated with the chosen activity before sending it to the community modeling server. The preparation of the data involves hydrating each LDH document associated with the requested activity with fields intended to represent the feelings and emotions triggered by each of the contributions included in the interaction. This step strongly depends on the structure of each type of contribution, requiring that a specific hydration process be written for each document schema to be transformed. As an example, in the case of the Narrative Game, user contributions are given in the form of stories that include fields for textual responses to prompts, emojis, tags, and the artwork itself used as building blocks of the narratives. For each of these pieces of information, it is possible to make use of the Semantic Annotator (SSA) developed by WP3 to extract a document via SPARQL with the information related to the elicited emotions, as can be seen in figure 8.7. In this example, the result of processing the user response "stupid and horrible" in relation to their perception of a work is labeled with high values in the categories of toxicity, insults and negativity, among other emotions that are not shown in the image. The joint result of applying this analysis to all parts of an interaction document is added as an additional field to it progressively during this step.

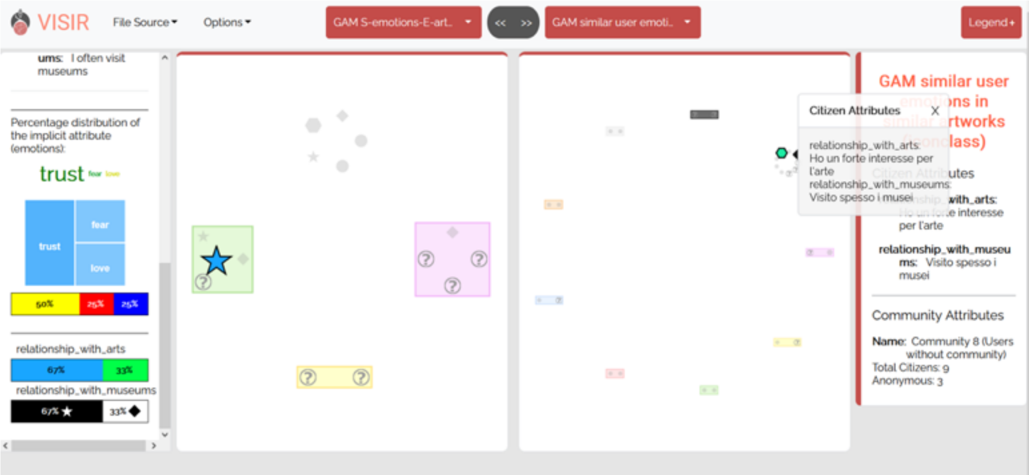


```
"earmark:hasContent": "stupid and horrible",
"semiotics:denotes": [
    {
        "@id": "marl:Negative",
        "orca:hasConfidenceLevel": {
            "@type": "xsd:double",
            "@value": 0.88463837
        },
        "orca:hasSource": {
            "@type": "xsd:string",
            "@value": "ML"
        }
    },
    {
        "@id": "ex:anno_46_hatespeech_ML_toxicity",
        "@type": "toxicity:toxicity",
        "orca:hasConfidenceLevel": {
            "@type": "xsd:double",
            "@value": 0.993948
        },
        "orca:hasSource": {
            "@type": "xsd:string",
            "@value": "ML"
        }
    },
    {
        "@id": "ex:anno_47_hatespeech_ML_insult",
        "@type": "toxicity:insult",
        "orca:hasConfidenceLevel": {
            "@type": "xsd:double",
            "@value": 0.9770815
        },
        "orca:hasSource": {
            "@type": "xsd:string",
            "@value": "ML"
        }
    },
```

**Figure 8.7:** Sample response from SSA to a text interaction "stupid and horrible".

3. The annotated data is sent to a dedicated Community Modeler endpoint, starting its processing. Since this is a computationally expensive task, the request returns a 303 code indicating that the result will be available for

display after a certain amount of time in a generated url. Once the generation is complete, the link becomes visible to the museum curator from inSPICE, resulting in an external visualization on the VISIR platform, similar to the one shown in figure 8.8.



ums: I often visit museums

Percentage distribution of the implicit attribute (emotions):

relationship_with_arts

relationship_with_museums

Citizen Attributes X

relationship_with_arts: Ho un forte interesse per l'arte
relationship_with_museums: Visito spesso i musei

GAM similar user emotions in similar artworks (iconclass)

Citizen Attributes

relationship_with_arts: Ho un forte interesse per l'arte

relationship_with_museums: Visito spesso i musei

Community Attributes

Name: Community 8 (Users without community)
Total Citizens: 9
Anonymous: 3

**Figure 8.8:** Community Modelling tool to visualize implicit communities in a Narrative Game activity.

# 9 Conclusions

This report presented the final deliverable of WP5 of the SPICE project, focusing on the interfaces for citizen curation activities developed in the project. It contains a description of the interfaces developed for the SPICE pilot applications, along with the community visualization tools that support reflection activities in those applications. VISIR, the community visualization tool is available for testing at https://gjimenezucm.github.io/SPICE-VISIR/ and the code is available open source at https://github.com/spice-h2020/VISIR.

The document also contains a description of the inSPICE system and its underlying framework, including the general architecture and common components of the inSPICE system, the specifics of the three main script families supported by inSPICE (visual stories, multistage forms and escape rooms) and a technical description of the underlying inSPICE framework. An inSPICE demo is available at http://spice.padaonegames.com, and the code is available open source at https://github.com/padaonegames/inspice along with its interactive documentation in Storybook format, in http://testspice.padaonegames.com/doc/index.html.

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