

# EDICULA

## Educational Digital Innovative Cultural heritage related Learning Activities

Project Code: 2020-1-EL01-KA203-079108



**NATIONAL  
TECHNICAL  
UNIVERSITY  
OF ATHENS**  
[GREECE]



**SAPIENZA  
UNIVERSITA DI  
ROMA**  
[ITALY]



**BEZALEL  
ACADEMY OF  
ARTS AND  
DESIGN**  
[ISRAEL]

**PerpetielSI  
SRL**

**PERPETIELSI  
SRL**

[ROMANIA]



**ISRAEL  
ANTIQUITIES  
AUTHORITY**

[ISRAEL]



**HELLENIC RESEARCH  
INSTITUTE OF THE  
ALEXANDRIAN  
CIVILIZATION**  
[GREECE]

INTELLECTUAL OUTPUT:  
DELIVERABLE:  
LEAD ORGANIZATION:  
DATE:

**O1 EDICULA EDUCATIONAL TOOLKIT**  
**D4.1 EDICULA Game Plots and Use Case Scenarios**  
PerpetielSI  
30 November 2021



Co-funded by the  
Erasmus+ Programme  
of the European Union





# EDICULA

Educational Digital Innovative Cultural  
heritage related Learning Activities

Co-funded by the  
Erasmus+ Programme  
of the European Union



## Table of contents:

1. Introduction .....	3
1.1 Background .....	3
1.2 Scope and Objective .....	3
2. Methodological approach for the Game Plots and Use Case Scenarios .....	3
3. Use Case Scenarios .....	5
3.1 Personas .....	6
4. EDICULA Game Plot .....	7
5. Conclusion .....	9
REFERENCES.....	10



# EDICULA

Educational Digital Innovative Cultural  
heritage related Learning Activities

Co-funded by the  
Erasmus+ Programme  
of the European Union



## 1. Introduction

### 1.1 Background

The EDICULA Digital Games Output (O4) of the EDICULA project aims to exploit all the semantic data and available content to create a realistic and immersive 3D virtual environment for “edutainment” (educational and entertainment) purposes by developing a serious game. In recent years, gamification methods in cultural spaces play an increasingly important role in order to draw the interest of more users to the archaeological places' websites and thus to make these archaeological sites known and possibly to increase physical visits to the sites themselves (Bampatzia et al., 2016). Technology and innovative tools like Virtual Reality (VR), Augmented Reality (AR) and Serious Games will lead people to recognize, appreciate, promote and enhance cultural heritage. There are several perspectives of defining serious games as seen from the academia and the industry and there is no single definition of the term “serious games”. However, it is widely accepted that a serious game in an educational setting is considered to be a purposeful learning environment that targets key curriculum areas for explicit learning. Serious games are games or game-like interactive systems developed with game technology and design principles for a primary purpose other than pure entertainment. Moreover, according to Mortara et al. serious games can provide player engagement by creating a fun experience for users while also supporting them to achieve learning objectives.

Advances in gaming technologies and 3D reconstruction techniques allow the real-time interactive visualization/simulation of realistic virtual heritage scenarios and environments, such as reconstructions of ancient sites and virtual museums simply by using basic consumer machines (such as mobile phones or personal computers) in situ (Laamarti et al., 2014). Although games for cultural heritage provide some cultural education, they mostly aim at supporting the preservation of artifacts and their reproduction. They also promote cultural awareness and allow for the appreciation of artifacts, archaeological sites and museums.

### 1.2 Scope and Objective

The EDICULA Digital Game will be developed to virtually transfer the user to the 3D environment of the Holy Edicule in Jerusalem and provide all the necessary information and knowledge about it and about the rehabilitation practices applied during its restoration in 2015-2017. It will include information about a wide range of thematic areas, relevant to the protection and rehabilitation of CH assets and specifically about the holistic rehabilitation practices applied at the Holy Edicule of Jerusalem. The variety, as well as the special issues involved in these areas, demands a close cooperation between the EDICULA partners, with NTUA as the leader organization of O1, to bring together valuable expertise, but more importantly to identify those thematic areas and the content that the EDICULA Digital Game will give prominence to. The main scope of the EDICULA Game is to attract the user and offer a realistic and appealing experience with both educational and entertaining elements.

All the information reported in the D4.1 deliverable will form a basis for the Game Plots and Use Case Scenarios of the EDICULA Digital Game development and implementation.

## 2. Methodological approach for the Game Plots and Use Case Scenarios

Based on the above, the careful design of the architecture and game plots of the Digital Game is the initial crucial step for its successful development. According to Laamarti et al's attempt to classify serious games by defining the characteristics that are important in their design and that have the potential to make a significant difference in the success of a serious game, these characteristics are (a) the activity, (b) the modality, (c) the interaction style, (d) the environment and (e) the application area.

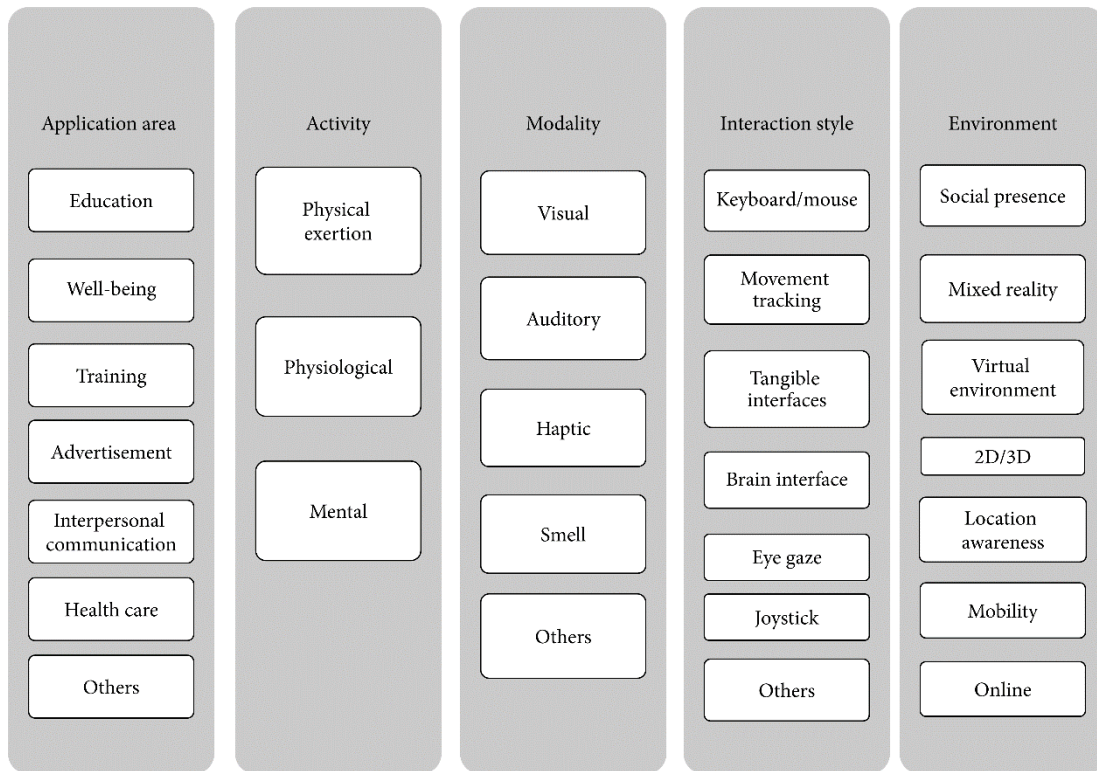


Figure 1: Taxonomy of serious games.

The application area of the EDICULA Digital Game is both the Education and Cultural Heritage, while the type of the activity performed by the player is definitely mental. Another aspect on the development of the digital game is the modality, which is the channel by which information is communicated from the device to user. The most common modalities include visual, auditory and haptic making the virtual environment, the storytelling and content of the game rather important for a successful game. The interaction style defines whether the interaction of the user with the game is done using traditional interfaces (inputs) such as keyboard, mouse or Joystick or using some intelligent interfaces such as a brain interface, eye gaze, movement tracking and tangible interfaces. Choosing the right interface during the serious game design has a great impact on the success of the game. For the development of the EDICUAL Digital Game traditional interface, like keyboard and mouse, will be used in order to make it accessible to a wider audience and more user friendly. In addition, the environment of the digital game can be a combination of several criteria such as 2D/3D, Virtual or mixed reality environment, location awareness, mobility, online and social presence. Finally, the application area refers to the different applications domains relevant to serious games. All these characteristics were taken into consideration for the game design and plots among with the available information and content for the virtual environment.

Becker K. (2009) is making focus on educational games, and it is suggested that, for them to be successful, their design has to take into consideration sound instructional models as already done, intentionally or not, in successful commercial games. The instructional model that was focused on is the nine events of instruction by Gagné et al. (1992). These are briefly the following:

- Gain attention
- Inform learners of the objective
- Stimulate recall of prior learning
- Present stimulus material



# EDICULA

Educational Digital Innovative Cultural  
heritage related Learning Activities

Co-funded by the  
Erasmus+ Programme  
of the European Union



- Provide learning guidance
- Elicit performance
- Provide feedback
- Assess performance
- Enhance retention and transfer

The above factors were not the only ones taken into account for the storytelling, the game plots and use case scenarios. The descriptive model for the use of games in cultural heritage, fully explained by Antoniou et al (2013), was also used here to describe the EDICULA game. The model is divided into three major categories: (a) game characteristics, (b) player characteristics and (c) organization characteristics.

The game characteristics include:

- the cognitive skills that the game tries to enhance,
- the learning objectives of the game which direct to the improvement of player's skills (i.e., knowledge, comprehension, application, analysis, synthesis, and/or evaluation, following Bloom's (1956) taxonomy of educational objectives,
- the numbers of players,
- the themes of games (e.g., adventure, strategy, action),
- the interaction mode (1st person, 3rd person, adaptive, etc.),
- the target audience (e.g. schools, families, adults),
- the game flow,
- the game play,
- the mechanics,
- the game aesthetics,
- the interface design and
- the technology (e.g., mobile, virtual reality, desktop).

As far as the player/visitor characteristics, these can be divided in situation/visit independent, such as personality factors (i.e., cognitive and learning style, age), and situation/visit dependent, such as visitor type factors (e.g., if the visitor is alone or in a group) and other situational factors (e.g., time of the day, tiredness levels, time constraints). The organization characteristics include (a) information about site/museum type (e.g., archaeological), (b) different organization characteristics and resources (e.g., personnel, budget), (c) the main goals set by the organization for the use of games and (d) the level of museumness. Museumness refers to visitors' perceptions on a certain physical or virtual space and whether this space forms a typical museum, archaeological site, monument or not. These perceptions influence the acceptance of different elements in those spaces including games.

### 3. Use Case Scenarios

EDICULA is an innovative approach that fuses the interdisciplinary collaboration among the sectors of applied sciences in the protection of monuments with humanities disciplines using XR technologies in order to develop an educational framework to advance scientific transdisciplinary synthesis and raise awareness, promote and enhance Cultural Heritage to a wider audience. The project aims to promote cooperation between universities and create immersive and interactive educational material. Moreover, EDICULA will reform the curricula of the postgraduate programs of the partners and develop the EDICULA Teachers' Course. According to the project's scope and objectives the EDICULA Digital Game addresses mostly to the



following users: (a) students from various fields of expertise, (b) teachers and professors, (c) researchers and (d) a wider audience.

In the following chapters the overall methodology to be followed in order to identify the EDICULA Digital Game user and their needs, according to which the game plot will be developed and the system requirements will be analyzed. For this reason, a persona will be used to define and represent a group of users to assist in the identification of their needs and system requirements.

## 3.1 Personas

### Student (Nicole)



- Graduate and/or Postgraduate Student
- Engineering/Applied Sciences
- Humanities
- Interested in Cultural Heritage, protection of monuments and rehabilitation methods/techniques
- Familiar with XR technologies and innovative tools
- Needs to have access to all the available information
- Test her skills and knowledge
- Catch her attention and keep her interested

### Professor (Smith)

- Professor at University
- Teaching Engineering/Applied Sciences/Humanities
- Field of expertise: Cultural Heritage
- Familiar with XR technologies and innovative tools
- Support edutainment as a teaching method
- Needs to have access to all the available information
- Responsible to keep available and up-to-date all the necessary information
- Responsible to test students' skills and knowledge
- Be able to change/improve the students' quiz games



### Researcher (Alice)



- Researcher at University
- Diploma/Master/PhD in Engineering/Applied Sciences/Humanities
- Field of expertise: Cultural Heritage
- Working at National/EU Research Projects
- Collaborating with multiple experts
- Familiar with XR technologies and innovative tools
- Needs to have access to all the available information





# EDICULA

Educational Digital Innovative Cultural  
heritage related Learning Activities

Co-funded by the  
Erasmus+ Programme  
of the European Union



## Active Citizen (Mark)

- Not an expert
- Interested in Cultural Heritage
- Interested in learning more about new, innovative methods applied in Cultural Heritage Rehabilitation
- More interested into historic information about monuments
- Not familiar with XR technologies and innovative tools
- Not able to travel a lot
- Willing to learn



## 4. EDICULA Game Plot

In a serious game context stories play an important role since they help to connect serious context with playing a fun game. By using narrations, the game designer is able to transport the “serious sense” behind the play, mostly an educational sense or training items (Kampa A. et al., 2016).

In order to form and design a serious game plot many different parameters should be taken into consideration such as the available content, the virtual environment, the type of users, their needs, the scope of the game, the post-processing effects, the rendering techniques, the storytelling, the annotated entities and environments, VR, AR, MR and AI techniques, etc.

The experience, knowledge, tools and methods from the emblematic Holy Sepulchre rehabilitation will be used as common base for the EDICULA Digital Game. The virtual environment will be formed by utilizing the available high resolution, textured 3D models of the Holy Edicule that were produced before and after the rehabilitation. Moreover, the 3D model of the Rotonda will be used to fully transfer the user into the virtual environment of Jerusalem. Furthermore, information in form of text and photos will be embedded into the virtual environment to help the user get familiar with the rehabilitation techniques, methods, innovative tools and the acquired knowledge.

The main idea is to develop a single player game consisting of multiple mini games so that the user decides what to do. The necessary information will be included into the virtual environment of the Holy Edicule both before and after the rehabilitation, presented as interactive, info points in a virtual tour. In addition, a virtual, digital classroom will be developed for the students, researchers, academic personnel and teachers to find out more about the rehabilitation process of the Holy Edicule. Finally, a quiz game will be developed based on the provided information to test the skills and acquired knowledge of the users. Below a first approach of the game’s activity diagram is presented in Figure 2. The user according to his/her needs will decide to take a virtual tour to the Holy Edicule and find out further information about it, have an intensive, digital class to acquire more, specialized details about it and/or test his/her skills by taking a quiz.

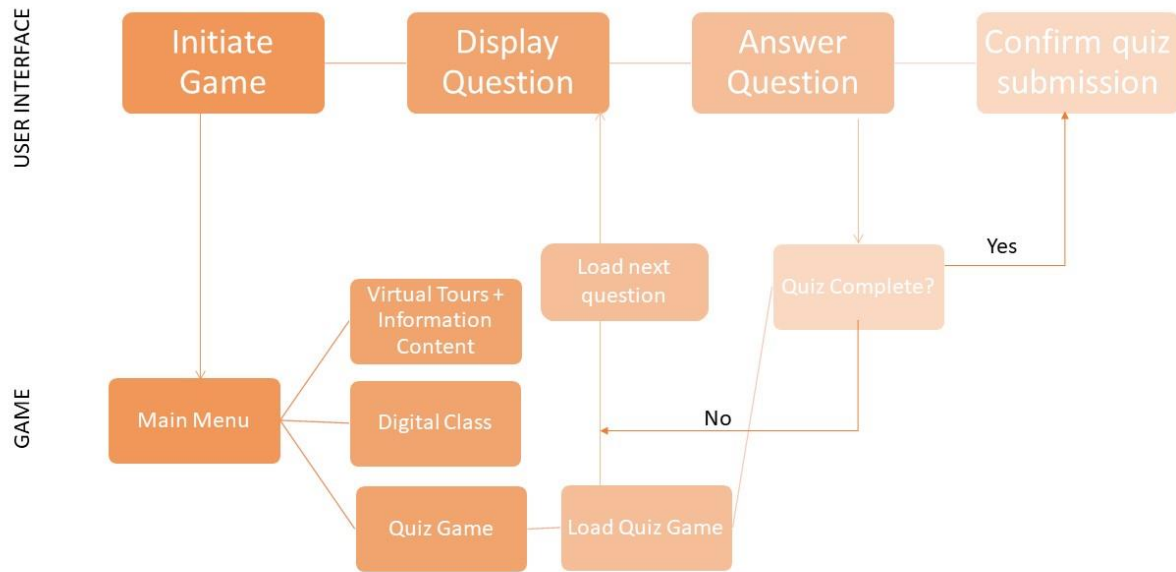


Figure 2: Activity Diagram of EDICULA Digital Game.

The descriptive model by Antoniou et al (2013) was used to summarize the EDICULA Digital Game and make the necessary decisions about the plot and technical characteristics of the game, player and organization that will present and distribute the game (Table 1).

			EDICULA GAME
Game Characteristics	Cognitive Skill	Observation	✓
		Reflection	
		Action	
	Learning objectives	Knowledge	✓
		Comprehension	✓
		Application	
		Analysis	
		Synthesis	
	Degree of complexity	Evaluation	
		Mini	✓
	Number of players	Complex	
		Single	✓
	Theme	Multiplayer	
		Strategy	
		Action	
		Adventure	
Shoot'm up			
Board			
Role			
Knowledge		✓	
Observingness	✓		
Mode	Interactive game		





# EDICULA

Educational Digital Innovative Cultural heritage related Learning Activities

Co-funded by the Erasmus+ Programme of the European Union



	Audience	All users	
		Specific target group	✓
	Game concept	EDICULA Serious Game	
	Game description	Consisting of multiple mini-games including virtual tours with info points, a digital classroom with further information about rehabilitation methods and a quiz game.	
	Scope	Education through entertainment in an interactive, contemporary and fun way	
	Mechanics	The rules that govern and guide the user's actions simply concern the movement and interaction during the virtual tours, as well as the interaction in the digital class, while during the quiz game the user simply has to pick an answer for each question.	
	User Interaction	1 <sup>st</sup> person	
	Technology	Online	
Desktop			✓
Mobile			
Player Characteristics	The players are described above in chapter 3.1		
Organization Characteristics	Level of museumness	High levels of museumness (Holy Edicule of Jerusalem)	
	Budget	Erasmus+ Programme EU Project / IKY	
	Demands on personnel	No demands of in situ personnel	

Table 1: Summary of EDICULA Game, using the descriptive model by Antoniou et al.

## 5. Conclusions

In this deliverable a first approach for the development of the EDICULA Digital Game was made. The aim of the deliverable was to identify the users of the game, their needs, the game requirements and the game plot. A brief description of the game, player and organization characteristics is included in the deliverable, while the mini-games are briefly described. The content and context of the game may be modified in the process according to the platform architecture, choices, equipment and available material.



# EDICULA

Educational Digital Innovative Cultural  
heritage related Learning Activities

Co-funded by the  
Erasmus+ Programme  
of the European Union



## REFERENCES

- Anderson, E., McLoughlin, L., Liarokapis, F., Peters, C., Petridis, P., Freitas, S. (2009). Serious Games in Cultural Heritage. 29-48.
- Antoniou, A., Lepouras, G., Bampatzia, S., Almpnouidi, H.: An approach for serious game development for cultural heritage. *J. Comput. Cult. Herit.* 6, 1–19 (2013).
- Bampatzia, S., Bourlacos, I., Antoniou, A., Vassilakis, C., Lepouras, G., & Wallace, M. (2016). Serious Games: Valuable Tools for Cultural Heritage. *GALA*.
- Becker, K., "Video game pedagogy: good games = good pedagogy," in *Games: Their Purpose and Potential in Education*, C. T. Miller, Ed., pp. 73–125, Springer, New York, NY, USA, 2008.
- Bloom, B.S.: Taxonomy of educational objectives: the classification of educational goals; Handbook I: Cognitive Domain. Longmans, Green, New York (1956).
- Gagné, R.M., Briggs, L.J., & W. W. Wager, *Principles of Instructional Design*, Harcourt Brace Jovanovich College, Fort Worth, Tex, USA, 4th edition, 1992.
- Kampa, A., Haake, S., Burelli, P. (2016). Storytelling in Serious Games. 10.1007/978-3-319-46152-6\_19.
- Laamarti, Fedwa & Eid, Mohamad & El Saddik, Abdulmotaleb. (2014). An Overview of Serious Games. *International Journal of Computer Games Technology*. 2014. 10.1155/2014/358152.
- Mortara, M., Catalano, C.E., Bellotti, F., Fiucci, G., Houry-Panchetti, M., Petridis, P.: Learning cultural heritage by serious games. *J. Comput. Cult. Herit.* 15, 318–325 (2014)