

New Fruition of Aegean Archaeology: A Board Game on Minoan Crete

CRISTIANA BARANDONI, University of Florence, Italy

ANNA MARGHERITA JASINK, University of Florence, Italy

ISABELLA VALINOTI, University of Florence, Italy

MUSINT and MUSINT II are part of a long-term project on Aegean and Cypriot collections from Italian Museums. MUSINT contains findings from the Archaeological Museum of Florence and other institutions in Tuscany. MUSINT II concerns the *cretulae* - i.e. small clay objects with the impression of a seal (sealing) - from Haghia Triada (Crete) stored in the Museum of Florence and in the "Luigi Pigorini" National Museum in Rome. One of the main aims of the project is to reach a wider audience: in MUSINT a small section was devoted to children and MUSINT II has been recently implemented with a special section entirely dedicated to games.

This paper focuses on the use of games preeminently inside -but also outside- classrooms as a new kind of educational resource. It turns out that games can be a valuable method in teaching Aegean archaeology. Different kinds of games (printed or digital) allow virtual visitors to get more deeply engaged and satisfied. At the same time the general needs of a better fruition of Aegean archaeological heritage will be achieved.

Although games can so far be found in many websites, they have never been concerned with Aegean archaeology. Indeed, this is a difficult and peculiar subject which needs specific games objectives. MUSINT may be the ideal platform to start with promoting the culture of game-based activities in this educational sector.

This contribution is particularly devoted on how dedicated board games can maximize the positive perception of archaeology. We worked to the creation of **MINOANS**, a board game on Knossos and Crete, mainly based on materials and games of MUSINT II. The island of Crete has been transformed into a platform where, acting and surveying, exploring and playing with ancient sites, new relationships between old findings and modern engagement are established.

Key words:

Aegean Civilizations, Communication, Educational, Gamification, Board Games, Primary School.

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INTRODUCTION

An improved communication of cultural heritage is an extremely important issue, especially if it targets younger generations. Significant approaches have been explored in this direction trying to take advantage of new digital technologies and, in particular, reports are available on application of "board games" and, specifically, of "serious games" and "gamification" dedicated to archaeological topics.¹ Although several games of these typologies have been created, like those presented in the Round Table on *The Application of Games, Immersive Environments and Role-Playing in Cultural Heritage* during the CHNT 2018, so far, they have never been concerned with Aegean archaeology.² Indeed, this is a difficult and peculiar subject which needs specific games objectives. The MUSINT and MUSINT II websites are part of a long-term project on Aegean and Cypriot collections from Italian Museums. MUSINT contains findings stored in the Archaeological Museum of Florence and other Institutions in Tuscany³, while MUSINT II is concerned with the seal's impressions (sealings) from HaghiaTriada (Crete) stored in the Museum of Florence and in the "Luigi Pigorini" National Museum in Rome⁴. The aim of the project is twofold, to offer useful up-to-date

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Authors addresses: Anna Margherita Jasink: email jasink@unifi.it; Isabella Valinoti: email ice9011@gmail.com; Cristiana Barandoni: cristiana.barandoni@gmail.com

1 [Deterding et al. 2011; Landers and Callan 2011; Wood and Reiners 2012; Robson et al. 2015; Fois 2015; Barandoni 2016; Feng et al. 2018]. See also the websites: <http://www.it-worx.education/gamification-in-education/>, <https://kids.tate.org.uk/games/>; <http://kids.tate.org.uk/games/memento-mori/>.

2 With the exclusion of the lecture by Cristiana Barandoni on "Games in Museums: a necessary evil?", which discusses also MINOANS.

3 Website <https://www.sagas.unifi.it/vp-429-musint-project.html>; [Jasink et al. 2011; Jasink et al.2012; Jasink 2013].

4 Website <https://www.sagas.unifi.it/vp-430-musint-ii-project.html>. [Jasink 2016; Jasink and Dionisio 2016; Jasink et al. 2017].

information and new research environments on specific Aegean topics to experts (scientific aspects)⁵ on one side and to reach a wider public with attractive educational aspects on the other. In MUSINT only a small section was actually devoted to children, while MUSINT II has been recently implemented with a special section entirely dedicated to young people, for whom games are particularly relevant (Fig. 1 and Fig. 2).

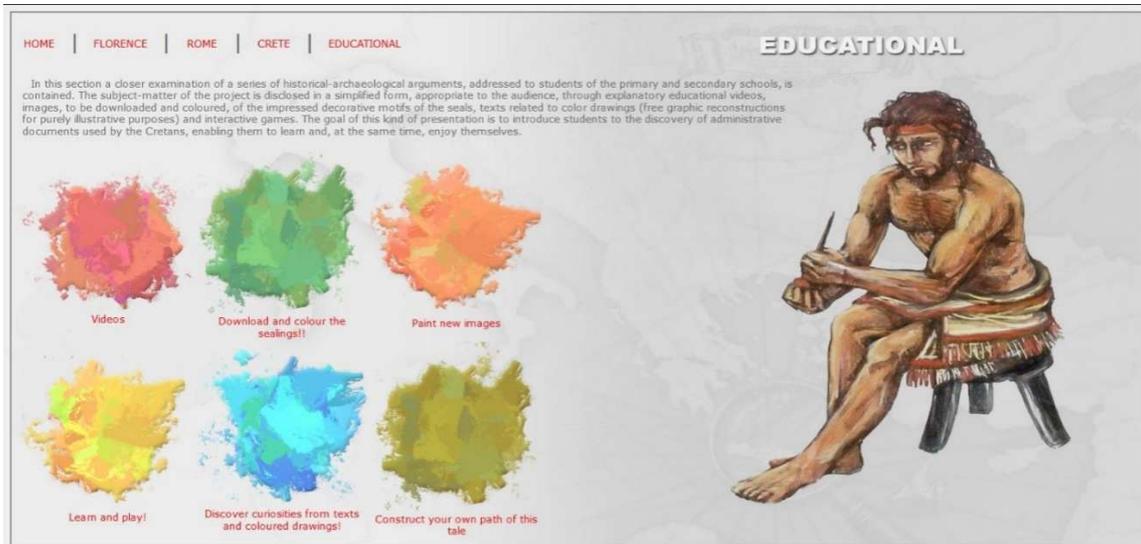


Fig. 1. Educational section of MUSINT II.

The educational sections of MUSINT and MUSINT II can be the ideal platform to promote the culture of games in archaeology and ancient history. In fact, the "game" we are going to present has been conceived starting exactly from the experiences of the interactive museums we have developed and are carrying on at the University of Florence.



Fig.2. Educational section of MUSINT II: Learn and play

(A. M. J.)

STRUCTURE OF THE MINOANS GAME

Within the communication strategies of museums, the role of games is becoming increasingly incisive, particularly in the planning of actions capable of involving an audience that normally, in the museum environment, does not find an

⁵For references to scientific aspects of the project see the works quoted in the two previous footnotes.

adequate response to its needs. The game, as a communication and training tool, on the one hand requires basic knowledge and reference contents and on the other hand increases the ability to rework specific topics in personal or original way. The idea of designing in our project a multilevel board game, to be used both in the classroom and individually, responds to our desire to spread the knowledge of the Aegean Archaeology more effectively, even outside the traditional didactic paths. **MINOANS** echoes the general suggestions of gamification and their potential in the museum environment and was designed with the specific purpose of creating a form of great simplicity to be immediately approached, in a way that is comprehensible and suitable for multiple users. For this reason, the choice fell on the board game usable both online and offline.

The approach to the game is very simple and friendly⁶. The number of players can vary in multiples of two up to ten. The board game is structured in the form of a chessboard, like the game "snakes and ladders", and consists of a unidirectional path (in circular or elliptical form) along fifty squares divided into three categories by color (blue, red, grey) and contents (Fig. 3). Each of the squares accompanies the players on a real journey to discover the island of Crete and the Minoan civilization, with the final aim of the journey to reach the labyrinth and kill the Minotaur. The players, individually or as a team, must pass a succession of checks, in the form of games or questions to be answered, to get to Knossos where the maze is located. Here the players have to overcome the last and most difficult check, after confronting themselves with those scattered all along the way.

To make the journey more realistic, a striking graphic editing was adopted, in imitation of a real treasure map with, in the upper right corner, a Compact Rose providing a basic geographical orientation. At the center of the panel is a silhouette that perfectly reproduces the territorial boundaries of the island of Crete on which the 50 boxes, stations of the journey, are in precise correspondence with the most important archaeological sites of the Minoan period. At the bottom right is a stylized image of the Minotaur⁷, the terrible enemy, while in the lower left a vessel in a stormy sea warns the players that the part of the sea voyage is the most difficult to face (see below for the travel rules). To move forward in the path, each player has a personal pawn and must throw the dice, proceeding clockwise for a number of squares equal to the result of the dice. The square slots are framed in different colors and correspond to specific purposes. The only non-square boxes, with the shape of a ship, are in the eastern part of the island and their function will be explained in a following section. Even the latter, like all the boxes, require the completion of some activities, only after which the player can advance in the path.



Fig. 3. The chessboard of **MINOANS**.

Since **MINOANS** is an essentially didactic resource, the progression of the game is somehow uniform (questions and answers, tests to be overcome, help boxes etc.). The motivation that drives players to move forward is guaranteed by the "reward", i.e. by the same mechanism to pass the tests. There is no prize as such but only the possibility to advance avoiding the risk of being expelled from the game. Players must avoid making more than five mistakes. The possibility of collecting advantages is part of the dynamics of the game. However, there is no value associated with the score but only the possibility of proceeding further, without being eliminated. The implicitly induced sensation is that of trying to

⁶ Concept and technical structure of the game are by Cristiana Barandoni.

⁷Minotaur figure has been designed by Panaiotis Kruklidis for introducing young people to MUSINT.

do the best without making mistakes, with an incentive to achieve the goal (with educational and behavioral implications).

The involvement of the players is further encouraged by an element of discontinuity, which occurs approximately one-half of the way (between boxes 30 and 42). The new mission of the player at box 30 is to continue the journey to Knossos by sea and navigation can only be done with **MINOANS Memory**. The player needs not to fight to unlock levels and/or objectives or win prizes to take advantages: the challenge itself is the overcoming of the game. **MINOANS Memory** is familiar and recognizable by some graphic changes on the scoreboard: squares become ships, filled with a deliberately neutral pattern (as for type and function these boxes belong to the grey typology) without any image inside them, to avoid any form of distraction due to a different form of the box, a difference that in any case creates a diversion from the main game. Despite these pull-outs, there is no loss of reference or context because of the choice made. In fact, taking into consideration the need to avoid players to feel lost, we decided to interrupt three times the sea travel by inserting three red boxes (31-33-41) that perform the function of landing (a sort of provisional stop). This section represents a complementary level which we overcome by introducing a well-known game, "Memory"⁸, whose standard rules are used only re-elaborated ex-novo. Once the players reach the grey box with the first boat (number 30), **MINOANS Memory** begins. The deck of 100 double cards is divided into two packs of 50 pairs; deck ONE is placed on the table, deck TWO is used to create the pairs. From deck ONE 10 cards are arranged face-up, while the others are face-down, thus creating a chessboard. The first player (or team) must take two cards from deck TWO and must attempt to compose pairs. Each time a pair is formed, the player advances his pawn and the pair is removed from the table. Otherwise, the cards are put back on the table and the turn passes to the next player (or team). The greater the number of couples found, the faster the journey by sea. It is evident that, for players arrived later, forming pairs is easier because a percentage of cards has already been discovered. Once all the pairs have already been discovered, the players will continue by simply rolling the dice.

(C. B.)

GRAPHICS⁹ AND CONTENTS OF THE GAME

Pawns and dice

The MUSINT II interactive website was welcomed with great success by young people. In particular, primary school students have developed a great interest in the Aegean civilizations exploring Bronze Age Crete with the help of some characters that act as leading actors of a story-telling presented in MUSINT II. These characters have been turned into pawns in the game. These pawns - drawn by Panaiotis Krukliadis - are two little girls, BriBri and Zuzù, the Lord of the Palace, the Secretary, the Lady and a young boy named Pim (Fig.4). All the characters are represented with faces and clothes appropriate for the Minoan society, with a detailed elaboration. The prototypes of the pawns are made of plastic with a 3-D printer for the board game while, in the online version of the game, they will be virtual characters.



Fig.4. Zuzù, BriBri, The Lord of the Palace, The secretary, The Lady and Pim

In the offline board game two dice are rolled together giving a maximum score of 12 (Fig. 5). In the online version of the game the dice will be substituted by random numbers from 1 to 12 inserted in a virtual interface. To generate random numbers, a pseudo casual number generator will be used. The generator is initialized within few milliseconds since the start of the machine, and this guarantees a fairly random sequence of launches (Fig.6).

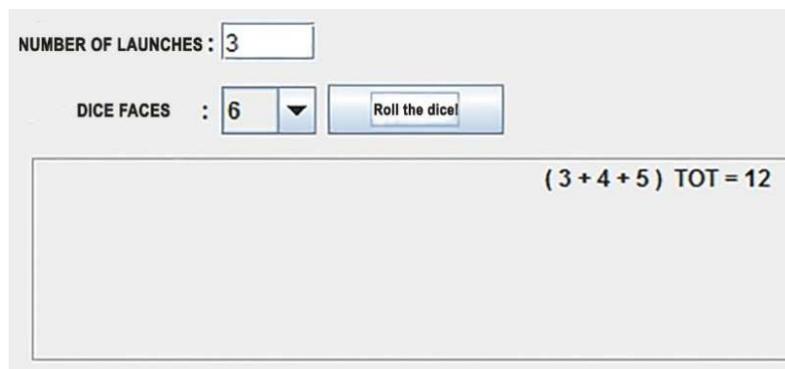
⁸ [Angiolino and Sidoti 2010, p. 613]

⁹The graphics and illustrations of the game, for both the squares and the cards, have been created by Isabella Valinoti and edited with the drawing software Photoshop, Gimp and Clip Studio Paint.

Fig. 5. Physical game dice.



Fig. 6. An example of virtual dice.



The role of the squares

In **MINOANS** there are three types of squares (apart from the small category of ships) distributed in various percentages so as to avoid moments of pause and always be stimulating. To respect the decidedly didactic character of **MINOANS**, the boxes are organized according to careful pedagogical evaluations. Specifically, each box has been designed to create on one side a theoretical network that supports the idea of fun through game and to satisfy the requirement of high-profile content on the other. The division into three types of squares corresponds to three different processing modes required to the players.

The red boxes (the choice of color is not unintentional) represent the "difficulty" to overcome and the cognitive component of the game. They are characterized by an identifying image of a site or an archaeological find that refers to its location. A small symbol (grain spike or double axe) is placed at the top right, depending on the test to be overcome using the red cards. The grain spike indicates that the player must answer a multiple-choice question (of increasing difficulty with the progress of the game) while the double axe includes a series of alternative games. The board game therefore involves the triggering of a competition among users with the aim of developing skills to decide, individually or in groups. These boxes give access to a specific section of games with exclusively scientific content and have been conceived with the purpose of providing an educational background as a basis for the scholastic path.

The squares with the blue border are completely different and contain a QR CODE through which the players can access a digital content that reports to the MUSINT website.¹⁰ Thanks to this stratagem **MINOANS** discloses its digital component. The QR allows the player to move virtually off the board and freely access, through an internet connection, educational videos uploaded to the AegeanLab DBAS site and even to specific 3D models of all the artefacts uploaded on Sketchfab and belonging to the Florentine and Roman collections ((National Archaeological Museum of Florence and National Prehistoric Ethnographic Museum Luigi Pigorini).¹¹

Finally, the grey boxes, called *neutral*, are divided into two sections. The first section (the land route) is composed of square boxes, identical to the others but bordered in grey, with an inside image, consisting of seal's impressions, in a stylized form, and all different one from the other, to be used with the "Layar application", freely downloadable through Google Play¹² on a smartphone or tablet. These boxes, like the blue ones, give access to specific digital contents created ad hoc, such as galleries of photographs or texts of historical-archaeological content. The second section of these boxes, in the form of ships, begins where the journey by land is interrupted and the one by sea begins, and the attempt is to try to simulate the maritime activities of Minoans. Changing the shapes from squares to ships is an attempt to make the experience as realistic as possible. When the game is used in a virtual way, players will be able to interact with these ships using them like in a real navigation. To proceed with the journey, players must still use the **MINOANS memory** game.

¹⁰Website <https://www.sagas.unifi.it/vp-430-musint-ii-project.html>.

¹¹The DBAS web-site (<https://www.sagas.unifi.it/cmpro-v-p-376.html>) is a wider container in which also MUSINT, MUSINT II and MINOANS are enclosed and is managed by the data processing laboratory of Aegean Civilizations (@egeanLab) of the University of Florence. A DBAS section is defined as "Educational" and contains lessons for both University and primary school's students. Exactly these latter lessons, changed into video and pdf, are part of the contents of the blue squares.

¹²<https://play.google.com/store/apps/details?id=com.layar&hl=it>.

The “proof/red” cards

This category of cards is divided into two groups, the "question cards" and the "game cards".

The "question cards", in the number of 50, have a kind of spike¹³ on one of the faces (face A) while the other (face B), initially hidden to the player, contains a multiple-choice question, different for each card (Fig. 7). The fifty questions are concerned with the Minoan history, the script (Hieroglyphics, Linear A and Linear B), the geography of the island and the main archaeological sites. The player selects a card and, once face B is discovered, chooses the answer. In the online version of the game the correct answers give a score that is automatically summed up.

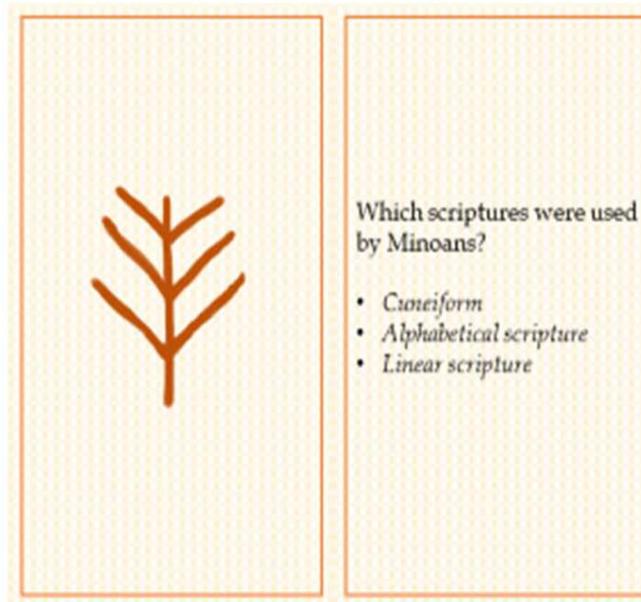


Fig. 7. Example of a “Question card”, face A and B.

The "game cards", in turn, have a double axe on the outer face A while the internal face B shows a game that the player must perform to pass the test (Fig. 8). The games are of five different types: puzzles, to be completed either offline or online (Figs 9,10); a story to be completed; crosswords; labyrinths; word search games (Fig. 11).



Fig. 8. Example of a “game card”, face A and B.

Fig. 9. Puzzle playable offline.

¹³ It is similar to the so-called "tree with ascending branches", a Cretan Hieroglyphic sign.

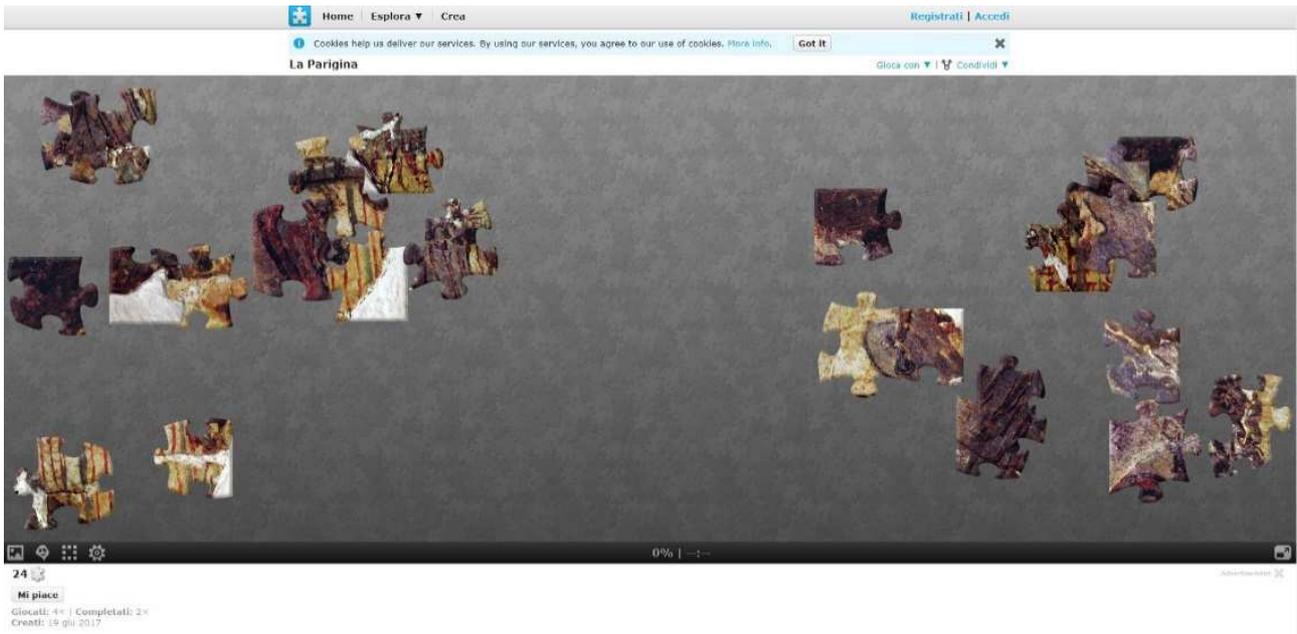


Fig. 10. Puzzle playable online with a timer.

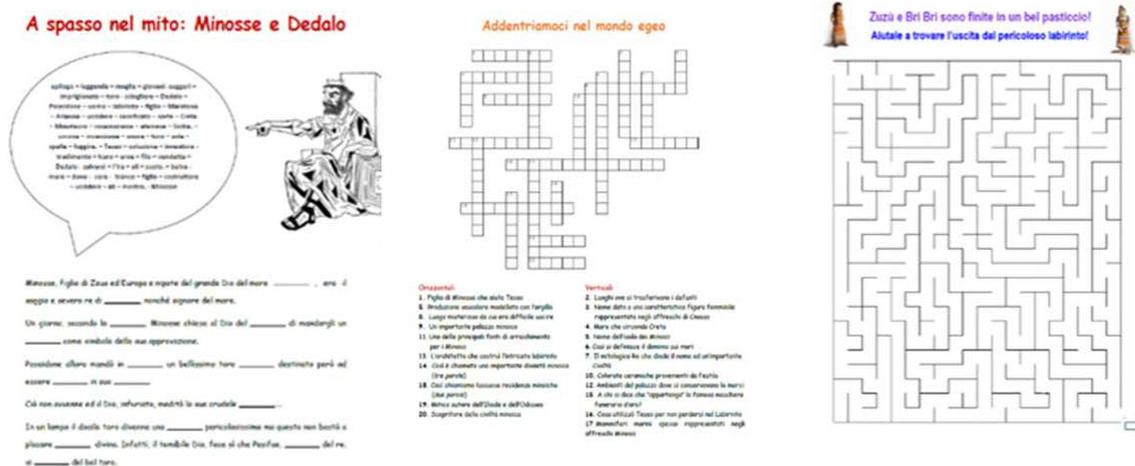


Fig. 11. Others examples of offline games played in Italian schools.

(I. V.)

“Neutral squares” and their contents

The so-called "neutral squares", already referred to in a previous paragraph and represented by ten different seal's impressions (Fig. 12) and colored in grey, are a necessary guide to allow the player to answer the questions contained in the "red cards", unless he already has a knowledge of the fundamental elements of the history of Minoan Crete. Each of the "neutral square" is an element of a specific aspect of this civilization and its content, which appears directly in the "Layar" application,¹⁴ can still be accessed through a link to the MUSINT and MUSINT II websites. For example, there are pages that describe, albeit briefly, a period in the history of Minoan civilization, from Prehistory to the post-palatial period (Fig. 13), or the site of Haghia Triada, its discovery by Italian archaeologists, and among these the most important figures, or even objects visible in Italian museums. Some pages are then specifically dedicated to young people, such as the one about the famous myth of "Minos and the Labyrinth", although they can be a guide for everyone.

¹⁴Alternatively, Hi-code App may be used instead of the Layar application.



Fig. 12. Neutral squares.

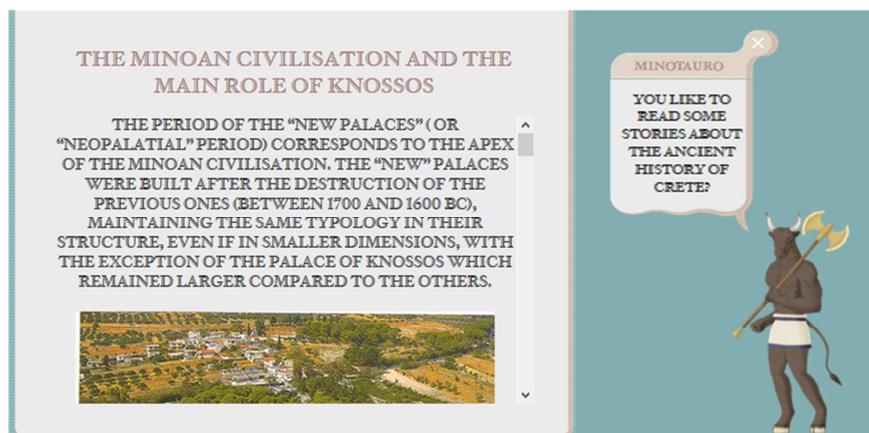


Fig. 13. Neopalatial period in Crete.

(A. M. J.)

The “memory” cards

The memory game, designed only for the off-line version of MINOANS, has been, for a long time, a favored game for generations. Easy to play even for young kids, it requires only the spirit of observation, concentration and memory.

The game requires:

- A standard deck of playing cards.
- Two or more players
- A playing surface large enough to lay down all the cards.

The memory cards, in the number of 100 (50 couples), represent places, script signs (Hieroglyphics and Linear A and B), frescoes, seals and ceramics of the Minoan period (Fig. 14). The game starts when the players take the boat to go on the second part of the travel. When they find a pair of equal images, they move one step and go on with the game.

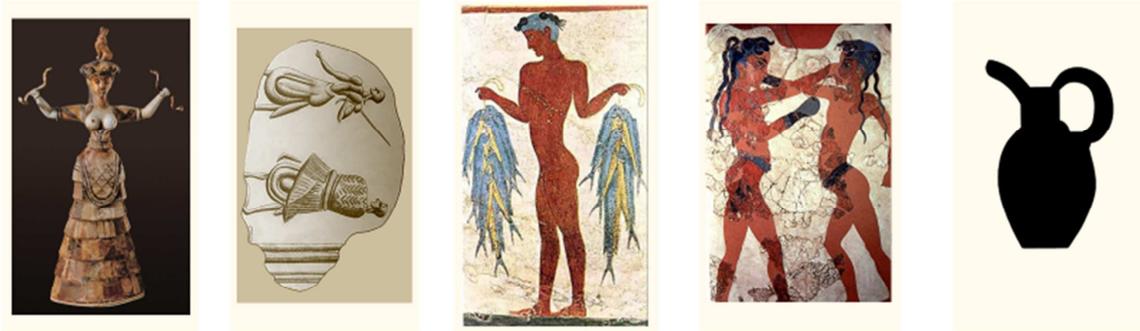


Fig. 14. Examples of "Memory cards"(the same image is represented on two cards).

(I. V.)

MINOANS IMPACT ON USERS: ON-LINE VS OFF-LINE VERSIONS

As repeatedly stressed, **MINOANS** is a board game with various facets implemented in both the on-line and off-line version and conceived as an easily comprehensible game suitable for multiple users. Both versions can be used individually or in groups. Certainly, the use in groups can be preferable because, provoking a moderate competitiveness, it stimulates the desire to learn the material in addition to familiarize the pupils with a group work. The online version is more suitable for individual use as a study tool. The practical use of the game in the course of 2018 confirmed the possibility of its variegated use in different contexts.

The on-line version of **MINOANS** can be used directly through links to MUSINT and alternatively, in some cases, using the mobile phones "Layar application" and QR code. In all the applications experimented in a primary school class the game was enthusiastically welcomed by the pupils. It was then reported that some of the students repeated the game with family members. In the on-line version **MINOANS** is fully prepared for use and, also with a modest knowledge on the Aegean civilizations, the game can be easily played by using information accessible through the MUSINT link, as described above.

The off-line version of **MINOANS** requires the activation of cards and boards which have already been prepared by our group but can also be created directly by the users. This was the case with an experiment done in another class. The students had fun redesigning the characters of players (pawns) and the images on the cards and cutting out the cards. In this case the game becomes more "creative" and therefore the participation of the students becomes more active. It has again been reported that the involved students have done some creations at home, making their parents participate. Thus conceived, **MINOANS** becomes a school heritage and can be re-elaborated year after year.

It is interesting to remark that the game was also experimented with university students and that even in this case the results were extremely positive.

The complex of the experiments on **MINOANS** made in the two primary school classes has allowed to bring out the aspects of the Cretan civilization that, during the execution of the games and the answers to the quizzes, aroused greater interest or curiosity in the students, striking their imagination. Among these we can mention, for example, the role of the female figure in society (thus creating cards and puzzles with female images like "La Parisienne"); or the games practiced by the Minoans (like the "bull leaping" or "boxing"), or the presence of fantastic creatures (the bird-lady, the Minoan genius, the griffin, and others) and, finally, the interest in jewelry and for weapons.

(A. M. J.)

RESULTS AND DISCUSSION

MINOANS is an online and offline game based on the convergence of playful and educational aspects. In the authors' purpose, the young user, moving from one square to another during the journey to Knossos, covering the whole island of Crete, looking at fragments of Minoan archeology and history and objects or symbols of Cretan writing, ends up learning many significant aspects of this ancient civilization almost without realizing it. The general aim of **MINOANS**, as well as of other forms of game or story telling developed in our general project, is to make learning and knowledge of a piece of cultural heritage, generally little known and not particularly treated at primary and secondary school level, easier and more enjoyable. To this purpose, the cards, which are wholly based on Cretan objects (paintings, vases, script-signs, etc.), are attractive, and the same can be said of the pawns, which represents characters like the real ones in Minoan Crete. The spike and the double axe used for the "proof/red cards" have been chosen as representatives of very important signs in Minoan scriptures. The questions and other games are a fun way to learn a piece of history that is not much considered in school textbooks. The links between **MINOANS** and the **MUSINT**

project are obviously very tight and the game may be played only starting from the information given in the interactive museums. In addition, one may expect that the curiosity of the players incites them, once the game has been completed, to become interested in the geography of Crete, in the various sites visited during the travel, in the Minoan art and religion, and so on.

If the purpose of gamification in the communication of archeology appears to be well founded theoretically, it is the verification of its effectiveness on the field which constitutes its concrete justification. The reception of the game among the students was extremely good. This was not a simple or superficial feeling but it was a concrete result of the evaluation by the group of teachers of the school completely independent from the authors of this project, evaluation that had a quantitative counterpart in the credits assigned to the students. The validity of this approach lies in the *in itinere* experimentation of the method that allows, on the basis of the direct experience and suggestions of the students, to correct, improve or implement the various aspects of the game. The repetition of the game with several classes and for several successive years will certainly make it possible to establish also a long-term statistical evaluation. However, since this is a teaching problem for very young students, it is crucial that aspects to be corrected or improved in the method are identified *in itinere* rather through a long-term statistic in which the users are considered rather passive instruments of the survey.

As we have repeatedly noted, MINOANS is a component of a larger project that includes the interactive museums MUSINT and MUSINT II. The University of Florence has drawn up an official agreement with a primary school in the province (the primary school in the municipality of Montelupo Fiorentino). The agreement provides that a group of university members annually conducts, in strict collaboration with the teachers of the school, a series of interactive lessons on the Aegean Civilizations for one or more classes of the school with the digital tools described in this work and contained in the MUSINT and MUSINT II websites. The participation of the students was enthusiastic and the parents urged the extension of the initiative from the experimental class of the first attempt to other classes of the school. Particular attention was indeed paid to the active participation of students. For this reason, at the end of the school year a general meeting of the school was organized in which all the students, teachers and parents of the students participate. The participants are of the order of 300. During the meeting the students, in groups of 4 or 5, present their works on what has been learned in the form of posters, short compositions with illustrative drawings, even of a certain complexity, showing not only to have learned the fundamental characteristics of the Minoan civilization but also demonstrating a significant expressive originality. The interest aroused in the students was then concretely demonstrated during visits that were organized in the Archaeological Museum of Florence where the students were able to admire the physical objects with which they had a virtual familiarity. A non-secondary effect of experimentation has been a form of digital education that has been developed by the pupils.

(C. B., A. M. J., I. V)

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