

# Archaeological museums as environments of informal and non-formal science and technological education

The case of Educative Islets

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*Abstract— This article proposes an innovative museographic solution, the “Educative Islet”, which aims to insert Natural Sciences and Technology (NST) elements into an archaeological museum environment. More specifically, it attempts to present the theoretical framework and methodological tools for its design giving an example based on a specific exhibit of the Archaeological Museum of Thebes, as part of a research for further development and evaluation.*

*Index Terms* archaeological museum, didactics of natural sciences, museographic transposition, educative islet, interdisciplinary

## I. INTRODUCTION

Museums in the 21st century increasingly tend to enrich their role. Examining the museums in the modern competitive age of the 21st century, one finds the effort to be transformed into wider cultural, research, educational and entertaining institutions, linked to the community and financially independent, aimed at upgrading the experience [1]. Museum pluralism at the level of architecture, administration and operation reveals the symbolic character and the social dimension of the mission of the museums, beyond the traditional obligations of conservation, validation and enrichment of the cultural heritage [2].

Taking into consideration the international and especially the European circumstances in terms of an interest's turn towards alternative ways of cultural heritage promotion, in combination with the fact that archaeological museums are already contributing to a powerful international Greek brand name, examining them from the Natural Sciences and Technology (NST) point of view broadens the knowledge spectrum that derives from the museum environment and makes them a tool of multiple readings.

## II. ARCHAEOLOGICAL MUSEUMS AND NATURAL SCIENCES

The archaeological museum can function as an attractive and intimate setting, as a motive for fields of knowledge of NST beyond the narrow traditional boundaries of History and Archeology [3]. NST are able to be in the spotlight, not in terms of a secondary role, but supplementary, for the reconstitution or the promotion of the historical identity of a historical period (in our case of the ancient Greek culture period), that also projects themselves on today's world, of a region or a community. Dealing with notions of natural sciences through the archaeological exhibits and in general the environment of an archaeological museum and its collections can bring more immediate results, since the objects offer visual and tactile stimuli from the material culture of the past, which can act as a more intimate beginning.

But how could we create "bridges" between fields that at first sight seem to have enormous epistemological and cultural differences? We believe that education, and in particular its interdisciplinary dimension, can offer solutions to the museum environment. Many museum workers (especially those in the education department) see museum exhibitions primarily as a method of education. For many museologists, museum exhibitions are educational, and it is always useful to consider the educative value of any exhibition as one important criterion for its success [4]. It has also been pointed out that the appropriate design of a multisensory, educational environment contributes to the building of critical thinking, to the equipment of the public, including children who are the future adults, with analysis and interpretation tools of a complex world, with tools of understanding the past and the present [5], so that they could contribute to scientific culture formation too [6].

This article proposes an innovative museographic solution, the “Educative Islet”, which aims to insert NST elements into an archaeological museum environment.

More specifically, it attempts to present the theoretical framework and methodological tools for its design giving an example based on a specific exhibit of the Archaeological Museum of Thebes, as part of a research for further development and evaluation. We thus exploit the use of the methodological tools of formal education, in the museographic design of an interpretative framework of a museum exhibit, in order to teach the concepts of natural sciences.

### III. THE CONCEPT OF THE EDUCATIVE ISLETS IN THE MUSEUM

*Educative islet* is a movable structure that creates a temporarily interdisciplinary educational micro-environment, designed around a specific archaeological exhibit, providing multisensory educational tools for acquiring scientific knowledge. It may contribute to scientific culture formation and to the building of critical thinking, with analysis and interpretation tools of a complex world, with tools of understanding the past and the present.

The educative islet extends the concept of star exhibits. Exhibitions can be arranged predominantly around outstanding objects when the exhibitor wishes to engage visitors with star exhibits before drawing their attention to less immediately striking ones (Fig.1). Star exhibits have a dual role: they enliven the areas around them, and also tend to draw visitors through a gallery and create a sense of expectation throughout the journey [4].

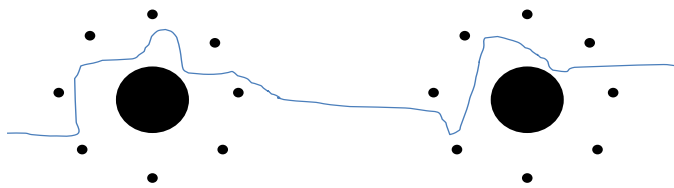


Fig 1. *Educative islet as a star exhibit and the movement of the visitors.*

The portability of the assembled educative islet allows for the proper configuration of the area around the exhibit to cover the needs of the group during the visit to the museum space without requiring re-designing of the whole exhibition with new permanent museographic intervention and without excluding a more abstract or other kind of interpretive framework for adult audiences. The term "islet" is inspired by the "îlot de rationalité" concept introduced by Gerard Fourez to describe the idea of a degree of knowledge in the midst of an ocean of ignorance within formal education [8].

For the design of the educative islets it is required the implication and the scientific osmosis of three theoretical fields: (a) of Museology, (b) of Science Communication, and (c) of Didactics of Natural Sciences (fig 2).

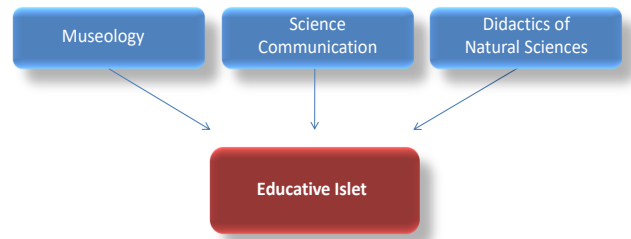


Fig 2. *Theoretical fields that contribute to the formation of the Educative Islet concept.*

From the wide and varied field of museology, we choose to draw on the theoretical elements related to the concept of museographic transposition which will determine the museographic character of the knowledge to be disseminated. Museographic transposition describes the process when an object of knowledge contained in scientific or an interdisciplinary literature and other sources is transformed to an object of knowledge contained in a museum exhibition [9, 10]. This concept has been used as an analytical or synthetic tool in describing and understanding the process of analyzing or constructing an exhibition, especially in museums of natural sciences. We believe it could be successfully applied to the development of museum environments such as educative islets which, on the one hand, contain interdisciplinary knowledge to be disseminated to the public and, on the other hand, require simultaneous processes of epistemological development and museum-pedagogical development.

The field of Science Communication will mainly determine the epistemological character of the knowledge to be disseminated. The study of the different forms of interdisciplinary processes and products is a prerequisite for the construction of an educative islet [11]. Particularly, the "conceptual bridges" between the collections, the exhibits or the interpretations that the archaeological museum seeks must be studied, as well as the NST knowledge that may be related to all above. Such interdisciplinary fields may be (a) physics methods that contribute to archaeological research such as conservation and dating of objects or archaeological geophysical research; (b) material science and ancient Greek technology; and (c) the relations between ancient Greek art and modern science.

Finally, the field of Didactics of Science will determine mainly the pedagogical character of the knowledge to be disseminated. In this field we will mainly identify two theoretical strands. The first is about the ability of students of various educational levels to develop cognitive and emotional progress in informal or non-formal educational environments, such as museums, and the second is related to contextual science teaching, an educational context where learning is achieved through the connection of the new knowledge within a social, historical or aesthetic context that is intended to facilitate it [12].

#### IV. THE ARCHAEOLOGICAL MUSEUM OF THEBES AS A FIELD OF DEVELOPMENT, APPLICATION AND EVALUATION OF EDUCATIVE ISLETS

Although the design and development of educative islets could be carried out in all Greek archaeological museums, the choice of the Archaeological Museum of Thebes is based on the fact that the time line covering all the exhibits of the new museum exhibition provides a panorama of Ancient Greek civilizations through the material remains of excavations [13] from all over Boeotia. This allows the selection of appropriate exhibits offering cross-bridges to connect them to the concepts of natural sciences. The exhibition of the Archaeological Museum of Thebes consists of collections of vases, jewelery, sculptures, coins, weapons, architectural pieces, etc. which cover a wide chronological range, starting from the time of the stone and reaching to the newer years. The exhibits of these collections are related to concepts of NST, offering a fertile ground for their understanding both by the general public and by students, as many of these concepts are included in the curriculum of various educational levels or appear to be suitable for cross-sectional extensions within the framework of the school curriculum, as has already been done in the design of the educational programs at the regional Museum of Thespies [14].

The designing of educative islets belongs to the developmental researches and is based on four consecutive stages: a. Analysis (object-exhibit, museum environment and target audience); b. Identification of the teaching objectives of the NST; c. Design of educational islets and d. evaluation. We then describe roughly an example of the designing of an educative islet for the analysis phase. Around the jar of the Bronze Age, an educative islet entitled "How and why were made the vessels of the 2nd millennium BC?" could function. The target audience for exploiting the educative islet is elementary school students. Indicative fields of NST knowledge arise from the analysis of the medium-sized copper-colored "pithos": (a) material science (quality and composition of clay, humidity and plasticity of clay, ceramic engineering), and (b) relations between ancient Greek art and modern science (vase decoration, mineral pigments, light and color).

For each of the two fields it is possible to organize educational activities-problems that lead to the building of the conceptual and cultural dimension of NST knowledge. For example, in the first field questions can be asked about the nature and physical properties of the clay, the physical changing during the baking of the object and in general in its mixing, forming, drying etc (conceptual dimension NST knowledge)



and / or questions related to the historical, social and technological conditions of ceramic engineering development (cultural dimension of NST Knowledge).

From the pedagogical point of view, the structure we described gives the student the opportunity to evolve from a scientific and technological point of view, building a different view of science and technology, as well as their relationship with society, and being able to express and position themselves in front of various issues with responsibility and autonomy.

The infrastructure (design of the movable structure, laboratory equipment, various educative tools, etc.) is under development.

#### V. EPILOGUE

In this paper we tried to show that it is in principle theoretically and methodologically possible to design interdisciplinary museographic structures – educative islets - within the archaeological museum which will give to the targeted audience the opportunity to connect the dominant interpretation of the museum with the contemporary scientific knowledge. Future work should include, in addition to enhancing the epistemological validity and methodological reliability of the design of an educational islet, the investigation of the didactical effectiveness of such an endeavor. To do this, we need to design specific types of educational islets and investigate their cognitive and emotional impact on the target audience using appropriate evaluation tools. Financial resources and capabilities, territorial constraints, regions interventions in the already formed museum environment determine the materiality and its feasibility.

#### REFERENCES

- [1] J. Falk and L. Dierking, *The museum experience revisited*, London and New York: Routledge, 2013.
- [2] C. Grenier, *La fin des musées?*, Paris: Editions du Gérard, 2013.
- [3] M.S. Copley, "Towards presenting scientific research in archaeology museums", *Museum Management and Curatorship*, 25, 4, 2010., pp. 383-398.
- [4] B. Lord and G. Dexter Lord, *The manual of museum exhibition*, New York & Oxford: Altamira Press, 2002.
- [5] G. Black, *The engaging museum. Developing museums for visitor involvement*, London and New York: Routledge, 2005.
- [6] D. Koliopoulos, *The didactic approach of science museum*, Athens: Metaixmio, 2017 [In Greek].
- [7] P. Hughes, *Exhibition design*, London: Laurence King Publishing Ltd, 2010.
- [8] G. Fourez, "Qu'entendre par 'îlot de rationalité'? et par 'îlot interdisciplinaire de rationalité'?" *ASTER*, 251997.
- [9] J. Guichard and J-L. Martinand, *Médiatique des Sciences*, Paris: PUF, 2000.
- [10] M.F. Mortensen, "Museographic Transposition: The Development of a Museum Exhibit on Animal Adaptations to Darkness", *Education et didactique*, vol. 4, 1, 2010, pp. 1-24.
- [11] A. Maingain and B. Dufour, *Approches didactiques de l'interdisciplinarité*, Bruxelles : De Boeck Université, 2002.

- [12] S. Klassen, "A Theoretical Framework for Contextual Science Teaching", *Interchange*, vol. 37, 1-2, 2006, pp. 31-62.
- [13] C. Renfrew and P. Bahn, *Archaeology Essentials, theories, methods, practice*, New York: Thames and Hudson, 2007.
- [14] P. Georgopoulou and E. Riga, "Regional museums as centers of strengthening the local cultural identity and as tourist

attraction. The case study of the display and the educational program of the Archaeological Collection of Thespies (Boeotia, Greece)", in: *Strategic Innovative Marketing*, A. Kavoura, D. Sakas and P. Tomaras, Eds., Switzerland: Springer, 2017, pp. 46.