

Guidelines and Methodology for using Cultural Heritage in Science Education: the EdMuse Project

Piedade Vaz-Rebello,¹ Andreanna Koufu,² Maria Gotsopoulou,³ Vincenza Ferrara⁴

¹ University of Coimbra, Portugal, pvaz@mat.uc.pt

² Directorate of Primary Education of Achaia, Patras, Greece

³ 46th Primary School of Patras, Greece

⁴ University La Sapienza, Rome, Italy

Abstract— In this paper we are presenting a summary of methodology and guidelines for using cultural heritage digital resources developed in the scope of EdMuse project. The methodology and guidelines are based on a constructivist model for natural sciences didactic and museum education and on a reflective model for teachers' professional development. The main steps of the Guide and methodology involve the reuse of digital resources stored in digital libraries, as Europeana, for planning multimedia lessons, involving the students in this process and analyzing the learning results achieved through these activities.

Index Terms cultural heritage digital resources, reuse learning objects, guidelines and methodology

I. INTRODUCTION

Cultural heritage resources, namely digital resources present in museums, have a great potential for educational purposes. Some reasons have been pointed for this potential, namely, it has been emphasized that cultural heritage enhances contextualization and interdisciplinary; it allows to promote transversal competencies such as cultural awareness and social and civic competences. Engaging with digital cultural heritage in meaningful and critical ways can enhance the European dimension in learning, stimulate reflection and debate, and actively contribute to a sense of belonging to a common cultural space shared across. Also, cultural heritage digital resources presented in museums may be used and reused in different contexts.

The European Commission has also called attention to the need to explore ways to use and reuse cultural heritage resources. The European Digital Agenda identifies as a priority the re-use of digital content related to the cultural heritage to develop learning content [1]. The museum objects can become a vehicle for educational content, as they can provide information related to its nature, to its use, to its representation in different historical contexts and disciplines. Being "image" and "content", they are candidate to become an effective contribution to the production of multidisciplinary and personalized educational courses. The presence of numerous digital resources made available in open data mode of the museums will ease their [1].

However, previous studies show that museum resources have not been used systematically in the framework of classrooms and that on site visits are not always producing the expected results in terms of learning [2]. Innovative educational resources are then needed to promote the reuse of digital museum resources and

they should be easy to use, adapt and develop. The Erasmus+ Project "Education and Museum: Cultural Heritage for learning science" aims to promote innovative methods of teaching and learning through reusing digital learning objects of museums- In this article it is presented the methodology and guidelines developed in the scope of the project for teachers to plan, implement and evaluate multimedia lessons. First, theoretical models for natural sciences didactics and museum education are presented following guidelines and methodology for using cultural heritage digital resources and Edmuse platform and promote teacher professional development.

II. NATURAL SCIENCES DIDACTICS AND MUSEUM EDUCATION THEORETICAL MODELS

The Natural Sciences Didactics and the Museum Education followed an almost common theoretical process, passing from the behaviourism to the social constructivism, more recently combined with socio cultural approaches. That process affected the Natural Sciences Curriculums and the Educational programs of the museums, which changed their focus from the "subject" to the "learner".

Nowadays the common ground between museum education and Didactics of Natural Sciences is the theory of the constructivism. The educational theory of the constructivism considers that students construct the knowledge themselves, through social interaction and language use, and they interpret the various concepts and ideas through their personal models, widely known in natural sciences didactics as conceptual representations. Constructivist educational theory argues that in any discussions of teaching and learning we should focus on the learner. The main teaching goal on Natural Sciences Didactics is to help students to learn how to learn, through multidisciplinary approaches, immediate experience, use of original resources and interactive initiatives.

The "hands on" and "minds on" activities of Dewey, the theories of Vygotsky and Bruner, which highlight the role of cultural background of learning and the theory of multiple intelligences of Gardner converge on using museum education in order to design and implement multidisciplinary teaching approaches.

In order to facilitate the full development of each student, it is necessary to provide an effective strategy for learning through various educational procedures. Teachers must develop teaching

learning scenarios on how to use the platform in a constructivist model. The constructivist-teaching model for the Natural Sciences evolves into five phases and it is proposed to develop EdMuse multimedia lessons:

- Orientation
- Promotion of children's representations
- Reconstruction of children's representations
- Implementation to everyday life
- Review

III. GUIDELINES FOR TEACHERS TO IMPLEMENT MULTIMEDIA LESSONS AND PROMOTE REFLECTION AND PROFESSIONAL DEVELOPMENT

The Guidelines for teachers present general orientation for teachers to use EdMuse platform to implement multimedia lessons aiming to involve students and stimulate their curiosity in science subjects. These Guidelines present teachers' tasks (design, implementation, tests) and point to a reflective approach in teacher practice as the process involves gathering data about the process, so teacher can analyse students learning improvement and reflect on the reason associated with the process. The general steps involve:

- Pre and post-test given to the classes.
- At least two classes are needed, the main class and a control class.
- The main class is taught through EdMuse or other digital resources of cultural heritage and in a multidisciplinary way. The control class follow its usual, traditional methodology of each country for the same topic:
- Time table.
- Pre-test, maximum 4 days before teaching.
- Implementation of the didactic process.
- Synthesis of children's report in a chosen form (poster, .ppt presentation etc.).
- Post-test, maximum 4 days after the end of the implementation.

The goal of the comparison is to define if children construct knowledge through our teaching and if there are differences or no in the construction process of the main class and the control class.

The form of the pre and post questionnaire, which should be the same (in form and content), has to contain:

- 10 questions.
- If multiple choice, 3 answers each, only 1 correct.
- yes or no/ true or false questions.
- One open question.

The questions should be related to the topic and not to the process.

IV. METHOD FOR USING CULTURAL HERITAGE DIGITAL RESOURCES AND EDMUSE PLATFORM

EdMuse Platform is a virtual learning environment based on collaborative work to share content and learning objects among many schools. EdMuse Platform collects the metadata of cultural

heritage objects extracted from the Europeana Digital Library. It aims to allow teachers to build a personalized path through web access to the Museums Catalogues and to download images and information on museum objects to be used in the production of multimedia lessons. Teachers and students logged in the project have an opportunity to create their own catalogues structuring specific paths in which they are going to insert the objects of their interest; they have also the option to add other descriptions visible to all using the annotation tool. Teachers can also upload their multimedia lessons in the platform and share them with other teachers.

The User Guide for EdMuse Platform to search and download museum object image and content for reusing them in multimedia lesson involve:

- To access to EDMUSE Platform and activate search engine in Europeana Digital Library. Users can insert the term or terms of search and click on the button.
- Select the useful images and save them. The images and the content will be saved in the collection area and the user can manage them.
- The user can choose to select one or more items and manage them to activate remove or download option. If the user activates the download option the system allows the user to capture images and content for its need.
- The collection.zip contains the html file of object form and images of museum object useful to reuse in the multimedia lesson.

As the core idea of EdMuse project is to reuse existing data about cultural heritage some issues about Terms of Use of each database used to develop multimedia lessons must be considered, taking into account under which conditions it can be re-used.

V. CONCLUSION

This paper presents the guidelines and methodology developed under the scope of the Erasmus+ Project "Education and Museum: Cultural Heritage for learning science". In the scope of constructivist and reflective approach, teachers and students are challenged to (re)use cultural heritage digital resources included in museums, developing personalized and adaptive eLearning pathways and analysing the impact of the process in the professional and academic learning.

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