

Natural History Museum of Crete-University of Crete in EUROPEANA Digital Library. The Natural Europe project.

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Abstract

The Natural History Museum of Crete which belongs to the University of Crete has made its first attempt, few years ago, to achieve a European digitization process in the field of engaging the cultural heritage of NHMs of Europe and the EUROPEANA Digital Library infrastructure, in order to enhance natural history and environmental education. This achievement was gained in cooperation with the Museu Nacional de História Natural in Portugal, the Jura Museum in Eichstaett, Germany, the Arctic Centre in Finland, the Tallinn Natural History Museum in Estonia and the Hungarian Natural History Museum in Hungary through their common European project Natural Europe CIP-ICT PSP-2009-3 250579 (2009-2013). Educators from the above museums were given the tools that allowed them to design environmental Education Pathways based on digital content resources from their collections. The following tools were used within Natural Europe: A multilingual software tool that allowed the semantic annotation of multimedia content resources for Museums (creating the digital library of the NHMs), a multilingual software tool authoring the Educational Pathways through the digital collections, a Web interface for navigating Educational Pathways through the Museums' Web sites, a Web interface for visualized faceted search through the NHM content of EUROPEANA and an interactive for virtual 3D navigation. The digitization of 4000 objects of NHMC-UoC and their value of use will be presented in this paper.

Introduction

In an era where natural history and environmental education inadequacy in formal and informal contexts is becoming an increasingly challenging issue, harvesting the potential of European digital libraries appears as a very attractive option. However, an impressive abundance of high quality digital content that is available in Natural History Museums around Europe remains largely unexploited due to a number of barriers, such as: the lack of interconnection and interoperability between the management systems of NHMs, the lack of centralised access through a European point of reference, like EUROPEANA, as well as the inefficiency of current content organization and the metadata used. However, a major problem is the lack of effective support of digital library applications as learning (Ursyn, 2015). Applications are well known to be long living, and typically they have longer life than systems. Thus, they tend to create their own standards and support infrastructures based on those standards.

These independent infrastructures and applications however do not exploit the vast wealth of information in the European digital libraries, and they do not interoperate effectively and efficiently with them. For this reason, a coordinated solution at European level was suggested through the Natural Europe project CIP-ICT PSP-2009-3 250579 (2009-2013) (<https://pro.europeana.eu/project/natural-europe>), coordinated by the Greek Research and Technology Network, in order to overcome the aforementioned barriers. In the frames of the project a balanced mix of high quality NHMs: the Natural History Museum of Crete-University of Crete in Greece, the Museu Nacional de História Natural in Portugal, the Jura Museum in Eichstaett of Germany, the Arctic Centre in Finland, the Tallinn Natural History Museum in Estonia and the Hungarian Natural History Museum in Hungary digitized a big number of resources. Based on the digital content from their NHM collections, educators from the above NHMs collaborated with educational and training institutions (Ellinogermaniki Agogi), educational technologists, metadata experts, user groups and standardization bodies (Technical University of Crete (TUC), Fraunhofer Institute for Applied Information Technology (FIT), BARCO & Magic Worlds) in order to design environmental Educational Pathways (http://www.exploratorium.edu/files/visit/field_trips/pdfs/Plan%20Your%20Field%20Trip%201-2011.pdf) (https://www.exploratorium.edu/vre/docs/NSDL_description.pdf), demonstrating a next generation learning scheme that crosscuts the boundaries between formal and informal learning settings, involving learners in extended episodes of playful learning. All the above material was uploaded to EUROPEANA Digital Library infrastructure engaging, thus, the cultural heritage of NHMs of Europe with natural history and environmental education.

Methodology

To implement the Natural Europe vision, a user requirements' analysis was implemented in order to evaluate existing solutions in digital environmental and natural history education content organization and delivery in NHMs. The outcome of this evaluation was a set of examples of good practice that demonstrated ways of effective and long term collaboration between the museums and the visitor communities.

Based on the digital content from their NHM collections, educators designed several environmental Educational in order to:

- Help provide direction and structure for the field trip.
- Focus the attention of field trip students on a particular set of exhibits or topic.
- Suggest links to related materials and additional experiments for pre- and post-trip learning.

All Educational Pathways included a learning objective, the targeted learners/pupils, a connection with their school's curriculum, a series of activities to be implemented before, during and after the visit to the museum, as well as the expected learning outcomes. Both types of Pathways, Guided and Open, were designed. Guided Pathways involved a set course of exploration in the museum. Each Pathway included a student worksheet and a matching teacher's edition. The teacher's edition linked the Pathway's content to curriculum topics and school standards providing additional support materials as well as sample answers to the worksheet questions. Open Pathways suggested creative ways for adults to structure their field trips and motivate the children. They were less structured and less time-demanding, since they are taking place with the involvement of adults. They focus on educating both children and adults, through activities that can motivate and involve the whole family.

The Natural Europe Educational Pathways were also enhanced in two ways:

- a) They included pathways that could be implemented completely online (with virtual visits to the involved exhibits/specimens).
- b) They included pathways that involved actual field trips to a specific NHM and also virtual visits to relevant exhibits/specimens in other NHMs (accessible through the Natural Europe federation and/or EUROPEANA).
- c) They included pathways that were enriched with more outdoor classroom activities that brought learners/pupils in contact with the natural habitat of their country/region (e.g. a visit to a nearby natural preservation site).

During the course of their production, the pathways were gradually made publicly available from the web sites of the NHMs, and feedback on them were collected using appropriate mechanisms and metrics – this feedback was used to further improve them until the end of the project. In addition, within the pilot activities, teachers were exposed to the produced pathways and provided their feedback and revisions on them.

The integration of the Natural Europe with EUROPEANA follows a layered architecture. During the lifetime of the project two extended pilot phases of user-centered trials were implemented. These trials were meant to serve more than one purposes: Besides focusing only on educational and technological issues and collecting valuable user's feedback on the usage of existing authoring tools, they aimed at involving all relevant actors in the design process of various interfaces and in the creation of educational pathways stored in a common digital library. This process ensured that user feedback is appropriately collected and feedback to the usability and the quality of the project outcomes (and particularly the developed pathways). Initially a general validation plan was designed and developed and the necessary instruments to be used for the data collection were constructed. The main aim of the validation activities and of the analysis of the data gathered were to provide evidence for exploring social tagging and folksonomy as an access strategy to the educational content of the NHMs.

Results

In the frames of Natural Europe project the number of content resources were ~16,000, the number of EUROPEANA records to be harvested and enriched were ~4,000 while the total number of content resources to be used within Natural Europe were ~20,000.

The different resources were:

- TEXTS like descriptions of minerals, fossils, reptiles, animals, birds, fishes and plants, prehistoric artefacts, educational and training, materials, lesson plans, projects and guidelines for field trips pathways
- PHOTOS of minerals, fossils, reptiles, animals, birds, fishes, plant, maps and prehistoric artefacts with all their metadata.
- PRESENTATIONS, VIDEOS AND ANIMATIONS of natural phenomena and animals
- INTERACTIVE WEB SITES that allow virtual tours in the museums, communication with experts and users.

In parallel the following thirty five (35) pathways were produced:

- Six (6) Guided Pathways concerning school field trips within the exhibitions of the partner NHMs (one per museum, enhanced when possible with outdoor classroom activities).
- Six (6) Open Pathways concerning visits of families within the exhibitions of the partner NHMs (one per museum).
- Six (6) Guided Pathways concerning field trips and outdoor activities/trips based on some specimen of the exhibitions of the partner NHMs (one per museum).
- Five (5) Virtual Open Pathways concerning virtual visits (implemented purely online) to digital specimens of more than one NHMs in the Natural Europe consortium (all collections were covered).
- Six (6) Guided Pathways concerning school field trips within the exhibition of one partner NHM and also involving a virtual visit to digital specimens from other NHMs (one per museum).
- Six (6) Open Pathways concerning visits of families within the exhibition of one partner NHM and also involving a virtual visit to digital specimens from other NHMs (one per museum).

The IT tools which were developed in order to help the whole digitization process, the production, promotion and dissemination of the Educational Pathways and the integration of the Natural Europe with EUROPEANA were:

- The NHM Multimedia Annotation Tool which was based on the existing GraphOnto Tool that TUC had developed and which had already been used during a past project and was used for the annotation of NHM content. The tool was further developed in order to comply with the technical and classification requirements of the Natural Europe content providers. In addition, it considered the integration of NH and Biodiversity ontologies that had been developed within the STERNA eContent *plus* Best Practice Network (<http://www.sterna-eu.org>) and other NH-related projects.
- The Educational Pathways Authoring & Annotation Tool which was based on the existing LearningDesigns Editor that TUC has developed in a past project. The tool was further developed in order to allow authoring of learning activities in the form of educational pathways through the NHM collections.
- The Web-based Educational Pathways Navigation and Faceted Search Service components which were based on existing interactive interfaces that had been developed with the contribution of FIT in the context of the MACE e Content *plus* project (<http://www-mace-project.eu>). The existing services for browsing and searching through content using visualized and interactive interfaces were further adapted, graphically redesigned, and connected with the Natural Europe federation and EUROPEANA, in order to provide users with advanced Web interfaces for searching NHM content in EUROPEANA (Makris, 2013).
- An interactive for virtual 3D navigation through educational pathways and NHM content of EUROPEANA. This concerned setting up a stereo-capable visualization system/installation that allows users to navigate and interact using 3-D, 'minority report-like' interface. The device/installation was based on similar ones produced by BARCO, whereas the implementation/adaptation of the software that visualizes the navigation/interaction of the users with the digital content within the repositories of the project was carried out by Magic Worlds.

Discussion - Conclusions

The Natural Europe approach focused on enriching the metadata already used to describe digital content within EUROPEANA with an IEEE Learning Object Metadata (LOM) application profile that added educational information about the potential learning uses of this content. It also provided a content organization methodology that was applied to a large collection of high quality natural history digital content. This allowed the end user to have seamless and unobtrusive access to the content, therefore offering unprecedented accessibility. The Natural Europe approach didn't rely solely on professionally prepared content but built a community that interactively enriched existing content through social tagging and creating new content. According to the project's statistics, the end-users found the service very attractive since it followed the same philosophy that many popular community-based web sites are using today.

The added value of the project was quite important. In parallel, its impact and coverage was enlarged, since it involved more stakeholders who contributed in content population, pilot trials and validation trials. This was succeeded through a variety of communication channels and using a number of dissemination mediums and awareness activities which communicated to all interested actors the project's results. Some of them were: the project's web site, the creation of a database of related contacts, which served as the medium for communicating with actors interested in the project news and achievements, workshops and Open Days which were organized in the user countries and aimed to enhance and validate identified user needs in the participating user communities. In parallel, the workshops served as the initial base for creating liaisons with other museums and/or educational institutions, as well as with representatives of professional and policy making organizations. Two regular publicity activities such as: short electronic newsletters and series of press releases and one final Workshop/Conference on "Natural History & Environmental Cultural Heritage in European Digital Libraries for Education. Challenges and the Natural Europe experience" added also value to the project.

Moreover the sustainability of the project was successfully achieved, mainly outlining a step-wise approach aiming at the efficient use, as well as exploitation of the research outcomes during but also beyond the duration of the EC support. The development of the proposed service was to bridge the identified gaps between the formal and informal education settings. At a time when there are still calls for collaboration between museums and science centers, schools, universities and the industry, when there is an increasing emphasis on lifelong learning, when there is still significant debate over the value, the utility and the reusability of digital resources, the Natural Europe project aimed to contribute to the access to and sharing of advanced tools, services and learning resources, by offering unique informal learning opportunities to the visitors of NHMs. Five years after the end of the project the Natural History Museum of Crete is still using the Educational Pathways as a main tool for delivering education and learning to school groups and to children participating NHMC summer schools and other activities of environmental education.

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