Learning About Palaeontology Through Interactive Games

Carles Sora
Universitat Pompeu Fabra
carles.sora@upf.edu

Sora, Carles (2011). Learning About Palaeontology Through Interactive Games. ***Museums At Play. Games, Interaction and Learning****. MuseumsEtc, Edinburgh.*

[preprint version]

Introduction

Though literature on exhibition design has brought about a new generation of exhibits over the last twenty years [1] in which visitors have been adopted as active participants from the outset, it remains difficult to find exhibits with the correct procedures and implementation of interactive technologies, particularly if we focus on the intersection of learning, playing, museums and digital technologies.

We have attended various exhibitions in recent years that have made use of what are known as “multimedia kiosks” as an interface and support for integrating interactive audiovisual media or mobile technologies in an endeavour to remain at the cutting edge of educational technology for interactive tours and itineraries. These interfaces produce a high degree of empathy and, therefore, their maximum integration into the visitors’ experience, capitalising on the strong points of their language, is of paramount importance. This integration into the exhibition itinerary calls for an adaptation of format and technology.

We consider that a museum experience should comprise all the elements that surround the participant. To this end, there is a need for interactive media that is consistent with the form, script and layout of the exhibition space as well as the remaining elements that comprise the museographic proposal itinerary. Therefore, the manner in which participants behave during a visit to a museographic space must be borne in mind. A museum visit is largely an experience to be shared. On the basis of a case study, Ciolfi [2] set forth a variety of approaches and means of sharing the museographic experience which reveal the need for interaction design that is capable of integrating visitors’ expectations: the ability to share what they see with others, to physically experience, to touch, to find coherence in the explanations given during the itinerary, etc. [3] It would involve constructing a dialogue and engaging learning rather than a passive and isolated experience. On the strength of this consideration, and the need to integrate interactive games as much as possible in the itinerary of visitors and therefore in their experience, the following proposal is put forward.

Context and exhibition design

The Catalan Institute of Paleontology (ICP), a research institution which holds one of the richest collections of macrovertebrates and microvertebrates in Europe, is a benchmark institution in this field. It took over the Museum of Paleontology in Sabadell, commissioning the interdisciplinary studio of exhibition designers *Touché* (in cooperation with researchers from Pompeu Fabra University) with the new exhibition *Avui investigues tu!* (Today You’re Investigating!). The exhibition opened on 2 October. This new phase was driven by the

ambition to have a space in which to disseminate the research undertaken by the ICP, and to arouse interest in research generating new scientific vocations. It also constituted an innovative approach which sought to make their lines of research and their discoveries known, moving away from the typical fossil exhibition in a showcase format.

To rise to this challenge, *Touché* designed an exhibition which endeavoured to focus on excitement, discovery and play in order for visitors to experience first-hand the processes carried out by a paleontologist in this science.

The space limitations and the strong commitment to rigor and depth of content led the exhibition design towards an interactive environment organised into three communication modules:

1. ***Physical models of real settings (laboratories, libraries and collections).***
2. ***Information panels to highlight the basics.***
3. ***The interactive media (QuadernICP) through which visitors play, learn and take part in the discovery of a fossil.***

To do so, they have to go through all the paleontology stages, on the basis of which the space was divided into five workstations (excavation, preparation, research, publication and dissemination). Each workstation features two touchscreens to interact with the QuadernICP interactive game. Two screens were proposed for each station so that the designed system could accommodate up to ten groups of three or four children,

simultaneously taking part in the experience, thereby enabling a class to participate together and independently of the proposal, achieving a milestone in this field. To do so, it

was necessary to intertwine the histories of four fossils facilitating group mobility within the exhibition hall.

A research case is assigned to each visitor by means of a card given to them on admission to the museum. Participants solve the research case by way of a series of activities and interactive games, physically moving from one station to another and progressing with the investigation until their research is published in a fictional scientific journal that they can send to their personal e-mail accounts. QuadernICP features four fossils to be researched, which constitute four real research cases conducted by the ICP. The QuadernICP interactive medium has fifteen educational interactive games, thirty charts, ten real locations and fifteen video clips for each study. We can therefore speak of an interactive film that maintains, leads and guides the participant's visit for more than 40 minutes.

The challenge of presenting the research process involved in paleontology was *a priori* both a challenge and a productive context for the design of interactive applications. A great deal of literature is found on the interplay between entertainment and education ("edutainment"), particularly in common study scenarios such as schools. However, with regard to less common places of learning such as museums, with different audiences and content, there are few studies that facilitate a move towards informal education. In the design being discussed herein, the creation of interactive media that move closer to the interplay between play and learning was chosen. For Resnick [4], this pairing involves greater participation in the activity, while meeting small-scale goals which continuously keep the participant motivated. Exploration, discovery, competition, narrative, fiction, fantasy and other concepts in proximity to the theories of pleasure [5] must be adopted in the interaction design for exhibits. Furthermore, collaboration, personification and taking of control by the visitor [6] represent some of the qualities that interactive games can bring to museums.

The reconstruction table

If we consider the diversity of museum visitors, as defined by Perry [7], of cultural approaches and levels of curiosity, of technological competence, and we bear in mind that learning can occur in different domains – the affective, psycho-motor or cognitive, personal or skills development domains – according to Gammon [8], it seems appropriate to design interactive modules that attempt to diversify the domains they comprise and the complexity of contexts and interaction they require. In order to achieve this diversity, it was decided that two interactive modules be designed beyond the itinerary of the QuadernICP visit, namely, "Reconstruction Table" and "Virtual Paleontology".

The game known as the *Taula de Reconstrucció* (Reconstruction Table) employs a tangible interface that enables visitors to look at a dinosaur skeleton and to simulate the verification of its corresponding fossils from a variety of unidentified fossils extracted from the same archaeological site. The Reconstruction Table was designed with the aim of reaching an audience that is less responsive to the interactive visit in QuadernICP. The attraction of physical objects interacting with the virtual screening as well as the spectacular display of animations presented therein appeal to the entire range of potential audiences. In addition, the interaction with physical objects (resin models of real fossils)

facilitates the learning of tasks to be undertaken and therefore makes their use immediate. Said approach has already been put forward by the work of Montessori manipulatives but, in this case, it has been transferred to the digital environment with the appropriate affordance in the object design.

The second model is the Virtual Paleontology interactive interface, which enables participants to simulate on a small scale the workings of a 3D laser and CAT scan. In this case, the rapid access to interaction with physical interfaces allows two plans of action to be compared very easily; a digital action which leads to a physical reaction in the physical interface.

Advantages of using an interactive digital system as museographic strategy

Traffic flow: Digital technologies allow the position and itinerary of visitors to be identified as well as small independent groups to be integrated in the same space. This allows up to 30 students, a school group, to take part simultaneously.

Databases: We can record the data from the actions carried out by the participants during their interaction with the system, and we can subsequently establish a protocol for their analysis and follow-up. From the data collected, the degree of success or understanding of the proposed interactive activities could be assessed.

Digital environment: It is easy to link the visitors' experience with their digital environment, by means of e-mail or social networks, thereby extending their visit to the museum website and promoting their experience.

Renewable resources: The final content of an interactive medium, the texts, images, or digital videos can be easily exchanged. We therefore leave the door open to updating

content that allows new life to be breathed into the exhibition and a major challenge to be set: visitors' contribution to the creation of content exhibited in the interactive media.

Final considerations

We briefly present herein the most noteworthy aspects of the interactive proposal presented which could serve as a preliminary benchmark model for designing interactive itinerary modules for museums.

The metaphor of the visit*:* Identifying a symbol by means of a metaphor, whether an object, idea or space, which is the reference of the visit, facilitates the follow-up of the content presented. QuadernICP uses the metaphor of the field notebook as a menu from which participants explore the contents of each station.

Three interrelated interpretation spaces: The approach using interlinked resources, including the interactive medium and the exhibition space, each of which make reference to the other, allows the content to be extended beyond the screen, thus visitors can experience physical objects and their experience is enhanced conceptually.

The visibility of the interface: To reiterate the idea presented in this paper, the creation of spaces and contexts that facilitate the exchange of ideas and experiences among participants is of paramount importance. Therefore, it is strongly advised to use devices with large-scale graphical interfaces that enable the interaction of more than one visitor as well as good visibility for those who are part of the group but remain in the background.

References

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