A COMMON POINT BETWEEN VIRTUAL AND CONVENTIONAL EDUCATION IN EARTH SCIENCE: E-MUSEUM

Assistant Prof. Dr. Ayten Çalık
Assoc. Prof. Dr. Emin U. Ulugergerli
Cumali Yaşar
Ibrahim Altinoluk

1.2 Çanakkale Onsekiz Mart University, Engineering Faculty, Terzioglu Campus, 17200, Turkey.
3.4 Çanakkale Onsekiz Mart University, School of Education, Computer & Instructional Tecnologies Education, Anafartalar Campus, 17100, Terzioglu Campus, 17100, Turkey.

ABSTRACT

Conventional education in applied science relies on both theoretical studies and hands-on-experiments while virtual education conveys theoretical information via enhanced visual aid. Visual information can be provided via dynamic web sites broadcasting from both existing laboratories and visual tours of imaginary collections.

An example for the fast growing e-museum projects has been proposed and the data warehouse model has been recommended to save the information in the presented example. The linking model is employed for the presentation of objects. The model is able to use an auditing classification between content finding and data fields. The free-of-charge web application has been used to track the visitor activities.

Although, both proposed project and its model have been used for creating an e-museum, it can easily be adopted to any learning environment which provides visual educational support to any science.

Keywords: E-Museum; Earth Science Museum; web application

INTRODUCTION

Limits of the conventional education system are delineated by the imagination power of both teachers and students. Especially, theoretical studies and hard-to-understand subjects require additional tolls to reach beyond these limits. Initially, overhead and projectors helped the teacher to overcome this problem but their usage was limited by the class hours. Being parallel to developments in technology and expansion in information content available has changed the profile of knowledge seekers. Knowledge is sought by people for different reason, scientific achievement, and personal curiosity or just for fun.

Note that, in the frame of this study, we shall mainly focus on the non-academic population who either do not wish to do any post-graduation studies after their university life or ceased their education adventure even before reaching university. Regardless of the educational background, the information seekers have shown enthusiasm to learn more wherever and whenever possible.
Generally, the pursuit of information is driven by either personal or professional reasons. We may employ the microeconomics definition, in its plain meaning, to explain the historical development; when the demand for any information is emerged, this demand also creates own suppliers. The most common approach has come from academics, the graduation, which was seen as an end of the academic learning period, has been associated to the initial step of the ‘continuing education’ or ‘lifelong learning’. The concept of continuing education includes all kind of post-secondary learning activities and programs and provides updates on specific issues. Due to monetary reason it has become a source of income for many academic institutions. The application of this concept, most of the times, is linked with some forms of master of science or master of business administration courses and up-to-date information is given at the certain location and in time range. But this linkage has created its own barrier and these programs, usually, open their doors to the university graduates only.

Recently, the information technologies such as the World Wide Web are increasingly employed by large information supplier extending from commercial or academic foundations to individuals. This has removed the restriction on time and location to access to any information.

The information serviced through internet either focuses on specific subject or includes outlines only. As a whole, all creates a ‘virtual learning environment’ in its broad sense, even if the some web sites simply include text-based (static) web pages.

Dillenbourg et al [2] identified virtual learning environments as follows; it is a designed information space where multi-authored information stored, maintained and shared with the world through HTML files. It is a social space where educational interactions occur between the learners and also discus with or send feedback to authors. It has a virtual space which is explicitly represented: the representation of this information/social space can vary from text to 3D immersive worlds. It is space in which students are not only active, but also actors and a part of the virtual space. In other words learners also provide information that can be used by anybody who can access this space. It overlaps with physical environments and may include a variety of non-computerized learning resources such as instruments, books, etc. and also face-to-face discussions among students and lectures. It integrates heterogeneous technologies and multiple pedagogical approaches. It is not restricted to distance education. Although it is often associated to distance learning education, it also used to support conventional learning. These points are important for vocational training, university courses and lifelong learning.

In this study, we use the name virtual learning environment without restricting the scope to any age or level. But our focus will be on the last definition given above and on the usage a virtual museum for the purpose of supporting curriculum of earth science education as well as providing information to those who seek information about the mineral, rocks and fossils. We will use the term ‘learner’, hereafter, to define all individuals who seek the information by means of conventional and non-conventional education tools.

Encyclopedia Britannica (online) defines virtual museum as ‘a collection of digitally recorded images, sound files, text documents and other data of historical, scientific, or cultural interest that are accessed through electronic media’. Similar or much wider definitions can be found in various resources. For instance, Schweibenz [9] describes it as ‘a logically related collection of digital objects composed in a variety of media, and, because of its capacity to provide connectedness and various points of access, it lends itself to transcending traditional methods of communicating and interacting with the visitors being flexible toward their needs and interests; it has no real place or space, its objects and the related information can be disseminated all over the world’. Besides the virtual museum, many different names can be found in use, e.g. “e-
museum”, “digital museum”, “cyber-museum” or “on-line museum”. We will use the definition of e-museum hereafter.

Historical development of the concept of e-museum can be found in many publications (e.g. [6], [8], [5]). The concept has stated that the information space of an item was much important than the item itself. As a result, by the usage of innovative methods, tools and, most importantly accepting World Wide Web as source of information for all, virtual museums have been created [7]. This step has made the information space of museums and collections more accessible to public and has redefined the whole museum experience.

Both time limits and location dependency still define the frame of the conventional education. Internet, on the other hand, removes the frames and makes information space available to learners anytime and anywhere. Taking size of information content into consideration, virtual education can be divided in many subgroups; virtual campuses which covers a set of courses leading diploma or degree, virtual classes or courses which provides information for certain parts of a curriculum, technical notes or opinions where very specific subject (e.g. manuals) and author’s personal opinions (e.g. blogs) are presented, and virtual venues. The last one can serve for many purposes. We will focus on virtual venues and take e-museum as an example to virtual venues. E-museums are usually taken as a show case and their educational function is immersed in to description of the items and supports the education both direct and indirect way (e.g. [3]).

In this study, first, we will evaluate the architectural requirement of an e-museum program, then, propose a simple e-museum site and share some statistical results for visitor behavior on a earth science e-museum (YBM¹). Discussion and the way forward for the educational support will be presented before conclusions.

E-museum in terms of functionality

Discussing ‘do’ and ‘don’t’ of designing a successful web site is out of scope of this study and they can be found either in many publications or even in the internet through search engines. We would like to share some outcomes of our experience that we have gained via developing and testing an e-museum site for three years. It is clear that the actual requirements are numerous and some important ones are given below:

a) An e-museum should be manageable by a limited manpower.

The architecture of an e-museum can be very complex. The complexity depends on the content to be presented. If it increases the cost of the designing the site also increases, and the maintenance of the site itself and updating or removing outdated the information in long run become either cumbersome or too costly to keep it up. This issue is also important if the site get hacked or contaminated by virus. Whole site should be able to return to broadcasting right after fixing or removing the security threats. The simple does not mean a static page and picture only. As an example, many fancy visual components require background tools or engines to run. These tools should be installed on both end-users computer and host computer start, modify and stop such tools and the visual components run with them require expertise services which may not be available on spot.

b) Structure should be modular

Modular structure is open for modification and update and allows expansion in information space. Whenever or wherever necessary, new information space can be added to the database. Then, relevant module can be modified to access that information.

c) The content should not cause distraction.

The level of the complexity should be balanced and the visitors should not be distracted or paralyzed by animations or get lost between external links or drown in excessive information.

¹ http://ybm.comu.edu.tr
We suggest that ‘the simpler is the better’ and necessary information may be added after launching and running the web site whenever it is requested.

d) Information should be able to digest by all visitors regardless of their educational background.

e) Information content should be spread between simple outline and detailed description. We observe that learner seeks pictorial information while technical visitors request detailed text and visual information.

f) Web site should allow the visitors send feedback. This is especially necessary to remove errors from text or figures, to fix the bugs and to define what sort of information should be added to the site in future.

g) There should be connection to popular social media. Social media helps to promote the website and share the knowledge faster than any other tools. Dedicated pages or fan groups on social media also act as a forum for the discussions. No need to mention that this list only includes main issues and can be easily extended.

Technologies to be used

Possible technologies that may be employed in designing an e-museum are very wide. In this study, we have chosen a straightforward example for the e-museum projects, called YBM. It is a fast growing and easy to maintain project.

In general, YBM has been developed for XML-based web service (Figure 1). The function of the web service is to transfer the information to external platforms. Any update or new sample is, automatically, passed on to different web applications by means of the service channels.

![Figure 1: Technologies used in YBM](image)

Data service is an integration of all communications and interactions between entries. YBM has a semantic infrastructure (Semantic Web 3.0) that can be read by the computers (Figure 2). It allows the computer to ‘read’ a name and assign its meaning.

![Figure 2: Semantic infrastructure of YBM](image)
The data warehouse model has been employed for YBM to save the information in the presented examples. Data miner technique is used to do associative modeling of the data (Figure 3). As an example, the most sought samples can be tracked by looking at the visitor profiles.

![Diagram](image)

**Figure 3** Usage of the data miner technique

The interaction with the end user is the presentation of the sample and information together. The linking model which is able to use an auditing classification between content finding and data fields suits to our needs for that presentation.

**User traffics**

The success of the digital broadcasting is measured by the number of visitors and their activities in the web site. Search engines provide detailed information about the visitor activities. To reduce the cost of operation, the free-of-charge web application of Google analytics has been used to track the visitor activities. The statistical records include geography, demography, language, source of traffic, keyword(s), and number of visitor, etc.

Sample statistical records for the date between 22 February -10 April 2014 are as follows:

Site usage (Figure 4a) states number of visitor and visitor activities in the web site. Visit per page and average time spent in the site identify learner profile. If the numbers are low, the learners just visit a page or so and left the web site, if the numbers are high, then, the learners have searched detailed information and surf between the pages. Visitor overview (Figure 4b) gives daily variation of visitor number. Map (Figure 4c) is geographic information about the learners. Overview of sources of user traffic (Figure 4d) present the channels that the learners have used to access to web site.

Statistical report plays key role in updating strategies. In terms of education, it reflects the learner’s interests and lack of information in their curriculum. Following the statistical feedback development plan of the e-museum can be determined.

**Discussion and the way forward**

We have been testing an e-museum site since 2011 and our preliminary results indicates that one does not need a complex design for a virtual venue targeting audience from earth science.
Visiting statistic and feedback from learners have pointed out that the learners are looking for specific information with high standards that the museums have to provide but do not want to get lost in excessive information.

In this sense, the questions, how much information should be given and how to present, are still need to be answered. Worldwide accepted ‘resource description formats’ are currently established and there are effort to implement them for educational purposes. In general all answers depend on targeted audience. The simple approach is that ‘start it with basics and improve it by the help of feedbacks’.

Figure 4 Sample statistical records for the date between 22 February -10 April 2014, a) Site usage b) visitor overview, c) map, d) sources of user traffic.

E-museums are needed as much as conventional ones. Bearman [1] estimates that over 20 million original objects will have been digitized in the museums by the end of this decade. The projection of this action into education is that all major libraries are busy digitizing their materials and make them available to public. Major universities have already moved their educational resources into digital environment under the continuing education and lifelong learning.

Up to now we have not mentioned any drawbacks of the virtual education. Besides having benefit of being accessible in anytime and from anywhere, using a virtual learning environment does not guarantee effectiveness. Dillenbourg et al., [2] warns that virtual learning environment must integrate with rich pedagogical scenarios and these scenarios must benefit from its various facilitating features. Applying the “virtual learning environment” concept to any sort of Internet technology (classic Web sites, learning management systems, 3D environments, etc.) entails the danger of ignoring interesting avenues of research and development that could and should enrich education.

To have an e-museum has two sides; the learner and the teacher. The learner is an active player and cast one of the major roles; searching, learning and applying. The learner also uses interactive sessions to provide feedback and have online practice exams. If any of them is missing then the mission will not be accomplished. On the other side, the responsibility of the teacher is to provide the content to be taught. This point is also a source of one of the problem; many teachers assume that it is a one-time job. In fact it is not. Defining the updates for the

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2 [http://www.w3.org/](http://www.w3.org/) (access date April 4, 2014)
information content and answering the question via interactive sessions can make it much exhausting and, if the web design is complex, time consuming than conventional way is. Additional to the functionality, the e-museum project must include staff, budget and also a lab or physical space for long term service. The crucial staffs are dedicated ones for software development, and for sample preparation and an advisory committee for sample identification and the selection of the information to be added. Even if it is in digital environment, e-museum has some cost to be beared. The collecting and maintenance of the samples, staff expenses and the cost of web hosting are some of them. E-museum are usually accompany to conventional museum thus, storage, display and laboratory facilities are also required.

Teaching and learning relations are moving through transition processes, driven by many factors including supplying the information to increasing demand of the learners with using limited resources in many institutions. For this purpose, we have to use web technology to enable a virtual learning environment to be available all the time for all learners.

**Conclusion**

The virtual learning environment is not a competitor for the conventional education system because, by its digital nature, it cannot offer hands-on-experiments together with face-to-face discussion opportunities to learners, as the conventional education does. But it can extend the ideas and scientific theories into the digital space and, by the aid of visualization, increase perception and sped up the learning. Additionally the virtual learning environment will reach out to learners who might never be able to visit an educational foundation.

Proposed structure of e-museum is not ultimate one. But, it is enough for a team who wish to start to create their own virtual learning environment with a tight budget.

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**REFERENCES**


