ISSN 2029–2236 (print)
ISSN 2029–2244 (online)
SOCIALINIŲ MOKSLŲ STUDIJOS
SOCIETAL STUDIES
2013, 5(2), p. 501–514.

VIRTUAL MUSEUM IN TEACHING SUBJECTS IN THE CULTURE AREA

Nina Panina

Department of History of Culture
Novosibirsk State University
Ul. Pirogova 2, Novosibirsk, 630090, Russia
E-mail: panina@mmedia.nsu.ru

Vladislav Kazakov

Department of Multimedia
Novosibirsk State University
Ul. Pirogova 2, Novosibirsk, 630090, Russia
E-mail: kazakov@phys.nsu.ru

Natalia Bartosh

Department of History of Culture
Novosibirsk State University
Ul. Pirogova 2, Novosibirsk, 630090, Russia
E-mail: bartosh@academ.org

Pavel Emelyanov

Institute of Informatics Systems
Pr. Lavrentieva 6, Novosibirsk, 630090, Russia
E-mail: emelianov@iis.nsk.su

Abstract. *The article presents the concept of a virtual museum. The data model and the main data entities of such a museum as well as its content management system are described. Splitting entities into subtypes using the polymorphism of classes allows us to adjust the model to a specific museum/subject area. The model comprises several groups of classes*

ISSN 2029–2236 (print), ISSN 2029–2244 (online)
http://www.mruni.eu/lt/mokslo_darbai/SMS/
http://www.mruni.eu/en/mokslo_darbai/SMS/

implementing different parts of the information resource. Each group is formed around some basic entity corresponding to some important type of museum information objects. The authors demonstrate a use of this methodology for implementing the electronic study guide, History of Western European Culture of the 20th Century, developed as a course support for the graduate level students at Novosibirsk State University. It supports multiple educational trajectories and levels of complexity. Professors may use it during lectures as well as the students for independent study; the best results are achieved when independent work with the resource is combined with its usage during the lectures.

***Keywords**: virtual museum, data model, content management system, electronic study guide.*

1. Virtual Museum as a Type of Course Support

A large amount of visual information accompanies every culture-related university course. Every professor is familiar with the problems of the best possible method of organizing information and its effective presentation. The era of digital technology offers a variety of concepts for solving these problems[1]. These solutions are often extremely promising, although in many instances the learning process in not on their focus directly. One of them is the idea of a virtual museum, which, as we think, has extensive potential, and, yet, is not much used[2] .

For relatively long time the concept of a virtual museum, an imaginary, ideal museum, has been a part of the cultural realm in a sense of a free corpus of images, taken from various sources. These images are subject to the order, specified by the author's concept within the intellectual game aimed at creating such a space where a certain idea is embodied in the sequence of images[3]. In the practice of Internet users, the concept of a virtual museum narrows down to a model of a museum – real or existing exclusively in cyberspace – created using computer technologies. A virtual museum reproduces some aspects of a real museum, including the catalogs of the "collections," "exhibit display," etc. As a rule, a virtual museum is distinguished by the possibility of feedback by the visitors of the web-site, extensive reproductions of "museum objects," the presence of three-dimensional "virtual exhibitions," enabling a visitor to make a virtual trip around the "exhibition" and to customize it to his personal needs.

1 Aroyo, L., & Dicheva, D. The New Challenges for E-learning: The Educational Semantic Web. *Educational Technology & Society*. 2004, 7(4), 59-69. Devedžić, V. Semantic Web and Education. In *Springer's Integrated Series in Information Systems*. Berlin: Springer, 2006. Gruber, M. R. *E-Learning im Museum und Archiv. Vermittlung von Kunst und Kultur im Informationszeitalter*. Saarbrucken: VDM Verlag Dr. Muller, 2009.

2 Peacock, D. The Information Revolution in Museums. In Marty, P., & Jones, K. B. (Eds.), *Museum Informatics: People, Information, and Technology in Museums*. New York: Routledge Publishing, 2008, p. 59-76.

3 Gruber, M. R. *E-Learning im Museum und Archiv. Vermittlung von Kunst und Kultur im Informationszeitalter*. Saarbrucken: VDM Verlag Dr. Muller, 2009. Daverio Ph. *Il museo immaginato.* Milan: Rizzoli, 2011.

Notice that now an idea of precise virtual 3D copies (with different levels of detailing) of existing or imaginary museums is very popular. The authors completely agree that this approach is useful and promising in domains of aesthetic enlightenment and popularization of sciences[4]. Nevertheless, the authors believe that it does not correspond to educational purposes completely, because the effective acquirement in educational process is as important as the emotional impact. Usually scientific and didactically elaborated descriptions of resources are either absent or superficial; there is no related bibliography and comparative references.

By analyzing the "spontaneous," "natural" process of how a professor prepares for classes that involve extensive presentations we have arrived at a recognition of the didactic capacity of a virtual museum and of the opportunity and even the need to use virtual museums in the learning process[5].

Field expeditions, museum depositories, researchers' desks, museum exhibitions, the offices of university professors are not only different types of workplaces, but also the symbols of various types of creative work. Many educators go through all these steps before bringing the results of their work directly to their audience. Each of us, who once was a student, knows that very specific types of experience as a rule underlie a living, vibrant, interesting presentation of a problem which we hear from the professor. First, it is the tedious and apparently boring work of the researcher, but in many cases, it combines with the work of a populariser – a guide, an organiser of exhibitions and other presentation events, where the scholarly depth is hidden behind pronouncedly simple statements. It is an extremely attractive task to combine all types of "academic art" – scholarly, museum, and educational, and the development of a model of virtual resources following the metaphor of a museum attempts at reaching precisely this goal.

The practice of using museum collections in the learning process in the disciplines related to the field of culture and art has developed in at least two forms: as illustrating materials (a series of illustrations) at lectures and various methodological projects, and as materials for independent student research as a course assignment for a final project. Certainly, not only professors in art history use museum collections. Professors in archaeology, geology, biology, etc use the collections formed during field studies. As a rule, any individual real museum collection does not cover the thematic coverage of a course. It covers only some part of it. For creating a seamless presentation series in the framework of the entire course, the professor compiles the material from different collections, that is, the images of objects that are actually stored in many different places. Guided by the objectives of the course, by necessity the professor creates a space where a sequence of images illustrates his ideas in a graphic manner. Filling this

4 Gibbs, K., Sani, M., & Thompson, J. *Lifelong Learning in Museums, a European Handbook*. Ferrara, Italy: EDISAI, 2007.

5 Peacock, D. The Information Revolution in Museums. In Marty, P., & Jones, K. B. (Eds.), *Museum Informatics: People, Information, and Technology in Museums*. New York: Routledge Publishing, 2008, pp. 59-76; Gruber, M. R. The Role of E-Learning in Arts and Cultural Heritage Education. In Hornung-Prähauser, V., & Luckmann, M., (Eds.), *Kreativität und Innovationskompetenz im digitalen Netz* – Creativity and Innovation Competencies in the Web, (pp. 343-350). Salzburg, Austria: Salzburg Research Forschungsgesellschaft m.b.H, 2009.

space with images of objects, which were initially a part of museum collections, the professor must take into account the specific character of the "museum" organization of the materials that reflects the physical characteristics of the object, confirming its reality and the validity of its use in a given context.

The trajectory of a professor's preparation for classes and the types of information spaces that he creates in the process follows a certain standardised structure. Thus, we can distinguish the three most common types of professor's activities in creating course support, both of which correspond to a certain didactic scheme:

- *Course support for lecturing*. The lecture is one of the main forms of education in a university. It involves the presence of students and a professor and provides a fixed sequential presentation of educational material by the professor. Course support for lecturing supplies the lecture with a series of illustrations and has the character of a presentation system, to which the professor refers from time to time during the lecture.
- *Course support for independent work with study materials*. Self-guided work of students associated with learning new educational materials is an important element in the learning process at a university. It involves searching and acquiring proficiency in some field of knowledge. Course support for independent work with study materials supplies the student with databases of educational materials and tools for working with them. The nature of such course support can be reference retrieval systems. In addition, there are such types of course support as programmed learning, laboratory workshops, etc.
- *Course support for knowledge testing*. It is quite important to control student's progress in acquiring course. A test bank is one of useful tools to achieve this goal. Notice that different levels of its automation and sophisticated solutions are possible [6].

As we noted above, if a certain form of course support uses museum objects, then their specific form of initial organisation is very important. It bases on three main activities of any museum:

1. acquisition of funds, their description, and storage of museum objects;
2. creation of permanent and temporary exhibitions;
3. popularisation of funds and education of visitors.

We tried to define the structure of a virtual museum, taking into account the existing forms of museum life of the collections and "natural" forms of their use in modern teaching. Expositional, educational as well as referential and descriptive activities of a real museum correspond to the first two trajectories of course support development: creating educational information systems of presentational and exploratory types.

---

6 Masterman, L. A Knowledge-Based Coach for Reasoning about Historical Causation. In Looi, C-K., McCalla, G., Bredeweg, B., & Breuker, J. (Eds.), *Artificial Intelligence in Education: Supporting Learning through Intelligent and Socially Informed Technology*. Amsterdam: IOS Press, 2005, pp. 89–98. Feng, M., & Heffernan, N. T. Towards Live Informing and Automatic Analying of Student Learning: Reporting in the Assistment System. *Journal of Interactive Learning Research.* 2007, 28(2), 207–230.

Before proceeding to the actual description of the concept of a virtual museum and methods for its implementation, we would like to mention a situation that makes our project even more relevant. The latest achievements in the Humanities do not readily find their way to the educational practices of provincial universities. Thus, in many of them the lack of foundations for training in the field of visual studies now is not even recognised as a problem. Meanwhile, this field is so important that the competitiveness of the graduates from such universities in the field of modern sciences is out of the question.

As part of an outdated paradigm of the humanities, working with images as sources of knowledge about the past (in addition to archeology and art history) is much less important than working with verbal sources. Future historians, philologists, and cultural specialists are taught how to see the text and read it in such a way as to extract a maximum amount of information out of it. Images, as a rule, play a purely illustrative role. These images pass before the eyes of students at the departments of humanities in the courses of the History of Culture, which are extensive enough to allow the professor to reveal the scholarly value of images as visual sources.

In this situation, a virtual museum used for teaching the cultural subjects, provides a compromise between the traditional approach to images as illustrations and a gradual transition to understanding that images may possess great scholarly value as sources. A virtual museum is an information system that supports different levels of referencing on the part of the user. He can search and view:

- single picture-illustration;
- popular coverage of the subject on the same display stand with a great number of illustrations;
- selection of all available images on the subject in a form of a photo gallery;
- general treatment of the subject in the form of a lecture;
- highly specialized excursion into the subject in a reference article;
- selection of visual sources on the subject including their descriptive attributes.

High-order information systems equipped with ontologies can propose quite complex retrieval techniques, for example, an ontology-based description and closure of data[7].

At this point, we need to define the position of the virtual museum among various digital repositories of visual sources long available for consulting in major libraries and museums. Now these repositories form portals and aggregators on a European scale and their interoperability is an intensive subject of investigation[8]. The key concept here

7 Ghiselli, C., Trombetta, A., Loris, B., & Binaghi, E. Semantic Web Meets Virtual Museums: The Domus Naturae Project. Paper presented at *the International Conference on Digital Culture and Heritage*, 2005, September 21-23. Paris. Goodall, S., Lewis, P. H., Martinez, K., Sinclair, P. A. S., Giorgini, F., Addis, M. J., Stevenson, J. Knowledge-Based Exploration of Multimedia Museum Collections. Paper presented at *the European Workshop for the Integration of Knowledge, Semantics and Digital Media Technology*, 2004, November 25-26. London.

8 Besser, H. The Next Stage: Moving from Isolated Digital Collections to Interoperable Digital Libraries. *First Monday*. 2002,7(6), 3-5. Panina, N. L., Emelianov, P. G., & Shelegina, O. V. Portal of Museums of SB RAS. Paper presented at *the XII International Conference on Informational Society, Culture, and Education,* 2009,

is the notion of the author's resource. Electronic repositories of museums and libraries possessing the wealth of material do not provide themselves educational courses and therefore their subsequent customization is needed. The student learns how to work with such databases at special workshops. In contrast, the professor tunes an environment of a virtual museum for the desired subject area; it contains the nodes of information and links between them needed precisely for the teaching process, and at the same time provides sufficient scope for creativity.

2. Museum Data Model

The data model for a virtual museum, which would satisfy educational needs, originally developed obeys most general features of actual museum activities. Since the specific features of a particular museum did not have any impact on the model, it can be extended to other resources on similar subjects. The option of splitting entities into subtypes using the polymorphism of classes, for example, different attributes for different types of museum objects, makes it possible to adjust the model to a specific museum or a specific subject area. We do not give description of our model in "standard" ER-model terms because a goal is to establish a conceptual museum-oriented description.

The model comprises several blocks – groups of classes, which implement one or another part of the information resource. Typically, each block is formed around one of the basic entities corresponding to the most important types of information objects of the museum. Thus, we have the block Funds that works with the items of the entity Museum Object, the block Library for full-text Publications, the block Reference for Reference Articles, and the block Lecture Hall for Expositions and Exhibitions.

The most fundamental entity is Museum Object. The block Funds, representing work with museum funds, is built around museum objects. Museum objects belong to different categories in the data model and include artifacts, books, audio or video recordings, etc. Each type has its own system of attribution, although there also are attributes, which are required for all classes. Auxiliary classes of the block and the block's interfaces provide a typological and systematic classification of museum objects, their search, filtering, and sorting.

All blocks of the model and sections of informational resource correspond to information stored in the museum – to the so-called Museum Collection. Yet, although a museum collection is a necessary part of the museum, it does not constitute the museum in its own right. To ensure the adequate work of the museum organizing access to the museum's collection is a quite important part of the entire system. In the real museum, expositions, exhibitions, lectures, etc implements this feature. Our data model of a virtual museum provides the corresponding functionality in the block Lecture Hall. Two entities – Exposition and Lecture – form the basis of this block.

November 30 – December 2. Moscow. Gruber, M. R. Supporting the Reuse of Open Educational Resources through Open Standards. Paper presented at *the 18th International Conference on Computers in Education*, 2010, November 29 - December 3, Putrajaya, Malaysia.

Exposition is a thematic unification of Stands. Each of the Stands unites several exhibition objects. Exhibition Object is the museum object provided with additional information, which puts it into the context of a particular exhibition. We can say that the Exhibition Object is a sort of container for the Museum Object. Additional information for the exhibition object includes, first of all, an annotation, which can be formatted and can include context-sensitive relationships with other objects of the museum. In addition, the exhibition object can include audio information. The browser interfaces, Exhibitions, allow the user to view the exhibition as a "slide show." Viewing the exhibition with a sound track is particularly interesting in this mode. Such elements as annotating the exhibition and each stand, the option of a background image for the stand, etc. make the exhibition a powerful informational and artistic tool for displaying the museum collection of a virtual museum.

The other basic entity is Lecture. The metaphor of a lecture is tied with lectures and excursions of the museum (popular, attractive presentation of the material) and university lectures (presentation of the material according to the author's concept). The lecture is the first level of entering a specific topic. The lecture can contain hyperlinks to provide a more in-depth coverage of the topic. In general, a number of associations is defined in the model, which makes it possible to create an advanced hypertext space of the resource. Thus, the lecture may contain links to museum objects (including fragments of video), articles from the section "References," containing among other things detailed information on the phenomena of science and culture. BacReference article is the second level of immersion into a topic, which requires more extensive training and more specific interests of the user who works with the resource. The third level of immersion, also available through hyperlinks from the lecture, is a bibliographic link, leading to the full-text publication of an individual scholarly article or an entire book.

3. Model Implementation

For implementing the model, we built a content management system (CMS), directed at working with virtual museums and collections. The basic requirements for the CMS of virtual museums and the objectives of the CMS have been already analysed in the literature. The specific character of these systems does not permit using the most standard types of databases (for example, relational databases), and transfering the settings of CMS to the museum area at the level of the conceptual data model. The nature of this data, in particular, their dual documentary and factographic character, requires a special language for constructing a conceptual model, and, accordingly, a special layer over data storage, different from database management systems[9].

9 Lyapunova, N. A., Kazakov, V. G., Pishchik, B. N., Fedotov, A. M., & Fet, Ya. I. Creating A. A. Lyapunov Museum as a typical goal of publishing scholarly and educational collections on the Internet. *Vestnik, Quarterly Journal of Novosibirsk State University, Series: Information Technologies.* 2008, 6(4), 15-23. [Sozdanie virtualnogo muzeya A. A. Lyapunova kak tipichnaya zadacha publikatsii nauchno-obrazovatelnykh kollektsij v Internete].

We briefly describe our solution. The system of museum management is implemented on two levels. The control kernel of the CMS operates on the first level. This kernel is implemented as a three-tier client-server architecture with a web browser, acting as an universal software on the client side. A SQL server operating on the level of data storage represents the server side. The data model of the archive supports the specialized application server. This server, together with the web server constitutes the intermediate level.

However, the application server is designed in a very special way, radically different from the conventional implementations of such systems. It does not implement a specific data model at all. Instead, it may implement and interpet a whole number of data models represented in a certain way. In a sense, it implements a new type of databases. We use the notation "type" instead of "model" with respect to databases to avoid confusion with the data model. The opinion that the use of the term "data schema" instead of "data model" can solve this problem is not entirely justified, since, for example, we still have the conceptual and logical modeling, which continues to bring about some confusion.

The main distinction of the implemented type of databases is its hybrid nature. Its basis is a factographic relational database, which determines the contextual independence of the data and the possibility of working with them through structured queries.

Firstly, the implemented CMS engine has some features characteristic of object-oriented databases. The main feature is a representation of the entities by classes, which also include methods. The use of these methods for placing the templates of interfaces allows us to separate the specific data model from the engine of CMS and to integrate the interface level into the data model. In addition, such a property of object-oriented databases as class polymorphism makes it possible to split the entities into subtypes, and provides a convenient tool for developing a data model without a significant restructuring of the interface.

Secondly, the new type of databases implements associative context-sensitive links that make it possible to build a complex hypertext space of the information resource. These directed links are produced from a special type of attributes. The targets of these links are database objects. Associative links in the database have a typed form: each link is the instance of the Association that determines from which class to which class the link can lead. The engine can selectively process them according to the belonging of an associative link to a particular type.

We used the application server that implements the database management system in our metamodel for organizing the CMS of a virtual museum. The second part of the CMS is the data model of the virtual museum, described in the previous section.

3.1. Stages in Creating a Virtual Museum

The process of creating a virtual museum begins when the professor learns facilities of the development environment. On their basis, the professor designs his resource. After registration in the development environment, he can customize it to a particular subject area. The professor should create the types of museum objects, which in the

future will constitute the collections (the funds) of his museum, and set the description fields for each type. After that, the professor gets the shell of the museum customized for the typological classification of the objects he needs. The professor starts working with compiling the collections he needs. First, he sets the systematic classification of museum objects, and then enters the information about each of them, attaching a digital photo and filling out the fields of the description of the subject that was set up during the preceeding phase. During the next phase, the professor enters the main array of reference information. The professor does not have to fill out the reference sections of his museum, entering links to external Internet resources when the need arises. This makes it possible to avoid duplication of information, but complicates the creation of full-featured copies of the museum on offline forms (i.e. CD- and DVD-ROM copies) since in this case all links to external resources have to be removed as having no sense.

It is possible to enter additional museum objects and collections, or reference articles at any stage of the development and subsequent life of the resource. It is recommended to enter the main body of images and reference documents at once, since this information will form the basis for the resource, and most of the output forms of the virtual museum in the future will refer the user to this array of information. Next, whenever the professor wants, he can use in any sequence such features as publishing the full text of lectures with hyperlinks to images and reference materials, creating galleries (large thematic collections) of images or stands (blocks of 8–12 images and video clips with small text or audio, accompaning each of them) and exhibitions – sets of stands, united by the authors' concept.

An important means of improving effectiveness of the information systems for course support is the capacity for using study materials multiple times. The possibility of multiple use to a great extent is achieved by the data structure and is implemented through securing the extensible access to the system and ensuring a long lifetime of the system. The modular principle that underlies the creation of the objects in a virtual museum greatly facilitates the process of working with lectures, stands, and exhibitions. Thus, the author compiles the stand from museum objects, and every museum object may be simultaneously used in several stands. The exhibition is a composition of several stands and the same stand can also be used in several exhibitions. This allows the author to generate many new configurations of once designed modules.

One of the most important qualities of a virtual museum is its long life on a university server and support of its designers, the capacity for development and improvement in both its structure and content. This is important for professors in the Humanities, whose ideas undergo constant transformations during the teaching process. For updating the content (deleting, editing, entering new information nodes), adding announcements, or changing the artistic design, the professor does not need the help of developers or special expertise in software.

3.2. Electronic Study Guide, *History of Western European Culture of the 20th Century*

An example of how a virtual museum can be integrated into the learning process is the electronic study guide, History of Western European Culture of the 20th Century,[10] intended for graduate level training. Our previous experience in this domain is presented in Lyapunova, Kazakov, Pishchik, Fedotov, & Fet, 2008; Lyapunova et al, 2010. The study introduces the students to the main stages of fine arts, literature, music, and cinematography in Western European culture in close connection with the process of historical development. It presents the works of art and music as well as the most important texts of European literature and philosophy, and encourages the students to reflect on the ideological and cultural specificity of culture in the 20th century in the context of the European mentality.

Problems of the history of Western European culture, a comparative analysis of its various forms, and their dynamics, and the genesis of culture are revealed with the help of extensive reference and illustrative material. The study guide consists of sixteen thematic sections.

The Section Lecture Hall includes lectures, as well as exhibitions and stands dedicated to individual lectures. Each lecture is presented in the form of semantic units (equal to one screen), each of which is accompanied by an illustration. The text incorporates additional images through hyperlinks. In the Section Exhibitions illustrative material of the lectures is organized in thematic clusters and individual small stands. Textual commentaries, which supplement the lecture material, accompany each object of the stand. Stands are accessible from the corresponding part of the lecture.

Over two thousand images – a small amount for a digital repository, but very significant amount for a study guide – form the Sections Galleries and Illustrations. The Section Galleries provide extensive thematic collections of images. These images give an instant visual representation, unaccompanied by text, of the subject matter. The Section Illustrations supplies the option of browsing through all images that appear in the study guide. Their standard description as a museum object includes information on the date of creation and attribution of the original piece, its location, dimensions, materials, and method of execution. As usual hypertext links rule out reference information. The hyperlinks lead to the sections of the reference directory: Reference Articles, Persons, Bibliography. The Section Quotes is designed for highlighting individual cultural figures and more direct presentation of their main ideas.

The study guide presents the history of Western European literature, music, and arts in the context of Cultural Studies. The purpose of the professor was to ensure an integrative interdisciplinary approach to the problems of the history of culture and to provide a comprehensive view on the development of European culture in its diversity, in interaction with the social and historical context, and philosophical concepts.

---

10 The electronic study guide can be accessed on the website of Novosibirsk State University http://vixpo.nsu.ru/euculture. The Information and Computer Center of NSU has experience in designing virtual museum-based study guides in Archeology and History (see at http://vixpo.nsu.ru).

The resource supports several user pathways; so, a student can choice any of them. The sections of the resource – lectures, expositions, illustrations, library, etc. – have the same internal division according to sixteen main topics of the course. The student may start the introduction to the resource with any section.

The student is recommended to start with an average level of complexity that is with the lectures. Lectures consistently reveal the author's concept of a virtual museum intended for a senior student user. The lecture is the main information node for each topic of the course; it contains both pathways:

- from more popular and illustrative information (illustrations, stands, galleries);
- more complex material of reference articles and full-text publications on the subject.

If a student feels uncertain, he can start working with the resource from the Exhibition Section. He can view exhibitions, stands, and galleries of images for each subject of the course. Then, moving further to the lecture section, the student will have visual information on each topic and will be able to better navigate himself in the array of verbal information.

A user with a high level of expertise can start working directly with primary sources (academic and literary texts, paintings, sculpture, graphic art, etc.) and then move to the text of the lectures, and from there access the illustrations and reference information.

Based upon the professor's decision, work with the study guide can be removed from the lecture course and made a student's independent assignment. However, experience shows that students achieve the best results when independent work with the study guide is combined with its usage during the lectures. For doing this, the class should be held in a computer lab where each student logs into the resource from his workstation while the professor has the resource open on the big screen (the board). Referring to a particular source in the course of the lecture, the professor locates it in the virtual museum. This facilitates not only with later self-orientation in the resource for the students, but also with a better understanding of the current lecture. The need to switch between the space of the lecture hall and the space of the webpage and to absorb information of different types increases the intensity of communication between the students and the professor. The use of an electronic study guide of any kind during the lectures offers the same advantages.

Yet another advantage actually follows the nature of the virtual museum. It is an opportunity to alternate several levels of immersion in the same subject. First, there is the popular, attractive, and spectacular level, forming bright mnemotic images, which are the main content of the museum type of creativity embodied in stands, exhibitions, and galleries in the virtual museum. Second, there is the traditional university level with the corresponding traditional form of an author's lecture as the embodiment of a professor's creativity. Third, there is the level of scholarly research, which in the digital world corresponds to the databases of sources and digital libraries.

The form of the virtual museum is attractive, in the first place, due to its creative capacities such as playing with sources, justified from an educational point of view, and at the same time, it promotes popularization and rigorous scholarly reflection.

References

Aroyo, L., & Dicheva, D. The New Challenges for E-learning: The Educational Semantic Web. Educational Technology & Society. 2004, 7(4), 59-69.

Besser, H. The Next Stage: Moving from Isolated Digital Collections to Interoperable Digital Libraries. First Monday. 2002, 7(6), 3-5.

Daverio Ph. Il museo immaginato. Milan: Rizzoli, 2011.

Devedžić, V. Semantic Web and Education. In Springer's Integrated Series in Information Systems. Berlin: Springer, 2006.

Feng, M., & Heffernan, N. T. Towards Live Informing and Automatic Analying of Student Learning: Reporting in the Assistment System. Journal of Interactive Learning Research. 2007, 28(2), 207–230.

Ghiselli, C., Trombetta, A., Loris, B., & Binaghi, E. Semantic Web Meets Virtual Museums: The Domus Naturae Project. Paper presented at the International Conference on Digital Culture and Heritage, 2005, September 21-23. Paris.

Gibbs, K., Sani, M., & Thompson, J. Lifelong Learning in Museums, a European Handbook. Ferrara, Italy: EDISAI, 2007.

Goodall, S., Lewis, P. H., Martinez, K., Sinclair, P. A. S., Giorgini, F., Addis, M. J., Stevenson, J. Knowledge-Based Exploration of Multimedia Museum Collections. Paper presented at the European Workshop for the Integration of Knowledge, Semantics and Digital Media Technology, 2004, November 25-26. London.

Gruber, M. R. E-Learning im Museum und Archiv. Vermittlung von Kunst und Kultur im Informationszeitalter. Saarbrucken: VDM Verlag Dr. Muller, 2009.

Gruber, M. R. The Role of E-Learning in Arts and Cultural Heritage Education. In Hornung-Prähauser, V., & Luckmann, M., (Eds.), Kreativität und Innovationskompetenz im digitalen Netz – Creativity and Innovation Competencies in the Web, (pp. 343-350). Salzburg, Austria: Salzburg Research Forschungsgesellschaft m.b.H, 2009.

Gruber, M. R. Supporting the Reuse of Open Educational Resources through Open Standards. Paper presented at the 18th International Conference on Computers in Education, 2010, November 29 - December 3, Putrajaya, Malaysia.

Lyapunova, N. A., Kazakov, V. G., Pishchik, B. N., Fedotov, A. M., & Fet, Ya. I. Creating A. A. Lyapunov Museum as a typical goal of publishing scholarly and educational collections on the Internet. Vestnik, Quarterly Journal of Novosibirsk State University, Series: Information Technologies. 2008, 6(4), 15-23. [Sozdanie virtualnogo muzeya A. A. Lyapunova kak tipichnaya zadacha publikatsii nauchno-obrazovatelnykh kollektsij v internete].

Lyapunova, N. A., Kazakov, V. G., Pishchik, B. N., Panina N. L., Alekseeva, T. E., Popovich Yu. L., Fet, Ya. I. Virtual Museum of A. A. Lyapunov: main technological solutions. Vestnik, Quarterly Journal of Novosibirsk State University, Series: Information Technologies. 2010, 8(4), 97-105. [Virtualnyj muzej A. A. Lyapunova: osnovnye tekhnologicheskie resheniya].

Masterman, L. A Knowledge-Based Coach for Reasoning about Historical Causation. In Looi, C-K., McCalla, G., Bredeweg, B., & Breuker, J. (Eds.), Artificial Intelligence in Education: Supporting Learning through Intelligent and Socially Informed Technology. Amsterdam: IOS Press, 2005, pp. 89–98.

Panina, N. L., Emelianov, P. G., & Shelegina, O. V. Portal of Museums of SB RAS. Paper presented at the XII International Conference on Informational Society, Culture, and Education, 2009, November 30 – December 2. Moscow.

Peacock, D. The Information Revolution in Museums. In Marty, P., & Jones, K. B. (Eds.), Museum Informatics: People, Information, and Technology in Museums. New York: Routledge Publishing, 2008, pp. 59-76.

VIRTUALUS MUZIEJUS DĖSTANT KULTŪROS DALYKUS

Nina Panina, Vladislav Kazakov, Natalia Bartosh

Novosibirsko universitetas, Rusija

Pavel Emelyanov

Informacinių sistemų institutas, Novosibirskas, Rusija

Santrauka*. Straipsnyje pateikiama virtualaus kultūros muziejaus samprata. Aprašoma tokio pobūdžio muziejaus duomenų modelis, jo dalys bei turinio valdymo sistema. Skirstydami duomenų dalis į potipius ir pasitelkdami klasių polimorfizmą, galime pritaikyti modelį tinkamai muziejaus/dalyko sričiai. Modelis susideda iš kelių klasių grupių, apimančių skirtingus informacinius šaltinius. Kiekviena grupė formuojama apie bazinę dalį, atitinkančią muziejaus teikiamos informacijos apie objektus tipą. Autoriai pademonstruoja, kaip taikant šią metodologiją diegiama elektroninė rodyklė temai „XX a. Vakarų Europos kultūros istorija“, sudarytai kaip papildoma priemonė Novosibirsko valstybinio universiteto antrojo studijų ciklo studentams. Programa leidžia plėtoti įvairias edukacines trajektorijas ir rinktis skirtingo sudėtingumo lygmenis. Dėstytojai gali naudoti šią programą per paskaitas arba rekomenduoti ją studentams savarankiškam mokymuisi. Geriausi rezultatai pasiekiami, kai savarankiškas darbas su šaltiniais yra derinamas su šio įrankio naudojimu paskaitų metu.*

Reikšminiai žodžiai*: virtualus muziejus, duomenų modelis, turinio valdymo sistema, elektroninių studijų vadovas.*

Nina Panina, Novosibirsko valstybinio universiteto Kultūros istorijos katedros docentė, daktarė. Mokslinių tyrimų kryptys: vizualioji reprezentacija, informacinės sitemos, duomenų modeliavimas, e.mokymasis.

Nina Panina, Novosibirsk State University, Department of History of Culture, Associate Professor, Doctor. Research interests: visual representation, information systems, data modeling, e-learning.

Vladislav Kazakov, Novosibirsko valstybinio universiteto Multimedijų katedros daktaras. Mokslinių tyrimų kryptys: informacinės sistemos, duomenų bazės, e.mokymasis.

Vladislav Kazakov, Novosibirsk State University, Department of Multimedia, Doctor. Research interests: information systems, data bases, e-learning.

Natalia Bartosh, Novosibirsko valstybinio universiteto Kultūros istorijos katedros docentė, daktarė. Mokslinių tyrimų kryptys: modernusis menas, Art Nouveau, e.mokymasis.

Natalia Bartosh, Novosibirsk State University, Department of History of Culture, Associate Professor, Doctor. Research interests: modern Aart, Art Nouveau, e-learning.

Pavel Emelyanov, Novosibirsko informacinių sistemų instituto vyresnysis tyrėjas. Mokslinių tyrimų kryptys: informacinės sistemos, semantinė analizė, programos reinžinierija, kombinatorinės problemos ir algoritmai.

Pavel Emelyanov, Institute of Informatics Systems, Novosibirsk, Senior Researcher. Research interests: information systems, semantic analysis, program reengineering, combinatorial problems and algorithms.