THE MECHANISM FOR THE IMPLEMENTATION OF DIGITAL EDUCATIONAL RESOURCES IN THE "E-LEARNING" SYSTEM

Saule Kudubayeva, PhD
A. Baitursynov Kostanay State University, Kostanay, Kazakhstan

Abstract

The problems of implementing e-learning through the integration of teaching and information and communication technologies that radically increase the effectiveness of training and massive quality education. Sets out requirements for the characteristics of the system being interconnections with adjacent systems for the storage and use of digital learning resources (DLRs). The requirements to be met by DLR, placed on the portal «e-learning».

Keywords: E-learning, digital educational resources, national and regional server, web service

Introduction

According to the State Program for education development of the Republic of Kazakhstan for 2011-2020, the e-learning system will cover more than 70% of all schools in the whole country, sets priorities to create an unified informational environment. In particular, the necessity to "create a framework for an unified system of information and academic support of education and industry to create an information system for efficient object management and education processes." [1].

In Kazakhstan, the e-learning system has recently received the official recognition, it is actually represented as a separate section of the State Program of Education Development. The Education Development strategy (XXI century) aimed at the graduates training, whose principles must be "life-long learning" based on mobile info communicational interaction in the open information and educational space.

The platform for their studies in school today is a new paradigm of learning as the info communication legitimate objective process.

The mechanism for the transition to a new paradigm of education is based on e-learning and pedagogical integration of information and communication technologies, it provides the radical in the effectiveness of training and massive qualitative education.

Through e-learning goes the process of transformation of the traditional educational process in the acquisition of cognitive activity in the first place, of course, knowledge and skills in the subject studied, but beside of that also universal - such as searching, selection, analysis and presentation of information using the information for solving specific tasks in life, the ways of interaction in infocommunication, which are part of the personal information culture, so it's considered to be very necessary for full life and work in the information society.

The researchers in Western countries, however, that have already gained some experience in e-learning, express concerns saying that the e-learning expectations have been hugely exaggerated, and the e-learning development in the West is in crisis (Romiszowski, Woodill, etc.) [2,4].

The main reason for this, the researchers saw the wrong strategy in choosing, the rate of infrastructure development, network technology, the lack of methodological approaches to the development of the content and methods of e-learning courses.

In main, e-learning is developed by technical experts but no teachers, that leads to focus our attention on infrastructure development rather than on the development of educational content. The result of the content analysis of e-learning centers websites provides Woodill with the conclusion that only 73 companies of 1004 have mentioned on applied learning theories or methods. [2].

Contrary to the practice of e-learning systems of other countries, Kazakhstan plans to carry out in the unity of its backbone subsystems represented in the State Program for education development of the Republic of Kazakhstan for 2011-2020 years.

Digital learning resources (DLRs) are the foundation of e-learning. In this regard, the study of the mechanism of their development and usage raises an important task of modernization of the educational process and its technical support. For many teachers, a modern multimedia computer is a reliable assistant and effective training tool in teaching various school subjects. But the computer itself is useless if there is no access to information: it doesn't have the access to modern electronic resources in the Internet or on CDs. Using qualitative DLRs by teacher makes real to obtain adequate modern education for students.

Creation of digital educational resources is considered as one of the main direction of all education forms and levels informatization in Kazakhstan. Information technology development services in education, including the DLR and methodical software production, along with the creation and development of telecommunication structures of some educational institutions and the industry, quality systems of education is the basis of forming the infrastructure of education informatization.

Under DLR it's understood an information source containing graphics, text, digital data, voice, music, video, photo and other information aimed at meeting the goals and objectives of modern education. In one digital educational resource can be allocated informational (or informational and reference) sources, tools intended for information creation and management, various control elements.

Requirements for the system interconnections characteristics with adjacent systems for DLR storing and usage

The application-level interaction protocols should be based on the XML specifications. The XML usage is the guarantee of systems independence in the national information infrastructure even in case of using different software solution vendors services. Thus, it should ensure the mechanism of information resources development in the future.

In the process of creation and development, the appropriate standard meta descriptions should be developed for each type of document or message that the system uses to communicate, using standardized metadata types and in accordance with the specifications of XML.

XML should be used as a standard representation of the transmitted data.

The system should provide the support of XML-driven objects using built-in tools which provide at least following functions:

- reuse simplification;
- processing (DTD or schema);
- business-rules installation;
- storage functionality;
- attributes automatic filling;
- personalization and classification;
- references management;
- keeping all related files;

- life-cycle and access rights management.

For interaction with ministerial bodies informational systems the given system should provide the following functionality:

- developed Web services systems availability;
- Web services systems descriptions availability;
- interfaces to interact using message exchanging methods;
- the ability to process messages in accordance with the established rules and policies.

Conjugation of the information systems of state bodies should be ensured by the presence of the following components:

- information systems of state agencies adapter interface, they should be data exchange standards compliant;
- Web services that implement the functionality of public services as well as services provided by other government agencies;
- Web-based services descriptions;

The integration with the government agencies information systems and educational institutions should be implemented in two ways:

- integration of the messaging layer;
- integration using Web services.

Integration with using Web services for sharing DLRs

In this method the service-oriented approach should be used. Using loosely-coupled messages as a part of the integration server should minimize the relations between available resources and portal applications. Implementing changes to existing resources or portal applications should be possible without affecting the main system.

State agencies informational systems interfaces that implement interactive services are recommended to determine using open standards Web services. The usage of XML-based interfaces among existing applications and portal applications limits the technology dependency and diminishes vendor lock-in possibilities.

As the transport for delivering the messages should be used a protocol such as HTTP, HTTPS or SMTP. The document description and messages language should be XML. The message delivery between services should be organized using message envelopes reflected in SOAP standard. The body of the message should describe where and from whom the message is sent, regardless of the transport protocol used.

The structure itself and the syntax of the interface messages that are sent between the services should be described using an XML-schema and WSDL languages.

To be able to find a web service from other available web services, the special web services registry keeping their metadata should be implemented. It should be created using UDDI specifications.

Main components of the DLR repository on an e-learning server

The national and regional servers can host a variety of digital learning resources (DLRs) - a set of data in digital form which is applicable for use at the classes. Mainly, they are simple DLRs(elementary DLRs) suitable for using as a whole, and this doesn't allow the division into separate elements that can be used independently.

Examples of simple DLRs:

- an article written in MS Word, HTML with images, a PDF document, etc.;
- a JPEG picture;
- a JPEG picture with accompanying text in HTML format;
- a book as a collection of scanned pages in GIF format with TOC arranged in HTML;
- a HTML book (a HTML file set and associated images);

- a MP3 audio file;
- a DivX video file;
- a MS Power Point presentation;
- a separate media object of the course run on a specified technology platform.

Each DLR will be accompanied with a number of associated components:

A rubricator is the formal representation of the tree section. The rubricator includes the following basic elements: an ID in the parent partition identifier, the actual partition ID, and the name of the partition. In storage, two rubricator types are determined: storage rubricators and DLR rubricators.

Storage rubricators are "Class", "Subject" and "Subject categories" rubricator classifications are mandatory for all DLRs and should comply with the applied national standards. The auxiliary rubricators are "DLR type", "Collections description", "DLRs suppliers", "Rubricator types". All storage rubricators ("Class", "Subject", "Subject categories", "DLR type", "Collections description", "DLRs suppliers" and "Rubricator types") should be present in the DLR store.

DLR Rubricators are the rubricators relevant to textbooks content and lessons planning. They are provided by DLR suppliers, and each of them should be bound to a specific class of school education and a subject in accordance with national standards. It is important to distinguish the content of textbooks from lesson planning and take into account that between them can be relations.

A collection is a rubricator or a list of selected editorial resources on a certain topic or subject. It may not contain a single column, in this particular case, all the resources presented there are linked to the root - the name of the collection.

DLR declaration is the description of the DLR content and structure in SCORM form. For simple resources it is necessary to specify the startup file. The declaration file name is regulated: imsmanifest.xml.

DLR startup file is a file (HTML, image, etc.) from which an user should begin using the resource. It can be viewed using a standard Web browser (MS Internet Explorer or Mozilla). For those DLRs which require additional software installation, a special HTML file with instructions is placed. The software itself is not included to the resource but a Web address reference from which it can be downloaded. It is usually provided in the guide that comes along with the resource.

DLR metadata (description) is a DLR formalized description sufficient to search, select an understanding the details of the DLR properties, its purpose and usage. As the DLR metadata model a subset of IMS LOM standard is used: http://school-collection.informika.ru/develop/spec/#. The metadata file name can be chosen by resource supplier and is indicated in DLR declaration.

DLR ordered set is a set of educational resources described by the DLR declaration and intended for serial passage all of its member resources. The resources in ordered set can be physically located in the same zip-archive with manifest file (imsmanifest.xml), or in an external zip-archive. In this case, simple DLR references are set in the manifest file. The case of external links declaration isn't shown in this article.

A test exercise (complete description, full specification and sample test questions are given in the test description rules) is an ordered set of DLR, including test questions. Test questions are designed to control or exercise testing. The final result of the test is calculated based on estimates of the test questions and can be automatically put into the unified journal. It is also possible to include into a test job ordinary resources which are not test questions, but at least one test question should present in the test job. In the simplest case, a test job can consist of one test question.

DLR exchange format specifications

Before exchanging and placing in a public repository procedures, a DLR file, declaration and metadata files should be packed together into a PKZip v2.04g (.zip) archive file, or into a ZIP file according official RFC1951 specifications.

The archive file contains a resource in the form of a set of files and directories. The declaration (imsmanifest.xml), metadata and DLR startup files are mandatory. Metadata file name is specified in the declaration: LOM_resource.xml in case of DLRs, and LOM_rubricator.xml in case of rubricators. The startup file should be regulated in the list of files and should be set in the "href" attribute of the "<resource>" item. The specification leaves the choice of file names for DLR suppliers, but requires that file names in the archive can only include letters, numbers and '-','_','.' ,'[',']','+','(',')' symbols. Other characters are prohibited in file names. The slash symbol ('/', Unix-style slash) should be used as the directory and file names delimiter.

Each DLR or DLR rubricator is assigned with a global unique identifier (GUID). The GUID value is generated during DLR creation, and remains unchanged for all next versions of DLR resource.

The archive file names will be different in case of transfer of resource and DLR rubricator. For DLR, the name is "DL_RES_<GUID>.zip", for the rubricator is "DL_RUB_<GUID>.zip" The abbreviation DL_RES relates to the phrase "digital learning resource", and DL_RUB to "digital learning rubricator" accordingly.

Examples of global unique identifiers:

fd0c4110-f204-11d9-8cd6-0800200c9a66

8559d902-7b97-7ddc-8fb4-11381f2b6369

An example of a file containing packed DLR:

DL_RES_fd0c4110-f204-11d9-8cd6-0800200c9a66.zip

An example of a file containing packed DLR rubricator:

DL_RUB_8559d902-7b97-7ddc-8fb4-11381f2b6369.zip

Each DLR or rubricator should have their own GUID assigned to them during the creation. The GUID in the XML description of the resource should match the GUID in the name of ZIP archive. The file containing an image of the resource and named "preview.png" (100x100 pixels) from archive can be used for preview purposes in search results.

DLR declaration specification

During DLR resources placement in central portal repository, there are XML files storing unique information on each shared resource are created. The appropriate namespace is reserved for each file.

Benefits and possible working issues of DLR storage

At the moment, the XML database is the most stable in production, and considered as high-speed and stable enough to possible external attacks. These databases can easily convert their reports to the most popular *.xls, *.doc data formats by request.

Such databases, however, would be very demanding on the central server and local storage hardware and software. If the program installation goes with using an XML database, it's worth to clarify technical specifications of hardware equipment according the following parameters, at first:

- the total size of stored data - at least 1 Tb;
- allowable response time for elementary search terms - no more than 4 sec (load up to 10 requests per second);
- allowable downtime during a single server restore - less than 60 minutes. The overall probability of storage availability, in general - not less than 0,99;

- 100 Mb/s connection channel to the Internet.

DLR developers should consider that the resources placed to the repository need to be stored in declared formats only.

Conclusion

In this article:

- analyzed the central and local DLR storages databases software maintenance;
- set a number of mandatory requirements for DLR database storage servers;
- determined the requirements to be met by DLR placed on the e-learning portal.

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