

## ANALYSIS OF CONSTRUCTION PRINCIPLES OF DISTANCE LEARNING SYSTEM INSTRUMENTAL ENVIRONMENT

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**Summary.** Development and application of current distance learning system is described. Instrumental environment's functionality is marked out: system functions, instructor's instruments, student's instruments, knowledge control system. The analysis of the content and construction principles of instrumental environment for creation and support of distance learning process is made.

**Key words:** distance learning, system functions, instruments, interactive systems.

### INTRODUCTION

Nowadays alongside with traditional educational process many educational institutions begin to use distance learning technologies more intensively. Distance learning advantages in comparison with traditional forms of educational process organization shows that distance learning enables to: organize the educational process in the most efficient way (without leaving the place of residence, in the process of production activity, under the individual schedule and depending on individual needs), reduce the cost of training, improve the education quality by implementing unique educational programs and combining courses, remove the moral age restrictions [Agaponov 2003]. Distance learning enables to preserve the accumulated experience and didactic materials for the future generations.

The use of distance learning is connected with the need to improve the education quality in universities, especially the part-time studies.

Distance learning problems are the subject of the research for specialists of various scientific fields [Kozlakova 2002]. Thus, the research in distance learning sphere is lead in many Ukrainian and Russian universities: International Research and Educational Center of Information Technologies and Systems (subdivision of V.M. Glushkov Cyber Center), virtual distance learning laboratory of Kharkov Technical University of Radioelectronics, Research Institute of Educational Technologies in Moscow State University of Economics, Statistics and Informatics (A.A.Andreyev), Moscow State K.E. Tsiolkovsky Aviation Technical University (S.M. Avdoshyn),

Moscow Institute of Electronics and Mathematics (S.M. Moiseyev), Moscow State Experimental Center of Computer Training (V.L. Latyshev).

Though the majority of publications are concerned only with the didactic aspect of distance learning, informational and organizational-methodological directions are not less important. Education quality depends on the way the distance learning course is organized in the aspect of information flows transmission [Andreyev 1999]. The problem of creation, control and updating of the content of distance learning courses in methodological aspect requires special study.

## OBJECTS AND PROBLEMS

The aim of this article is to make analysis of structure and principles of instrumental environment construction for distance learning courses creating and support. Approaches to e-learning creation technology and environments are considered in the article. Development and implementation of the current system of the distance learning process support is described.

Introduction of distance learning technologies does not always go smoothly. Traditional educational process, as it is well known, consists of the following elements: purpose of training, learning content, students, teachers, methods, means and forms of training, control and correction.

Distance learning process peculiarities' analysis shows the actual functioning of a larger number of elements, as well as changing the content of some traditional. Additionally included elements represent normative-legal, financial and economic, identification-control and marketing systems. Certainly, these subsystems are present in implicit form with varying degrees of detailing in canonical educational system too, but their significance for the normal course of the pedagogical process is not as principled as when it comes to distance learning [Polat 1998].

Modern researchers agree that the best assistant in distance learning technologies implementation is the Internet global web [Soldatkin 2003]. Modern Internet is a hypermedia system of information presentation, interactive environment containing material that needs analysis and is capable to assess the user's actions and provide the feedback immediately.

Distance learning course oriented on the Internet contains a large number of text materials, graphics and multimedia. Different parts of distance learning course are connected by hypertext links (hyperlinks). But the number of connections in normal distance learning course may become so large that manual linking is no longer acceptable as the courses' structure may be lost. In addition, Internet oriented distance learning uses a large number of new network technologies such as: public bulletin boards, forums, chats, interactive knowledge control systems, etc. [Dyadychev 2010].

The solution to this problem is to develop automated tools of distance learning technology organization. At the moment large number of instrumental shells of distance learning courses' development and support are known. The most famous of them are western systems Blackboard, eCollege.com, TopClass, WebCT, IVLE, Virtual-U and others [Ignatiev 2004]. The given systems have a big disadvantage – their ownership cost is very high. There are also shareware western and domestic developments which

may be used at the initial stage of distance learning organization. However, if to summarize the requirements to the work of distance learning instrumental shell, significant flaws may be found at once. Firstly, it is not full coverage of functionality of the distance learning system oriented on the Internet. Secondly, it is the complexity of localization. Thirdly, it is inability to enhance the functionality by means of new modules adding (in many cases the given peculiarity is available in commercial version), etc. More detailed analysis is beyond the scope of this article.

To achieve the necessary functionality and ability to develop further the instrumental shell of distance learning courses' design and support there was integrated system of distance learning process support developed. It got the name of XML Education System Framework (XESF). This software is called so because its functioning is based on several advanced technologies, the main of which is XML. XSLT, Perl-CGI, DHTML are used also. The shell is created by the modular principle, and therefore it easily provides the further extension of software product functionality (fig.1).

Let us count the main XESF facilities at the moment. They are collected in three groups: system functions, tutor's instruments and student's instruments.

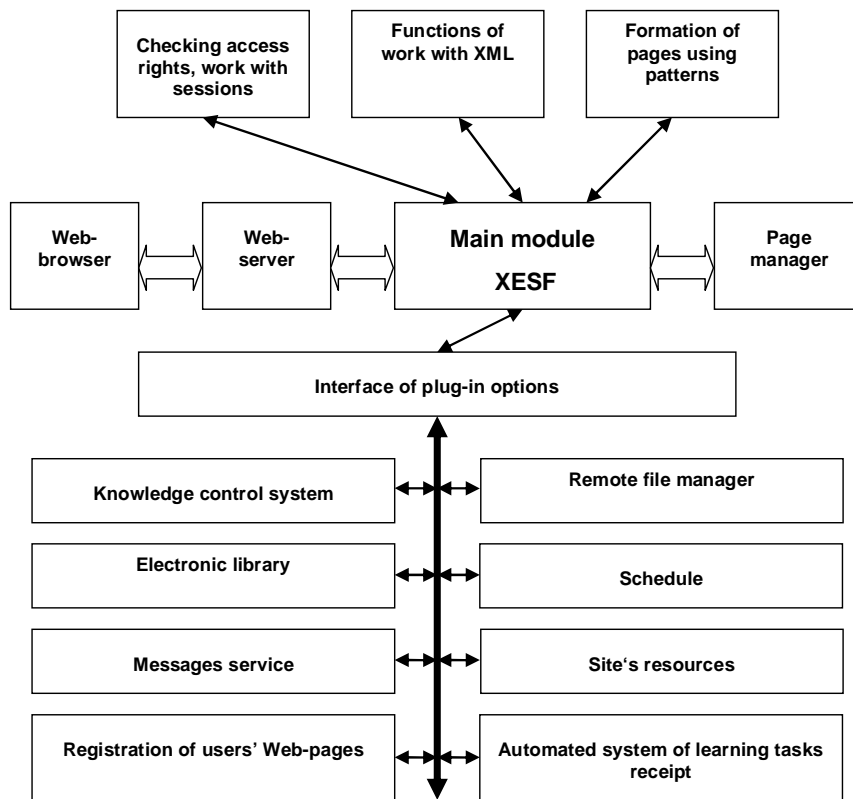


Fig.1. Scheme of XESF system's work

**Student's instruments**

1. Personal identification of students (at every moment of time the system "knows" who is working with it and therefore is capable to control user's actions).
2. Personal e-mail (it is not the part of distance learning system as the most convenient form of e-mail organization is using of special e-mail clients).
3. Access to materials interface description (integrated assistance system is implemented).
4. Message board (by means of this tool any student can send a message to all students, group of students, all teachers or someone personally (a teacher or a student)).
5. Personal file space with simple way to download files.
6. Rating system.
7. Ability to pass tests in the training mode (no time control, etc.).
8. Publication of the work results and other materials by students.
9. Electronic library with integrated navigation system.
10. Distribution of access to educational materials (student or group can see only those courses (sections, materials) which they have access to).
11. Distribution of access depending on time.

**Tutor's instruments**

1. Ability to add materials efficiently (implemented by means of FTP).
2. Unified design.
3. Configurable look (implemented by means of using patterns).
4. Support of multiple formats of information representation: regular text – TXT, HTML, XML or launching of special program of materials display.
5. Ability to preview.
6. Sections hierarchy (navigation on courses and their materials is fulfilled by means of the hierarchy tree).
7. Testing (specialized interactive testing system (look further)).
8. Summing up the learning process.

**System functions**

1. Subprograms of forming content on the basis of patterns.
2. Subprograms of XML conversion by means of XSLT. XML format is the main format of data storage and/or transfer.
3. Subprograms of distance learning site sections hierarchy support.
4. Subprograms of personal student's identification and means of access restriction.
5. Plug-in options support functions.
6. Subprograms of administration.

**Peculiarities of knowledge control system**

1. Representation of introduction, general information about text and conclusion, interpretation of the test results.
2. Support of different types of questions: choosing one option among many others, choosing many options among many others, short answer, active image creating.
3. Prompts to the tested person.

4. Flexible evaluation system, opportunity to set number of points for each question: for the correct answer, not correct answer or for the prompt, or to use the default settings.
5. Ability to set the number of tries for answer to each question.
6. Easy work with the multimedia content through hyperlinks.
7. Configurable reaction in case of the correct or not correct answer and even in choosing of concrete variant.
8. Ability to set time limit (by tools of the system).
9. Random mixing of questions and answer variants sequence.
10. Ability to store the test results and collect statistics (when working jointly with tools of identification).
11. Ability to set required number of questions for certain test from the general base.
12. Program working with data base for tests creation, storage and control.
13. Easy textual XML format for storing ready tests.

Currently the XESF system is used by students of both part-time and full-time students, the informational filling of the system and new courses creation are in process, the creation of distance learning groups is planned.

## CONCLUSIONS

The analysis of the content of instrumental environment of distance learning courses support on the basis of several commercial and shareware distance learning systems was made in the article. General principles of the similar environments' structure were identified; the implementation of the XESF instrumental system of distance learning support was described.

The promising directions of the given problem's study are: improvement of constructing techniques of instrumental environments of distance learning support, ways of organization of interaction between different environments.

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#### **АНАЛИЗ ПРИНЦИПОВ ПОСТРОЕНИЯ ИНСТРУМЕНТАЛЬНОЙ СРЕДЫ СИСТЕМЫ ДИСТАНЦИОННОГО ОБУЧЕНИЯ**

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**Аннотация.** Описана разработка и применение действующей системы дистанционного обучения. Выделена функциональность инструментальной среды: системные функции, инструментарий инструктора, инструментарий студента, система контроля знаний. Проведен анализ состава и принципов построения инструментальной среды для создания и поддержки процесса дистанционного обучения.

**Ключевые слова:** дистанционное обучение, системные функции, инструментарий, интерактивные системы