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EVALUATION METRICS OF ELECTRONIC LEARNING RESOURCES QUALITY

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The results of measuring modeling of educational materials qualitative characteristics for monitoring providing of electronic learning information resources quality of institution of higher education are presented. Distance learning system «Kherson Virtual University» is used as illustration.

Keywords: *types, metrics, criteria of quality of electronic training resources, distance learning, quality control monitoring.*

Introduction

Education quality maintenance is one of priority problems of an education system of Ukraine. It can be reached by implementation of quality monitoring system of educational process and educational services quality, in particular distance learning. One of objects of the quality analysis of educational process is electronic information resources (EIR), providing educational process. In particular, electronic tutorials are the one of the major and most often used EIR.

Electronic tutorials have both a number of advantages, and disadvantages. Among advantages it is possible to note:

- Use of the multimedia technologies, allowing to make the maintenance more demonstrable, clear, interesting;
- Possibility to create an educational resource with use of the dynamic modules allowing the pupil to consider the studied phenomenon from the different sides;
- Possibility to model studied processes and to experiment;
- Use of testing and self-examination of pupils knowledge;
- Possibility to organize independent work of pupils, to give contextual references and so on, that it is impossible to realize on the paper medium;
- Use of the hypertext links, allowing executing instant transition in the necessary place of the document.

One of the main advantages of electronic tutorials is possibility to organize virtual laboratory work which cannot be conduct in real conditions for whatever reasons.

Among the basic disadvantage of electronic tutorials it is possible to note:

- In most cases the absence of concept which lies in creation of the electronic tutorial;
- The majority of electronic textbooks (materials) represent simplified manuals, which cannot become a source of system, profound knowledge;
- Frequently unsatisfactory perception of the text information on the screen, especially not structured educational material and badly formatted text;
- Methodically not considered, incomplete giving of a teaching material. Pupils have difficulties with processing, ordering and learning of educational material;
- Redundant and inappropriate use of multimedia means, which distract and do not allow pupils to concentrate;
- Large quantity of the presented textbooks is hypertext analogues of usual textbooks.

The presence of the listed advantages and disadvantages defines a quality degree of electronic tutorials.

It is possible to allocate the basic criteria of quality of the electronic tutorial:

- High quality of a substantial part;
- Presence of the certain concept at creation and in use of the presented electronic educational products and completeness of maintenance with information resources of studied disciplines;

- Presence of such essential properties, which can be realized exclusively by electronic means.

Learning process quality with use of information-communication technologies directly depends on quality EIR, providing educational process.

In work [1] the results of quality criteria analysis and designing of system of quality monitoring of EIR in distance learning system «Kherson Virtual University», developed in the Kherson State University are presented. Methods of monitoring EIR to a functional identifier and criterion of EIR compatibility with the universal international standards such as IMS, SCORM [2] are considered. The basic conclusions of work [1] are following: system of quality monitoring of EIR is based on multicriterion analysis of these resources conformity to the universal educational standards. Classification principles allow considering separate characteristics of electronic means of educational appointment for conducting of quality monitoring of EIR as a whole. The compatibility EIR with standards IMS, SCORM can be chosen as criterion of quality. One of identifiers of compatibility EIR with international standards IMS, SCORM is the satisfaction of organizational-technical requirements unifications of educational-information resources, techniques of learning process, an exchange of educational materials between DLS.

The purpose of the present work is modeling of quality monitoring process of EIR on the basis of the metrics analysis and construction of EIR model estimation taking into account all basic classification identifiers.

Quality monitoring of EIR can be conduct by the functional identifier, defining value and place of EIR in educational process; by the structure; by the text organization; by character of the represented information; under the statement form; by special-purpose designation; by presence of a printing equivalent; by the nature of the basic information; by technology of distribution; by the character of interaction of the user and the electronic edition. Results of quality monitoring of EIR can be used in competitions by definition of the best structural departments of institute of higher education.

Types of EIR

Four groups of the educational information resources, differentiated to a functional identifier, which defines their value and the place in educational process, are distinguished [3]:

- Program-methodical (curricula and syllabus);
- Educational-methodical (the methodical instructions, containing materials in learning technique of subject, course learning, performance of project and degree works);
- Training (textbooks, manuals, texts of lectures, abstracts of lectures);
- Auxiliary (practical works, collections of exercises, encyclopedias, reading books, books for reading);
- Supervising (testing programs, databases).

Each group of EIR has the distinctive features and the parameters defining quality of this or that educational information resource [4]. So, most often educational EIR is the electronic textbook (course of lectures), which refers to educational resources. Among the parameters defining quality of the electronic textbook it is possible to allocate the completeness of representation and coherence of learning information materials, presence of the control-reference information, the conformity to the maintenance of the working program, structuring and sequence of material, ergonomics of the text, presentation of material: text formatting, the use of tables, charts, drawings, illustrations and so on.

The use of multimedia possibilities, interactive systems and modules, modeling possibility, and also testing use, possibility of knowledge monitoring, self-checking has the special importance.

Completeness of the electronic textbook assumes the presence of following additional information resources:

- Title page of textbook;
- The summary (it is desirable);
- The course program;
- The list of abbreviations (if it is available);
- The list of illustrations;

- Information about the author;
- Actually texts of heads № 1, 2, 3, …;
- The list of the recommended literature on themes;
- The list of the quoted literature in the end of a course;
- Appendices (the list of statutory acts, decrees, decisions if they are available).

Besides the electronic textbook the important role is played by a control-reference part of resource maintenance of the course, which should contain:

- The list of questions and tasks for self-examination studied to each theme-head, section and to all course (or the list of questions and tasks for computer training in the multimedia environment);
- Themes of projects and reports;
- The approximate list of examination questions at all course (or test);
- The chronological index (if it is available);
- The index of names (if it is available);
- The subject index (if it is available);
- The dictionary of terms;
- Methodical instructions (or recommendations).

Among all EIR distance learning course play the special role. It is the basic educational object, which is used in distance learning. It is compound learning object, which unites various EIR with the purpose of learning process organization with use of special program environments – distance learning systems (fig. 1). The example of such program environment, which allows creating, saving and using distance courses, is DLS «Kherson Virtual University» [5].

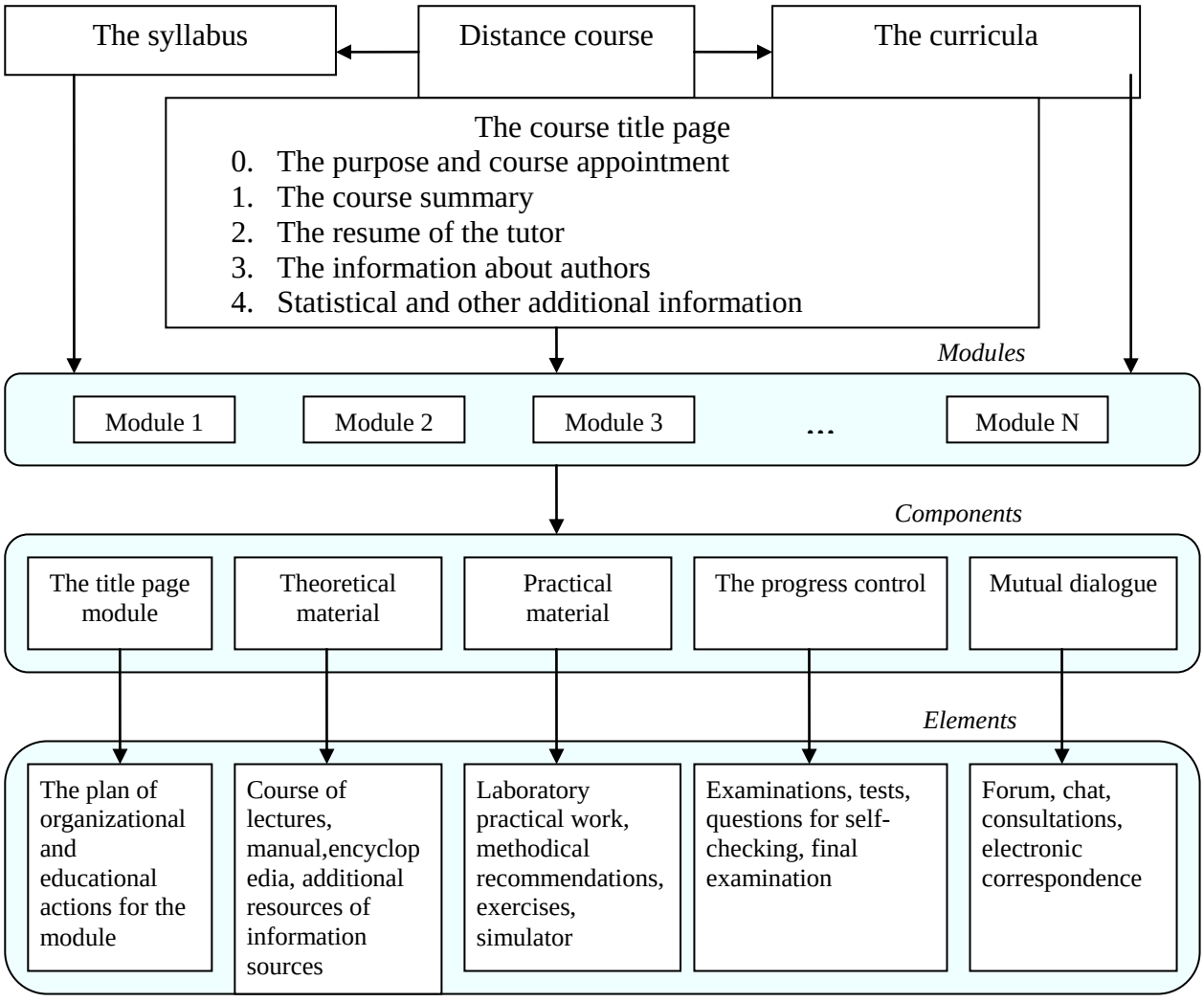

Fig. 1. Structure of distance learning course

Thus, EIR should be differentiated depending on their type. First of all, it concerns expenditures of labor on creation of these resources, both time, and intellectual. Therefore at quality estimation of concrete EIR it is necessary to start with some generalized criterion of labor input of its creation, which can be expressed by weight coefficient (tab. 1). It is necessary to notice, that depending on type the educational information resources have as the general, and the distinctive quality criteria, which are expressed by quality indicators (tab. 2).

Quality Criteria of EIR

The quality monitoring system of EIR can be based on multicriterion analysis of conformity of these resources to the universal educational standards.

Classification principles allow considering the separate characteristics of electronic means of educational appointment for conducting of quality monitoring of EIR as a whole. The compatibility of EIR with standards IMS, SCORM [1] can be quality criterion.

The specification of IMS is the information model of educational objects description. It defines the standardized set of information blocks, which contains data about the educational resource. The IMS-package, which contains educational object, consists of two main elements [6]:

- The IMS-manifesto – a special file, which describes the base resources, the maintenance and the organization of educational object (it is represented in language XML);
- Physical files, which make educational object.

So, above mentioned program-methodical, educational, additional, supervising EIR can be checked up by the criterion of conformity to specifications of IMS standard.

Let's pass to construction of the general criterion of EIR quality. As a base of quality criterion output we will accept the universal approach based on consideration of the average weighted factor of quality $K = (a_1k_1 + a_2k_2 + \ldots + a_nk_n)/n$, where a_i – average value of quality indicators, k_i – value of weight factor of *i-type* resource.

The general quality criterion of EIR can be calculated under the formula $K_э = \sum_{i=1}^{N} a_i t_i$. Here $a_i = n_i \cdot \gamma_i$ – quality metrics, n_i – weight factor (tab. 1), $\gamma_i = \sum_{j=1}^{m_i} k_{ij} / k_{i0}$ – average factor of quality, m_i – quantity of quality metric indicators, k_{ij} – quality *j*-indicator (tab. 2), k_{i0} – the greatest possible value of quality indicator, t_i – the generalized quality factor of *i-type* resource, N – quantity of EIR.

It is necessary to put into consideration relative average criterion of quality $K_в = K_э / N$, for definition of the faculties and chairs ratings of a higher educational institution

Quality monitoring of EIR in distance learning system «Kherson Virtual University»

The system of quality monitoring of EIR in DLS «Kherson Virtual University» is based on multicriterion analysis of conformity of these resources to the universal educational standards [1]. All resources of electronic library were estimated by criterion $K_в$ with values of weight factor from tab. 1 and indicators of quality from tab. 2. Values of factors and indicators in the resulted tables represent relative values, are the result of work of experts commission, and are offered to use by the methodical commission in computer science of scientific research institute of information technologies KSU.

Table 1.

Types of resources

№	The name of EIR type	The description	Weight factor
1	2	3	4
1.	Course of lectures	Full subject course of lectures	5
2.	The plan-abstract of course of lectures, laboratory and practical works	Annotations of lectures, laboratory and practical works	2
3.	Methodical instructions to conducting seminars and laboratory works	The full description of seminars, laboratory and practical works	4

1	2	3	4
4.	Test	Full set of questions with right answers	5
5.	The working program of course	It is confirmed in discipline	1
6.	Examination and self-checking questions	According to the working program	1
7.	Laboratory work	Virtual laboratory works in subject	5
8.	The collection of exercises, the dictionary	Quantity	3
9.	The methodical manual	The electronic methodical manual in subject	5
10.	The encyclopedia	The methodical manual in subject in the form of the electronic encyclopedia	5
11.	Distance course in subject	Corresponds to the international standards	20

Table 2.

Quality Criteria of EIR

№	*Criterion name* *Description*	*Measure units*	*Quality indicator*
1	*2*	*3*	*4*
1.	Completeness of subject methodical maintenance: Full – the working program, lectures, practice, tests, examination questions; Incomplete – absence of 1st indication; Average – absence of 2 indications; Below an average – presence only 2 indications; Insufficient – presence only 1st indication	1. Full 2. Incomplete 3. An average 4. Below an average 5. Insufficient	5 4 3 2 1
2.	Authorship of a material:	1. Full 2. The co-authorship 3. Plagiarism	5 3 0
3.	Completeness of material representation: The title page. The summary (it is desirable). The plan. The list of abbreviations (if they exist). The list of illustrations. Information about the author. Full texts (heads, paragraphs). The list of the recommended literature. The list of the quoted literature. Appendices (the list of statutory acts, decrees, decisions if they are available).	1. Full 2. Reduced 3. The abstract 4. The plan	5 4 3 2
4.	Conformity of a material to the world standards: IMS, SCORM, IEEE, etc.	1. Full 2. Incomplete 3. No	5 3 1
5.	Conformity to the maintenance of the working program	1. Yes 2. Partial 3. No	5 3 1

1	2	3	4
6.	Degree of resource usage:	1. Yes 2. No	5 3
7.	Material structuring: a table of contents; sections, heads, paragraphs of a substantial part; complexity levels, and so on	1. Yes 2. No	5 3
8.	Ergonomics of the text: Efficiency of understanding	1. Qualitatively 2. Middle 3. Poor	5 3 0
9.	Use of hypertext links	1. Yes 2. No	5 0
10.	Presentation of a material: text formatting, use of a drawings, illustrations, etc.	1. Qualitatively 2. Middle 3. Poor	5 3 1
11.	Use of multimedia possibilities which do a substantial part of a resource more evident, clear, interesting	1. Yes 2. No	5 0
12.	Use of interactive systems and modules, modeling possibility	1. Yes 2. No	5 0
13.	Use of testing, possibility of knowledge monitoring, self-checking	1. Yes 2. No	5 0
14.	Use of standard formats of files: Documents – *.pdf, *.doc, *.htm, *.xml Graphics– *.gif, *.jpg, *.png, *.swf, *.dcr, etc.	1. Yes 2. Partially 3. No	5 3 0
15.	Use of tables, schemes, drawings	1. Yes 2. No	5 0
16.	Conformity of a material to level of users' knowledge	1. Yes 2. No	5 0
17.	Special-purpose designation of a material for a corresponding audience	1. Yes 2. No	5 0
18.	Easy approach to a material	1. Yes 2. No	5 0
19.	Stylistic correctness of material statement	1. Qualitatively 2. Middle 3. Poor	5 3 0
20.	Sequence of materials	1. Qualitatively 2. Middle 3. Poor	5 3 0

Quality monitoring of EIR in distance learning system «Kherson Virtual University» was carried out according to the KSU rector order and it sets as the purpose, first, to give quality grade rather great volume of learning resources (about 2000 names), developed by teachers of the university, and, secondly, to plan ways of improvement of work quality of KSU faculty in this direction.

Conclusions

On a basis of multicriterion analysis taking into account compatibility of EIR with the international standards quality criteria of EIR are described.

The basic types of electronic means of educational appointment for carrying out of quality monitoring of EIR are distinguished. The weight factors and quality indicators are offered for each type of EIR. The quality criterion of a learning electronic resource, which is the average quality characteristic, is developed, and it considers its weight factor and relative indicators of quality.

The offered system of quality estimation of learning electronic resources is not unique and supposes additions and updating. The estimation of quality monitoring of EIR is given by corresponding commission of experts of high school.

BIBLIOGRAPHIC REFERENCES

1. Кравцов Г.М. Система моніторингу якості електронних інформаційних ресурсів вузу / Інформаційні технології в освіті. Випуск 2. – Херсон. – 2008. – С. 42 – 46.
2. Стандарт СДО IMS. – www.imsglobal.org.
3. Демкин В.П., Можаева Г.В. Классификация образовательных электронных изданий: основные принципы и критерии. – Томский государственный университет. – 2003, http://www.ido.tsu.ru/ss/?unit=214.
4. Краснова Г.А., Беляев М.И. С чего начать? Информационно-педагогическое обеспечение для дистанционного обучения. – М., Изд-во РУДН. – 2001. – 166 с.
5. Кравцов Г.М. Система дистанционного обучения ХГУ. / Материалы второй международной научно-практической конференции «Информатизация образования Украины: состояние, проблемы, перспективы». Херсон. – 2003. – С.70 – 72.
6. H. Kravtsov, D. Kravtsov. Knowledge Control Model of Distance Learning System on IMS Standard / Innovative Techniques in Instruction Technology, E-learning, E-assessment, and Education. – Springer Science + Business Media V.B. – 2008. – P.195 – 198.