ORGANIZATION OF METHODOLOGICAL SUPPORT OF THE EDUCATIONAL PROCESS IN HIGHER EDUCATION

ORGANIZAÇÃO DO APOIO METODOLÓGICO DO PROCESSO EDUCACIONAL NO ENSINO SUPERIOR

ORGANIZACIÓN DE APOYO METODOLÓGICO AL PROCESO EDUCATIVO EN EDUCACIÓN SUPERIOR

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ABSTRACT: The creation and improvement of modern information technologies require higher education institutions to introduce new approaches to learning, ensuring the development of communicative, creative and professional knowledge, and the need for self-education. The introduction of information technology in the educational process of universities is moving to a new stage - the introduction of new multimedia educational materials. A large number of diverse information resources are being created in Russia, which have significantly improved the quality of educational and scientific activities. More and more often multimedia technologies are used in formation, the spectrum of which has expanded significantly: from the creation of formation programs to the development of a holistic concept for building educational programs in the field of multimedia, the creation of new learning tools. Methodically, the textbooks are structured in such a way that they meet the programs of leading universities in Europe and the requirements of a credit-modular system for organizing the educational process, which laid foundation in our country, like the ECTS system adopted in the Bologna process. The practical value lies in the fact that the textbooks allow students, bachelors, masters and graduate students of technical universities to independently master the knowledge of modern electronics. The materials of the textbook will help specialists in practice in the development, implementation and operation of electronic devices and systems, which are an integral part of electrical, radio engineering, telecommunications, computer, biomedical and other complex devices and equipment for automating the processes for technological, marine, space and defense equipment.

KEYWORDS: Hypertext. Modules. Hyperlinks. Key material. Design. Scrip. Control actions.

***RESUMO**: A criação e o aprimoramento das tecnologias modernas de informação exige que as instituições de ensino superior introduzam novas abordagens de aprendizagem, garantindo*

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o desenvolvimento do conhecimento comunicativo, criativo e profissional, e a necessidade de autoeducação. A introdução da tecnologia da informação no processo educacional das universidades está avançando para uma nova etapa - a introdução de novos materiais educacionais em multimídia. Um grande número de diversos recursos de informação está sendo criado na Rússia, o que melhorou significativamente a qualidade das atividades educacionais e científicas. Cada vez mais as tecnologias multimídia são utilizadas na formação, cujo espectro se expandiu significativamente: da criação de programas de formação ao desenvolvimento de um conceito holístico para a construção de programas educacionais no campo da multimídia, a criação de novas ferramentas de aprendizagem. Metodicamente, os livros didáticos são estruturas feitas para atender aos programas das principais universidades da Europa e aos requisitos de um sistema modular de créditos para a organização do processo educacional, que lançou as bases em nosso país, como o sistema ECTS adotado em Bolonha. O valor prático reside no fato de que os livros permitem que alunos, bacharéis, mestres e alunos de pós-graduação de universidades técnicas dominem, de forma independente, o conhecimento da eletrônica moderna. Os materiais do livro ajudarão os especialistas no desenvolvimento, implementação e operação de dispositivos e sistemas eletrônicos, que são parte integrante da engenharia elétrica, rádio, telecomunicações, informática, biomédica e de outros complexos dispositivos e equipamentos tecnológicos para automação tecnológica de processos, equipamento marinho, espacial e de defesa.

***PALAVRAS-CHAVE**: Hipertexto. Módulos. Hiperlinks. Material chave. Design. Script. Ações de controle.*

***RESUMEN**: La creación y mejora de las tecnologías de la información modernas requieren que las instituciones de educación superior introduzcan nuevos enfoques de aprendizaje, garantizando el desarrollo de conocimientos comunicativos, creativos y profesionales, y la necesidad de autoeducación. La introducción de la tecnología de la información en el proceso educativo de las universidades está pasando a una nueva etapa: la introducción de nuevos materiales educativos multimedia. En Rusia se están creando una gran cantidad de recursos de información diversos, que han mejorado significativamente la calidad de las actividades educativas y científicas. Cada vez más a menudo se utilizan tecnologías multimedia en la formación, cuyo espectro se ha ampliado significativamente: desde la creación de programas de formación hasta el desarrollo de un concepto holístico para la construcción de programas educativos en el campo de la multimedia, la formación de nuevas herramientas de aprendizaje. Metódicamente, los libros de texto están estructurados de tal manera que cumplen con los programas de las principales universidades de Europa y los requisitos de un sistema modular de créditos para la organización del proceso educativo, que sentó las bases en nuestro país como el sistema ECTS adoptado en Bolonia. proceso. El valor práctico radica en el hecho de que los libros de texto permiten a los estudiantes, licenciados, maestrías y graduados de universidades técnicas dominar de forma independiente el conocimiento de la electrónica moderna. Los materiales del libro de texto ayudarán a los especialistas en la práctica en el desarrollo, implementación y operación de dispositivos y sistemas electrónicos, que son parte integral de la ingeniería eléctrica, radioeléctrica, telecomunicaciones, informática, biomédica y otros dispositivos y complejos, equipos tecnológicos para la automatización tecnológica. procesos, equipos marinos, espaciales y de defensa.*

***PALABRAS CLAVE**: hipertexto, módulos, hipervínculos, material clave, diseño, guión, acciones de control.*

Introduction

The issues of creating educational electronic publications, in particular, interactive and multimedia electronic textbooks, teaching and methodological complexes (CMDs) remain the focus of attention of specialists of educational institutions. One of the reasons for the steadfast unflagging attention, as our experience in developing and analyzing several articles on the question of designing didactic materials has shown, is the lack of a universal technology for developing the necessary educational materials for teaching materials, including the lack of relevant standards (BELYAEV, 2009).

As a rule, each university uses its own technology for designing educational materials based on its own vision of what an electronic textbook should be, what structural components should be part of the CMD, and what forms of knowledge representation and transfer should be used. It should be noted that the preparation and development of the content of the CMD (content) is a creative process that is difficult to formalize, cannot be automated, and therefore requires a lot of time from the authors to develop courses (KRASNOVA; BELYAEV; SOLOVOV, 2001).

The educational electronic publication should contain systematized material in the corresponding scientific and practical field of knowledge, provide creative and active mastery of the students' knowledge, skills in this area; should be distinguished by a high level of performance and decoration, completeness of information, quality of methodological tools, quality of technical performance, clarity, consistency and consistency of presentation.

When creating an electronic textbook, one must bear in mind that it should contain a minimum of text, because long reading of text from a computer screen is tiring and reduces the perception of new information. It is very important to choose the right fonts for the text, having familiarized yourself with the theory of fonts in advance. The electronic textbook should contain as many graphic images as possible. The assimilation and perception of information when reading illustrated tutorials are much higher (KRECHETNIKOV, 2016).

Methodology

The article uses the methods of comparative analysis of scientific literature, modeling the design process of an electronic textbook.

Results

We consider the process of building an electronic textbook on the example of a technical university, the graduate of which acquires the qualification “Engineer”, equipped with a specific specialization. Most of the subjects taught by students during their studies, such as mathematics, engineering graphics, electrical engineering and many others, have a leading component - “methods of activity”, which determines both the structure of the educational process and the functional components of the structure of the electronic textbook.

Even though the electronic textbook is addressed primarily to the student, other subjects of the educational process — teachers, administration, also enter the modern information educational space of the university. An electronic textbook, together with actively developing electronic control shells, is a multifunctional system aimed at solving many problems facing all subjects of the educational process, which are its users in relation to ES. For each subject of the learning process, that is, for each category of users of the electronic textbook, at the stage of its creation, it is necessary to pre-register the possibility of various use cases.

An electronic textbook can be considered as a means of organizing independent work of students with individual dosed pedagogical help, which is difficult to ensure using only a printed publication. If we consider ES in subjects with the main component of the content of “modes of activity”, then the basic material includes not only the foundations of sciences, but also the typical tasks used in the process of mastering the ways of activity as an orientation element. The scenario of the student learning the educational material may include, in the general case, the study of the theoretical part and the sequential implementation of practical tasks of three types: testing, self-study and control tasks. Tasks of the first type are needed to assess the user's readiness for mastering the next segment of educational material, understanding the basic provisions of the theoretical part. With the help of teaching tasks, the formation of skills takes place; pedagogical assistance in solving these problems may include leading questions, links to theoretical principles, references to typical examples and, finally, a detailed solution to the problem. Tasks designed for control and self-control do not have any “hints”. The system of tasks can be supplemented with creative tasks to which the student addresses his choice.

The following mandatory components are required in an electronic textbook: task setting, presentation of information, disclosure of solutions to problems, generalization and systematization, consolidation and control, independent work.

The main components of the content of the electronic textbook: informative, reproductive, creative, emotional and valuable. Each component has a specific composition and means of embodiment:

- An informative component is presented in the textbook using verbal and symbolic presentation (vocabulary, facts, laws, methodological and evaluative knowledge), as well as illustrations;

- Reproductive tasks focus on understanding the material, general educational, subject-cognitive and practical actions;

- Procedures for creative activity are set using problematic exposition, problematic questions and tasks, collapsed text;

- The emotional-value component reflects the moral, worldview, labor, ideological, aesthetic and other orientations; this is ensured by the brightness and graphic presentation, the appeal to life problems and personal experience of students, the use of paradoxes and other means.

Currently, electronic textbooks (ET) are subject to the following requirements:

1) The completeness, completeness of coverage and the integrity of the presentation of teaching materials aimed at implementing the level of the Federal State Educational Standard for academic discipline: each element of the kit complements (extends) the content and functionality of the other;

2) Information on the chosen course should be well structured and represent complete fragments of the course with a limited number of new concepts;

3) Illustrations representing complex models or devices should have an instant hint that appears or disappears synchronously with the cursor moving over individual elements of the illustration (map, plan, diagram, assembly drawing of the product, control panel of the object, etc.);

4) The text part should be accompanied by numerous cross-references, allowing to reduce the search time for the necessary information, as well as a powerful search center; a promising element may be the inclusion of a specialized explanatory dictionary for a given subject or area;

5) Video information or animations should accompany sections that are difficult to understand in the usual presentation; in this case, the time spent for users is 5-10 times less compared to a traditional textbook. Some phenomena cannot be described at all by a person

who has never seen them (waterfall, fire, etc.); video clips allow you to change the time scale and demonstrate the phenomena in fast, slow or selective shooting;

6) ET should serve as the basis for creating an active-cognitive environment for the student due to the possibility of implementing training activities and monitoring knowledge, modeling, and support for creative activities;

7) To support the possibility for students to implement individual educational paths due to the availability of additional material that expands and deepens the main content of the subject, hyperlinks to materials of the electronic application to the textbook and other electronic components of the teaching materials, hyperlinks to network resources of regional and federal repositories of electronic educational resources;

8) To provide comfortable, intuitive conditions for the student to interact with educational content, both during classroom lessons and during independent work.

The process of constructing a textbook involves not only specialists in a narrow scientific subject or field, but an electronic textbook should also be the product of joint work of specialists in the field of didactics, psychologists, and the team of programmers responsible for the final implementation of the project.

To facilitate software implementation, to give the textbook adaptive properties and to ensure the possibility of generating individual educational paths, it is necessary to structure the training material in more detail than when divided into functional units (MARTYUSHOVA, 2018).

The graph-oriented approach to structuring educational material allows you to build individual learning paths, use a personality-oriented approach to learning, that is, and consider personal characteristics of students, their level of training and characteristics of psychology.

The essence of the graph-oriented approach is the possibility of presenting various training scenarios and course paths in the form of an oriented weighted graph. At the vertices of the graph there are content elements (tasks, various tests, theoretical positions, creative tasks, etc.), the direction of the arcs determines the sequence of passage of these elements, and branch points adapt the learning process to the personality of the student (MARTYUSHOVA, 2018).

Using the mathematical theory of graphs, we solve the following didactic problems:

1) The construction of individual task sets of the required level of complexity to control the formation of the educational competencies of users (in this case, the complexity of the tasks is used as the weights of the graph arcs);

2) The construction of individual educational trajectories of users, allowing to ensure the most effective assimilation of educational material (the choice of the graph arc is carried out interactively, depending on the student's response);

3) Adaptation of the content of the electronic textbook for a specific audience of users (weights are recalculated for the complexity of tasks; weights are introduced associated with educational competencies, the time taken for the test, etc.) (VIENS, 2001; ZAITSEVA; BOULE, 2003; ZAITSEVA; BULE; KUPLIS, 2003; ZAITSEVA; POPKO, 2004; ZAITSEVA; PROKOFYEVA; POPKO, 2004).

Other aspects of the use of graph theory are possible, inter alia, related to the technical implementation of the project.

Discussion

With the help of a modern electronic textbook, a teacher can conduct full-time and correspondence control of students' knowledge; dynamically analyze the statistics of their work. The teacher also refers to the scenarios of the use of ET by the process of automated compilation of control and test tasks taking into account the level of complexity and the time limit for their implementation. It is possible to use an electronic textbook, both by students and teachers, as a reference, since the search for information in electronic form requires a minimum of time. This use case for the ET is most obvious and requires only an interactive table of contents with hyperlinks. From the point of view of the administration at various levels, from the curator to the dean, there is a need to monitor the educational process during the semester, when measures can still be taken to reduce the number of underperforming students.

Conclusion

Thus, the theoretical foundations that normalize the process of designing electronic textbooks for students of technical universities are:

1) System-activity/competency-based approach to the process of training students of a technical university;

2) The classification of subjects according to the cultural concept, according to the leading component of the content of education;

3) The presence in each subject, and therefore in the textbook, of all four components of the content of education: knowledge of the world, methods of activity, experience of creative activity and an emotional-value attitude to reality;

4) A scenario approach to determine the functional elements of the structure of an electronic textbook;

5) A graph-oriented approach to the structuring of educational material and the construction of individual learning paths considering the personality of the student;

6) The availability of a set of teaching aids, consisting of an electronic textbook and a printed publication that meet the agreed requirements;

7) The presence in the structure of the electronic textbook of a functional unit in which statistical methods for processing information about user work are implemented.

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