Features of Educational Electronic Grade Development by Engineering Disciplines

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Abstract. Traditional teaching aids lose their relevance in connection with the introduction of a competence approach, therefore, it is necessary to introduce such manuals that will allow students to retain their mobility and productivity without losing the quality of teaching. The relevance of the chosen topic is determined by the identification of the features of the development of qualitatively new electronic teaching aids in the university. The purpose of the research: identification of features of the development of an electronic textbook in the formation of professional competencies of students. For this purpose we have singled out the definition of the term "electronic publication". The problems associated with the development and implementation of electronic textbooks have been identified. The principles of creating electronic materials have been singled out, which is part of the structure and composition of the electronic textbook, as well as the experiments carried out by us, demonstrating, firstly, the need to use information technology in education, and secondly the informativeness and effectiveness of the electronic textbook. One of the main recommendations for the creation of an electronic textbook is the need to provide the teacher with an adequate individual perception, understanding of the teaching material by students. It is necessary to timely eliminate errors, as well as update data: a glossary, practical tasks and text textbooks.

1 Introduction

Modern education actively uses information technology and computer communications. Modern approaches and trends show that science and technology are interrelated and play a major role in the formation of a highly qualified specialist. Electronic technologies not only introduce new elements into the learning process, but also make it more productive and more interesting. At the same time, the level of mastering the educational material is increased and the educational process is being improved, and this is of interest to the students for further development. Many scholars note that the electronic textbook should preserve all the capabilities of the traditional textbook, but acquire fundamentally new qualities that include elements of hypermedia and virtual reality that will provide a new level of visibility, illustrative and high degree of interactivity, provide new forms of structured presentation of large amounts of information and knowledge, will provide opportunities to effectively search for necessary information.

An electronic textbook is a special device or developed software that is used in classes for a particular discipline.

The electronic textbook can not completely replace paper, but it creates great advantages, allowing university students to open additional illustrative materials:

- audio files;
- video clips;
- presentations;
- various orders;
- documentation;
- instructions;
- scheme;
- tables;
-reference materials.

The lack of recommendations for the development of high-quality electronic teaching aids predetermines the development of this topic. The ongoing research will complement existing recommendations, thereby improving the approach to creating electronic materials. At this stage, it is also worth noting a number of undeniable advantages of electronic textbooks:

- convenience. Electronic teaching aids do not take up much space. For their storage, huge library rooms are not needed [14];

- efficiency. One can find the necessary information in a few seconds;

- profitability [13]. For their distribution, money or paper is not needed, it is enough to distribute over the network or copy to a disk;

- security. The number of factors affecting information is significantly less than the number of factors affecting other learning materials, such as books. Given that the information protection area is one of the most dynamically developing areas, it can be assumed

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that after a while there will be no risk factors for information [12];

- simplicity. Electronic textbooks can be used by any PC user.
- compactness of storage of educational material on a magnetic storage medium or on the Internet;
- modeling and solving of educational tasks in an interactive mode;
- provision of educational material in both linear and non-linear formats;
- a convenient navigation system and the ability to learn on an individual trajectory at the optimal pace [1].

Technologies are developing fast enough and educational institutions must correspond to this development, electronic benefits are the best way to optimize the educational process. Of course, subject to certain requirements and rules as such, productive elements have their own shortcomings: they can be avoided by constant monitoring of the general situation associated with the assimilation of necessary information by students. It is necessary to timely eliminate errors and update data such as glossaries, practical tasks and the text itself.

2 Methodology

Since the theme of the development of an electronic textbook touches the use of IT technologies in education, we conducted an analysis of the introduction and application of information technologies in the learning process. To identify problems, university students took part in the survey. It is established that 100% of students believe that information technologies help to assimilate material and speed up the process of performing the work, simplify the process of searching for the necessary information. In addition, students-engineers, more often than not, question what graphic software you would like to learn to achieve success in professional activity, answered by AutoCAD. Therefore, we will consider the development of the electronic textbook "Engineering graphics in AutoCAD".

3 Results

AutoCAD is the most popular computer-aided design system. It includes many design departments of different organizations [19].

Factors that determine the relevance of the topic also include:

- increase in demand for highly qualified and competitive specialists;
- students who have different levels of training, so everyone needs individualized training;

The available electronic textbooks do not allow one to reach the necessary level of professionalism [10]. The instruction of the Ministry of Education treats the electronic edition as a collection of textual, graphic, speech, music, video, photo and other information, as well as printed user documentation [19].

The main elements of the development of electronic learning materials include: principles, stages, means of creation.

Principles:

- distribution of educational material;
- interactivity of educational material;
- multimedia presentation of educational information;
- adaptability to the personality traits of the learner;
- completeness [18];
- visibility;
- branching;
- regulation;
- computer support;
- collectability [8].

It is also worth noting that the electronic textbook has a number of differences from the traditional one:

- use of multimedia technologies;
- provision of virtual reality;
- a high degree of interactivity [9];
- the possibility of an individual approach to the student.

The structure and composition of the electronic textbook should include:

- exercises, tasks and background information;
- theoretical material;
- video clips;
- methodical material [6];
- individual tasks;
- test tasks [7].

The tasks located in the electronic textbook are shown in Figure 1.

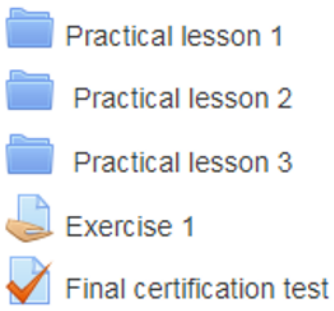

Fig. 1. Tasks located in the electronic textbook.

Background information can be provided by the teacher in the electronic textbook as a glossary. A student can quickly find the term he needs to carry out his work.

Entering the required section under the name "terminology dictionary", the student clicks a line with the inscription "find" and enters the desired term. Below are the options that were introduced by the teacher in this glossary earlier.

Fig. 2. An example of an electronic conceptual-terminological dictionary.

In order to ensure that the electronic textbook is safe for health, it is necessary to observe the following requirements for their creation and application in the educational process:

- a sufficiently large screen of the electronic device;
- the image on the screen should be clear, as there is a need to transfer images with fine print;
- the text of the textbook should be supplemented by a sufficient number of cross-references that would speed up the process of searching for useful additional information.

The federal state educational standard establishes that a student should not only have a certain amount of knowledge, skills, but also professional competencies demanded by employers [2]. Hence the main component of the content of the developed electronic textbook will be directed towards satisfying the requirements of GEF, that is, the formation of competencies.

The tool for developing the textbook "Engineering graphics in AutoCAD" is the HTML editor Macromedia Dreamweaver, which presents tools for creating visual design, application development functions, code editing support.

The user interface of the interactive tutorial can be divided into three parts:

- a title that illuminates the title and composition of the textbook;
- content;
- a window for displaying content [3].

An experiment was conducted at a lesson in engineering graphics. When working in AutoCAD, a part of the group was engaged in methodical instructions issued by the teacher, the other - using training video clips. The analysis showed that for the mastering of the material and for the performance of independent work, the students from the second group took half the time [4].

The electronic textbook gives students the material for self-study and facilitates the work of the teacher [16].

In our opinion, it is worth noting the problems associated with the preparation and implementation of electronic textbooks [15,16]. This includes not only organizational and financial problems, but also methodological and technological, conditioned by the peculiarities of electronic learning tools [5].

When creating a textbook, it is necessary to ensure an adequate individual perception, understanding of the learning material by students. Therefore, it is necessary that the material be presented at different levels of complexity, thus providing the trainees and choosing the individual trajectory of the study [11]. Each of the levels must contain a base and an optional component.

An important role is played by the development of technologies for managing the process of cognition, the timely identification of student errors, prompt feedback, and the provision of recommendations by the teacher [17].

Effective student learning activities should be provided by methods of visualization of initial data, intermediate processing results that provide a unified form of presenting the current and final information in the form of images that are adequate to the person's visual perception and convenient for unambiguous interpretation of the students' results.

It should also be said that when using network technologies, some problems can arise in the form of slow data transfer, for example, in the case of using multimedia tools and complex graphics in an electronic textbook. The information presented in the textbook should be updated in a timely manner.

4 Conclusions

Among the advantages of the electronic textbook system, we distinguish the provision that the teacher can remotely work with the devices of each student from his computer, tablet or any other electronic device.

An interactive e-textbook implements an active, activity-based approach to teaching, develops creative abilities and forms educational needs, and therefore contributes to the development of the necessary professional competencies. Indicators of the survey on the establishment of the need for electronic textbooks indicate that students are fully convinced of their productivity. An experiment was also conducted that showed the effectiveness of the textbook. The group that used it in the lesson coped with the task much faster, because the material was more accessible and understandable due to the clarity. Consequently, our recommendations and features in the development of the electronic textbook "Engineering Graphics in AutoCAD" will help to form a highly qualified, creative specialist.

With the reduction of the classroom hours for studying the discipline, the benefit of the electronic textbook is undeniable, since it allows to reduce the study of theoretical material in classroom classes and, accordingly, allows paying more attention to practical activities.

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