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# DEVELOPMENT OF INFORMATIONAL SYSTEM FOR THE ELECTRONIC EDUCATIONAL AND METHODICAL COMPLEX OF THE DISCIPLINE

In this article is discussed the possibilities of students independent work of higher education institutions based on the use of electronic educational and methodological complexes as a component of the educational information environment of an educational institution, structure, advantages and disadvantages of its use in the educational process. The electronic educational and methodical complex structure as a full-fledged component of the modern educational process and criteria for its creation has been determined. The analysis was carried out and the existing educational information systems and electronic educational and methodical complexes were characterized. A list of training products that are included in the electronic educational-methodical complex structure of the discipline is given. The developed electronic educational and methodical complex, the scope of its application and use is presented. The diagrams of use cases were presented for individual users types. An introduction to the system of two types of users was provided. The functions and principles of the main service components, which allow organizing a planned, cognitive, organizational and methodological orientation of students' activities, which are targeting to achieve a result: the assimilation of a certain academic discipline, which students master independently without the information support and communication technologies. The developed database is presented, which enables you to operate educational complex.It was identified the main advantages and disadvantages of existing educational information systems. Attention was focused on the issue of assessing the quality of learning outcomes.

**Keywords:** electronic manual, electronic educational and methodical complex, information technologies, information environment, educational process.

## Introduction

The current state of the development of the higher education system requires using the latest data in the field of information and communication technologies. Modern technologies allow not only to increase the efficiency of traditional forms of learning, but also focus on the activity of independent work of students in studying discipline, the process of effective management and appointment of students [1-11].

In the context of the socio-economic changes that taking place in our country, the development and implementation of innovative technologies in the educational process is one of the most important ways of improving education.

**Analysis of recent research and publications.** Fedorchuk I.I. gave attention to the problems of scientific and methodological provision of educational process in high school [6]. The questions of designing and developing electronic teaching and learning complexes were considered by many authors Efremov O. [7], Vasyukevich V.V. [2], Gurevich R.S. [6, 7].Using of electronic educational and methodical complexes in the professional training of students of higher educational was considered by scientists Tatarintsev A.I. [2], Kuznetsova N.M. [1].

When I analyzing works devoted to the implementation of information technologies [9] in education, I have determined that during the years of informatization of education accumulated quite a wealth of practical experience in the development of computer didactic means, in particular electronic textbooks (ETs), but there is a need for fundamental research and development of the very electronic educational and methodical complexes (EEMC) that would have a significant role in optimizing the learning process.

**The purpose of the article** is to determine the structure of the electronic educational and methodical complex as a full-fledged component of the modern educational process and criteria for its creation, analysis and characterization of existing information systems, presentation of the designed EEMC, its functionality and its main components.

## The main part of the article

By appointment, pedagogical software has the following varieties [6]:

- computer tutorials (lessons);
- training programs (tutors);
- controlling (testing software);
- information and referencing (encyclopedias);
- imitation
- simulating;
- demonstration (slide or video);
- educational game;
- permits (computer games: arcade, quests, strategies, role-playing, logical, sports, etc.).
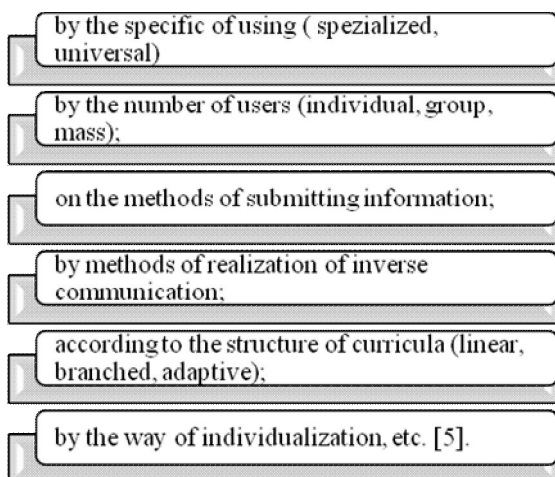
The need to use the ETs and EEMC in vocational education is dictated by several circumstances. First of all, they should include the fundamental changes of the present, which put on the agenda the question of the transition to a new strategy for the development of society based on knowledge and promising high-tech technologies. In the modern national system of vocational education in the conditions of continuous increase of information flow, the processes of information and computerization become more important. New information technologies provide the implementation of new approaches to learning, provide new tools and methods for finding and managing knowledge. At the present stage of development of education, the value of use in education of the ETs increases, due to the active implementation of information technologies that help to broaden the material, therefore, the development of the EEMC is relevant both for teachers and for students of all educational institutions.

Media applications use a certain way of transmitting information [6]:

– Interaction of various information blocks (text, graphics, video clips) with the help of hyperlinks. Hyperlinks are presented as a specially designed text, or as a specific graphic image. At the same time, several hyperlinks can be located on the screen, and each of them defines its route.

– Interactivity, that is, the dialogue mode of the user with a source in which he can independently choose the information he needs to speed and the sequence of its transmission.

Types of electronic textboobs:

by the specific of using ( spezialized, universal)

by the number of users (individual, group, mass);

on the methods of submitting information;

by methods of realization of inverse communication;

according to the structure of curricula (linear, branched, adaptive);

by the way of individualization, etc. [5].

After I was analyzing different literary sources, I can define the main interpretations regarding EEMC: EEMC is a realization of the educational-methodical complex in electronic form. EEMC can be used both in network and case versions, depending on students' needs and capabilities. Application of EEMC in the teaching process allows to greatly use the great opportunities provided by modern telecommunication technologies [2].

The electronic educational and methodical complex is an automated system that includes information and reference materials on the discipline and allows them to be used comprehensively for the acquisition of knowledge, skills,control and self-controlfor this process. The EEMC consists of pages, but its structure is nonlinear. Information is provided not only in the form of text, but also graphs, charts, animations, sound and video. With hypertext, the user can jump to another page and get an explanation, flash-animated or video fragments in this way. [3].

Electronic educational and methodical complex is a system of materials that reflects the model of the educational process and is intended for practical using by teachers and students. It regulates all types of educational activities of students and greatly facilitates the work of the teacher through the active use of methodological support [4].

Based on the foregoing, I would point out that the electronic educational and methodical complex is an informational educational resource intended for the description of the structured educational material of the discipline.

As a means of integrated action in the educational process EEMC allows:

– assist students in studying and systematizing theoretical knowledge;

– to develop practical skills and abilities;

– rationally combine different forms of learning;

– to teach the studied material in various forms (tex, tables, graphs, multimedia presentations, schematic images, etc.);

– control the learning process (self-control and control by the teacher);

– to effectively manage independent work;

– to implement an individual approach [1].

**Requirements for EEMC.** EEMC unites in a digital form text, graphic and video images, on this basis, new teaching tools are created. Obviously, the efficiency of the information process depends directly on the effectiveness of the processes of creating and using an information resource. With the help of EEMC, the student is an active participant and can control the educational process himself. The EEMC conducts structuring of lectures, organization of practical classes, which are accompanied by multimedia, which allows to significantly expand the area of knowledge, comparison of facts and observations. Lectures can be presented not only in electronic (printed) form, but also in audiovisual - with a demonstration of slides, video clips. Tasks for the students may be aimed at independent research, search, creative activity, which requires an independent problem solving, the creation of their own knowledge.

The structure of the EEMC includes a certain list of educational products: methodological materials: annotation, curriculum, work program; teaching materials: lectures, laboratory works, terminology; knowledge control: evaluation criteria, tasks for self-training, tests, questions for the test, exam; literature: basic, additional, Internet; the hard tasks of students.

The development of educational-methodical complexes of the discipline aims at:

– ensuring the systematic organization of the educational process;

– improving the quality of methodological provision of the educational process;

– timely adjustment and improvement of the electronical and methodical complex.

In the process of preparation and using in the educational process of the EEMC it is necessary to be guided by the modular approach, which allows the successful solution of a number of educational tasks:

– forming a subjective position of the student;

– realization of the educational goal in the process of cooperation of the teacher with the students;

– generation of students in productive thinking during classes;

– use in the process of preparing educational products organizational and activity methods that will promote the development of their abilities, which will correspond to their future professional activities;

– orientation of students to self-assessment of the obtained learning result.

Among the main requirements for information systems, it should be noted [7]:

1. The effectiveness of the information system - is determined by comparing all the costs associated with

the measures considered and the results obtained at the same time.

2. The quality of the functioning of the information system - degree of system adaptability to perform the specified functions. Among the main properties that determine the quality of the functioning of the information system, distinguish:

– adequacy of the functioning of the information system;

– availability of technical capabilities of the information system to interact, improve and develop;

– reliability and timeliness of information submission and implementation of functional technological operations;

– completeness, error-free, relevance and confidentiality of the information presented..

3. The reliability of the information system is determined by the reliability of technical means of its equipment and errors of the executors.

4. Security of the information system provides for its functioning, which provides: protection of information circulating in this system; protection of users of the information system from the harmful effects of both information circulating in this system and objects of the system itself; protection of information system and its objects from unauthorized change of its specified parameters and operating mode.

**Advantages and disadvantages of EEMC.** The advantages of using of the EEMC are:

– variety of forms of information presentation;

– differentiation of training, which consists in division of tasks according to the levels of complexity, taking into account the individual characteristics of students;

– intensification of independent work, which consists in strengthening the activity of self-study, self-control, student self-assessment;

– increasing of motivation, interest and cognitive activity at the expense of various forms of work, the possibility of the inclusion of the playing torque and the use of various forms of information representation;

– timely and objective assessment of student performance [4].

Along with the above-mentioned advantages one can distinguish one more advantage: the possibility for students to study remotely, having the opportunity to access the Internet, receive consultations of teachers and report on the study material. Structured electronic teaching and learning complexes can be located in the local university network, on the Internet, on electronic media, which allows students to fully provide the necessary information on discipline. The information bank of discipline (electronic textbooks and manuals, demonstrations, test and other tasks, examples of projects already executed, topics of course papers and theses, tasks for independent and individual work), which is part of the electronic teaching aids, must be constantly updated. [4].

However, the use of EEMC in the educational process has a number of disadvantage: lack of desire for students to study and control the material of classroom lectures, which is already partly in EEMC; the study of electronic materials often dismisses students from working with traditional textbooks, manuals, scientific literature; fast fatigability of students during some of the work associated with EEMC.

**Comparative analyses of exiting educational informational systems.** To determine the key characteristics of the developing system, an analysis of existing e-learning systems was carried out and their features were determined.

For comparison, I have chosen systems of electronic teaching of some of the most prestigious European universities:

– Department of continuing education (University of Oxford). There are a large number of courses in any given field on this resource. All courses are taught in English. One of the advantages is the possibility of studying in any part of the world, there is no need to be a university student for the course, certificates of graduation will be recognized as valid in other universities and in any work.

– Institute of Continuing education (University of Cambridge). The benefits of this resource include the possibility of revising courses not only for distance learning, but also for choosing summer courses, intensities, advanced training courses (for undergraduate and postgraduate students), some courses can be held not only in English but also in Spanish, German and French. in languages. The disadvantages are a relatively small number of online courses, compared with Oxford University, the cost of training at the same level.

In Ukraine, EEMC is not yet quite widespread; each of the existing ones has more disadvantages than advantages.

**The structure of the projected complex of electronic education.** The developed complex will help to systematize course materials for easier using.

This system provides two types of users (Fig. 1, 2):

1. *Teacher*. The teacher has the opportunity to create a course, invite students to join the course, download materials, edit and delete courses, course participants. The bulk of the functional is transferred to the teacher, so he acts as the administrator of the resource.

2. *Student*. The student joins the course for the received link, has the opportunity to view the materials of the course, download them.

Also, both the teacher and the student have the opportunity to comment on the course.

For the full functioning of the electronic teaching and learning complex, it is necessary to create such tables in the database(Fig. 3):

– user – system user table. It records the user's login information, his role on the site, and such business information as the registration date.

– course – the table of existing courses covers information about the course title, the user who created the course and the date of creation.

– file – the table in which all the materials that the teacher added to the course will be stored. Each file in the table will have its own type (lecture, laboratory work, methodical instructions, etc.) and order on the page.

– report – the table that stores object reports with data about them.

– comments – the table in which the comments for the course will be kept. I will keep the following data, as to which course of comment, who left it, when the text of the comment itself.
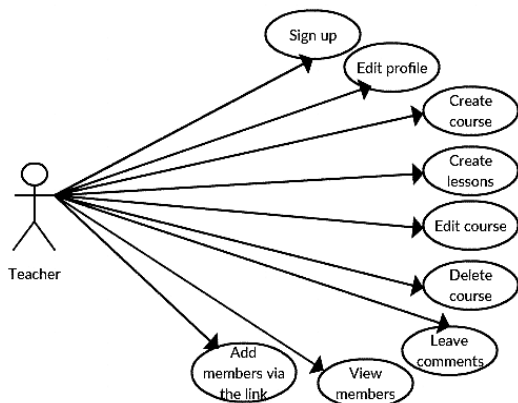


**Fig. 1.** Diagram of options for use by the teacher (teacher Use-Casediagram)
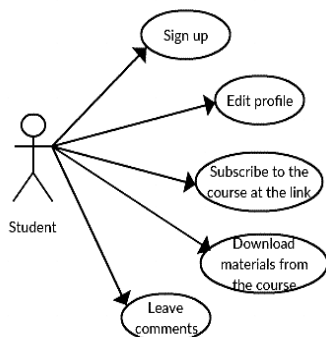


**Fig. 2.** Diagram of options for use by the student (student Use-Casediagram)

**Structure of the database of the designed electronic educational and methodical complex.** The architecture of a web resource is not difficult to understand and use (Fig. 4). All fields and the required functionality are easily accessible and can be accessed in two clicks of the mouse.
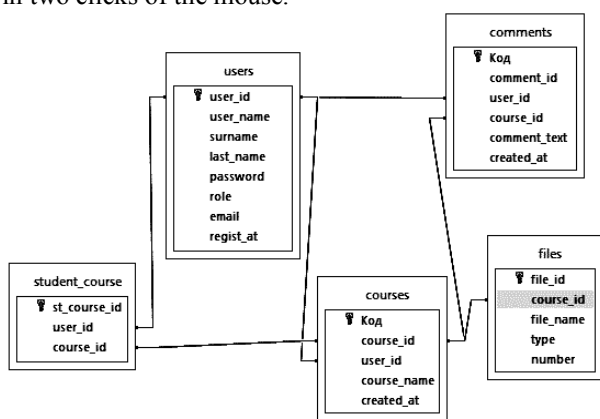


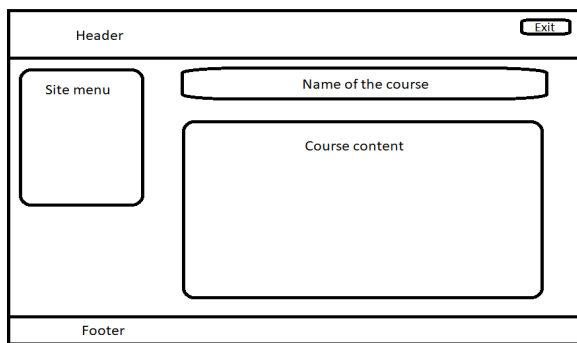**Fig. 3.** Structure of the database



**Fig. 4.** Web resource scheme

An important aspect is the question of assessing the quality of learning outcomes. The bulk of the tools for assessing the level of learning of learning information is now a closed form in which the activities of those studying is reduced to the choice of answer from the proposed. The construction of open-ended instruments, when students can demonstrate their creativity, individuality is a scientific and scientific-methodical problem, but is still not solved and requires the solution of the problem of "artificial intelligence".

In the future, the complex is planned to be added to the functional unit: view available courses for a student with a short description and a schedule; dialogues "student-teacher" and dialogue between the course teacher and all students of the course; assessment of the acquired course material by the tasks of the closed (tests) and open type (using neural networks).

## Conclusion

The implementation of self-sustained work with the use of informational educational environments contributes to the formation of students' self-sustainability, facilitates the acquisition of knowledge, skills development, and the integration of traditional and informational learning technologies. The effectiveness of the use of EEMC in many cases depends on the successful solving of methodological problems associated with its use in the training process.

EEMC allows organizing the planning, cognitive, organizational and methodically directed activities of students, aimed at achieving the result: the introduction of a certain discipline, which is carried out by students themselves without the direct support of the teacher in support of its ICT.

The developed electronic teaching-methodical complex of discipline includes two types of users. For the complete functioning of the complex a database is created. The architecture of a web resource fully meets the requirements of the learning process.

In the teaching-methodical complex provides assessment and assistance in the studied subject.

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**Розробка інформаційної системи електронного навчально-методичного комплексу дисципліни**

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У даній статті розглянуто здійснення самостійної роботи студентів закладу вищої освіти на основі використання електронних навчально-методичних комплексів як складової інформаційного освітнього середовища навчального закладу, структура, переваги та недоліки його використання в навчальному процесі. Визначено структуру електронного навчально-методичного комплексу як повноцінної складової сучасного навчального процесу і критеріїв щодо його створення. Проведено аналіз та надано характеристику існуючих навчальних інформаційних систем та електронних навчально-методичних комплексів. Надано перелік навчальних продуктів які включені в структуру електронного навчально-методичного комплексу дисципліни. Представлено розробку електронного навчально-методичного комплексу, сферу застосування і використання. Представлені діаграми варіантів використання для окремих видів користувачів. Передбачено введення в систему двох видів користувачів. Розкрито функції та принципи основних компонентів сервісу, які дозволяють організувати плануючу, пізнавальну, організаційну і методично спрямовану діяльність студентів, що орієнтована на досягнення результату: володіння певною навчальною дисципліною, котра здійснюється студентами самостійно без прямої підтримки викладача за умов підтримки її інформаційно-комунікаційними технологіями. Представлено розроблену базу даних, яка дозволяє повноцінно функціонувати навчально-методичному комплексу. Визначено основні переваги та недоліки існуючих навчальних інформаційних систем. Акцентувалась увага на питанні оцінки якості результатів навчання.

**Ключові слова:** електронний підручник, електронний навчально-методичний комплекс, інформаційні технології, інформаційне середовище, навчальний процес.

**Разработка информационной системы электронного учебно-методического комплекса дисциплины**

А. А. Гаврилишин, Т. А. Дмитренко, Т. Н. Деркач, А. А. Дмитренко

В данной статье рассмотрены возможности самостоятельной работы студентов ЗВО на основе использования электронных учебно-методических комплексов как составляющей информационной образовательной среды учебного заведения, структура, преимущества и недостатки его использования в учебном процессе. Определена структура электронного учебно-методического комплекса как полноценной составляющей современного учебного процесса и критериев его создания. Проведен анализ и охарактеризованы существующие учебные информационные системы и электронные учебно-методические комплексы. Дан перечень учебных продуктов, которые включены в структуру электронного учебно-методического комплекса дисциплины. Представлен разработанный электронный учебно-методический комплекс, сфера его применения и использования. Представлены диаграммы вариантов использования для отдельных видов пользователей. Предусмотрено введение в систему двух видов пользователей. Раскрыты функции и принципы основных компонентов сервиса, которые позволяют организовать плановую, познавательную, организационную и методическую направленность деятельность студентов, которая ориентируется на достижение результата: усвоение определенной учебной дисциплиной, которая осваивается студентами самостоятельно без прямой поддержки преподавателя по условиям поддержки ее информационно-коммуникационными технологиями. Представлена разработанная база данных, которая позволяет полноценно функционировать учебно-методическому комплексу. Определены основные преимущества и недостатки существующих учебных информационных систем. Акцентировалось внимание на вопросе оценки качества результатов обучения.

**Ключевые слова:** электронный учебник, электронный учебно-методический комплекс, информационные технологии, информационная среда, учебный процесс.