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Svitlana S. Kizim

PhD of Pedagogical Sciences,

Associate Professor of the Department of Innovation and Information Technologies in Education

Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University, Vinnytsia, Ukraine

ORCID ID 0000-0003-1451-3950

skizim2012@gmail.com

PECULIARITIES OF WOULD-BE TEACHERS' PROFESSIONAL TRAINING WITH ELECTRONIC EDUCATIONAL RESOURCES

Abstract. The article presents the results of the research on the problem of the use of electronic educational resources in would-be teachers' professional training and classifies electronic educational resources. Special attention is given to electronic resources for educational purposes, electronic educational and methodological package in particular (ELMP). The authors characterize the stages and principles of ELMP designing and determine its functions in would-be teachers' professional training at institutes of higher education. The process of ELMP designing implies the integration of the traditional and innovative didactic facilities, electronic educational resources and teaching methods in order to establish active cooperation between teachers and students.

The use of ELMPs ensures the efficient high-quality support for various forms of professional training; intensifies the development of students' intellectual and creative capabilities; reinforces learning motivation through the use of an apt ELMP interface; improves the comprehension of training materials; accelerates the formation of would-be teachers' professional skills; fosters professional competence in the sphere of information technologies and mental flexibility in professional problems solving in the process of would-be teachers' professional training at institutes of higher education.

The use of ELMPs in would-be teachers' professional training gives the following advantages: high technological effectiveness of creating and use; high level of systematization of educational and methodological materials; realization of various functions; advanced facilities in presenting (visualizing) training materials. The research shows that compared to electronic educational resources for educational purposes, ELMPs considerably improve the efficiency of teaching due to the ability of ELMP to respond to students' needs enabling a dialogue with the training system, the capability of timely renewal of training materials, the opportunity to introduce references to other electronic educational resources into ELMP; the capability of ELMP to adapt to students' individual abilities and needs through various learning pathways and different complexity levels of tests included in ELMP.

Keywords: electronic educational resources; teacher training electronic teaching resource package, institutes of higher education.

1. INTRODUCTION

Problem statement. At the contemporary stage of the information society development, modernization of the professional training of would-be teachers, which is concerned with the development of information and communication technologies (ICT), demands the regulation of the process of electronic educational resources (EER) accumulation and storage, as well as providing access to the resources and their professional orientation. This promotes the development of the information educational environment, quality improvement of ICT media, and rise of overall level of e-learning at institutes of higher education (IHE).

Providing open access to EER and securing safety and comfort for students working with these resources require the improvement of technological platforms, hardware for

electronic learning implementation, principles of creating such resources, and methods for their usage.

The process of professional training of would-be teachers requires professionally oriented EER which are part of information-educational environment of an educational institution and are available for students in 24/7 mode. It is necessary to determine the optimal stages and principles for creating such resources and their scientific and methodological support, which is especially topical in the view of the doctrine of the informatization of education.

The analysis of the EER shows that at present a shift of the paradigm of education development can be observed worldwide, which is caused by the use of EER as Massive Open On-line Courses. The entire educational process is transferred into the electronic (cloud) environment. The use of numerous sources of information, multimedia, fast navigation and management makes learning available at anytime from anywhere.

Unfortunately, the potential of available EER capable of meeting the demands of labour market as well as students' and teachers' needs is rather limited. This insufficiency should be compensated with compact EER developed in accordance with the trajectory of teaching students, through providing the conditions for electronic communication and co-operation between the participants of educational process by means of intensifying it with the use of EER as constituents of the electronic education technology.

Analysis of recent research and publications. The analysis of the preceding research shows that electronic education is rapidly developing all over the world. The USA, South Korea, and Western Europe lead the world in this sphere. In European countries electronic education develops on the account of state grants, while in the USA a commercial system already functions. In Europe and the US, the technology of electronic education showed to good advantage and has been applied to educational process as one of promising educational technologies.

Today a positive trend of application of electronic education and its various models is being observed in Ukraine. It has become the object of investigation for Ukrainian scientists V. Bykov, R. Gurevych, I. Zakharova, M. Zhaldak, N. Morze, I. Robert and others. The problems of elaboration and classification of educational EER are covered in the academic studies by V. Bykov, V. Lapinskyi, S. Lytvynova, Yu. Mashbyts, M. Shyshkina and others. The practical aspects of elaboration and application of electronic coursebooks, reference books, learning and methodological packages are described in the research by V. Vasiukevych, V. Vember, Yu. Zhuk, M. Kademiia, N. Klokar and others.

The problem of the use of EER in educational process is covered in the works by foreign scholars D. Stephens [13] and M. Burns [4], who explore the capabilities and essential characteristics of EER. On the one hand, they view it as a combination of graphic, textual, and digital content; on the other hand – as software and information component designed for all participants of educational process.

The experience of Alan Brinkley, Betty Dessants, Michael Flamm, Cynthia Fleming, Charles Forcey, and Eric Rothschild proved to be valuable for our research. In their work "Using Electronic Resources for Teaching" (an excerpt from "The Chicago Handbook for Teachers: A Practical Guide to the College Classroom" [22]) the authors investigate the promising directions of the use of EER in implementation of the Classroom technology.

The problems of the implementation of on-line education and the use of EER are investigated in the works by foreign scientists M. K. Tallent-Runnels, J. A. Thomas, W. Y. Lan, S. Cooper, T. C. Ahern, S. M. Shaw, X. Liu [21].

The article aims at generalizing the classification of EER; abstracting the possibilities of the use of EER in educational process of institutes of higher education; substantiating peculiarities of would-be teachers' professional training with EER and determining didactic

peculiarities of EER designing; sharing the authors' own experience in creating ELMP (including its stages and principles); determining the functions of the use of ELMP in professional training.

2. RESEARCH RESULTS

The analysis of the current state of the use of ICT in the educational process of IHE shows that their usage requires preparing teachers to practical application of ICT to their professional work. It is necessary to determine and substantiate the most efficient ways of the selection of electronic facilities and resources, their systematization, determination of their role in educational process, evaluation of the potential of their practical use and their correlation with the aims of teaching. Teachers should master the skills of selection and quality evaluation of educational EER through the analysis of their contents, functional capabilities to provide high-quality professional training, their cross-platform character, capability to be adapted to the needs of a particular user and their physical peculiarities.

A significant amount of EER created, in particular, via cloud technologies, and calculating resources (e.g. networks, servers, data files, software, etc.) are becoming available to users as web-resources. Thus, supplying content-information loading for learning space with necessary EER, such as electronic books, libraries, educational portals, distant educational services, etc. is a matter of the utmost importance. Quality improvement and promoting accessibility of EER foster the development of hi-tech infrastructure of educational process, which meets the demands of the present.

There are many electronic educational resources aimed at supplying, functioning and development of process of IHE, which can be grouped as follows:

- local and network EER (amongst others, on optical digital storage media);
- educational web-based facilities: specialized websites, electronic collections, libraries, bodies of educational materials, etc.;
- educational electronic databases;
- systems and platforms for electronic learning, distant ones in particular.

Ukrainian scientists V. Bykov and V. Lapinskyi in their research work “Methodological and procedural background for designing and using electronic educational facilities” define *electronic educational resources (EER)* as kind of facilities for learning and teaching activities; they are composed of a set of electronic information objects (documents, documented data and instructions, information materials, procedural models, etc.) which exist in electronic form and are stored and distributed within educational systems on storage devices for electronic data [1, p. 3].

According to the classification proposed by V. Bykov and V. Lapinskyi, the main sorts of EER (as per the field of function) are electronic resources of educational function (EREF), electronic resources supporting scientific research (ERSR), and electronic resources of administrative function (ERAF). Educational electronic resources (the most relevant in the context of the present research), in their turn, can be classified under various criteria.

In the context of the present research, special attention is focused on EREF. They comprise software and educational electronic data, which, in their turn, can be systematized according to the level of grouping [1].

According to the level of grouping, educational software is classified as follows:

- unattached software;
- systemic sets (collections) of educational software.

Educational data are divided according to the level of grouping into:

- unattached data;
- databases.

The types and kinds of electronic resources used at educational institution can be particularized under the criterion of their place in educational process.

Applied EREF as constituents of educational process can be classified into educational and providing ones [1, p. 4].

Educational EREF (designed directly for the realization of the educational process):

- educational e-editions (electronic coursebooks, textbooks, training courses);
- software for educational assessment;
- computer-oriented educational laboratories;
- reference resources;
- demonstrational resources;
- modeling resources;
- simulators;
- educational aids;
- educational sets of applied software;
- electronic sets of methodological and teaching aids;

Providing EREF (to provide the organization of the educational process):

- electronic educational data;
- electronic methodological and teaching materials;
- additional electronic scientific and educational materials.

Numerous EREF have already been designed in Ukraine, but their number is still insufficient, and their quality in some cases does not meet contemporary requirements [2, p. 6]. Thus, teachers often have to fill this gap by themselves, designing their own pedagogical program facilities for teaching particular units of some courses. We share V. Bykov's opinion that the major factor contributing to the efficiency of education informatization is not the achieved scientific and technical level of its computerization, but the quality and capacity of educational program facilities and other information educational resources [3, p. 16].

The quality of EREF depends on its contents, as well as adequate comprehension of its training material by every student. That is why it is advantageous to present the training material of various complexity levels; each level should comprise basic and variable components and proper amount of additional materials. It should include the basic theoretical training material which meets the requirements of state standards; the system of exercises and tasks which help form would-be teachers' professional competence; methods and means of learning administration; methods and means of final assessment of learning achievements.

Among the burning problems are the use of EREF in various operational systems; the simplicity of usage combined with functionality; interactive assistance; supporting individual and collective modes of learning; convenient review of the hierarchy of learning objects; the ability to choose any succession of units for studying; the swiftness of switching from one unit to another; the individual monitoring of the efficiency of task completion; the availability of means to control students' mistakes in the process of task completion; print capabilities for files, graphs, diagrams; supporting standards of graphical interfaces; animation of processes studied; the ability to work with glossaries; application of search services for units, headings, figures, formulas, references; the ability to create and use bookmarks; the availability of references to units, formulas, sources and the ability to work with them; the capability of numbering units, formulas, graphs, and figures; the ability to keep records of students' activities as well as video and audio support; adding and renewal of necessary information in the process of learning; the availability of space for notes and free zones for comments; the ability to control the integrity of software etc. [5, p. 453].

Considering the view of S. Lytvynova [19], we can systematize the facilities of using EER in the process of the professional training of would-be teachers as shown in *Fig. 1*.

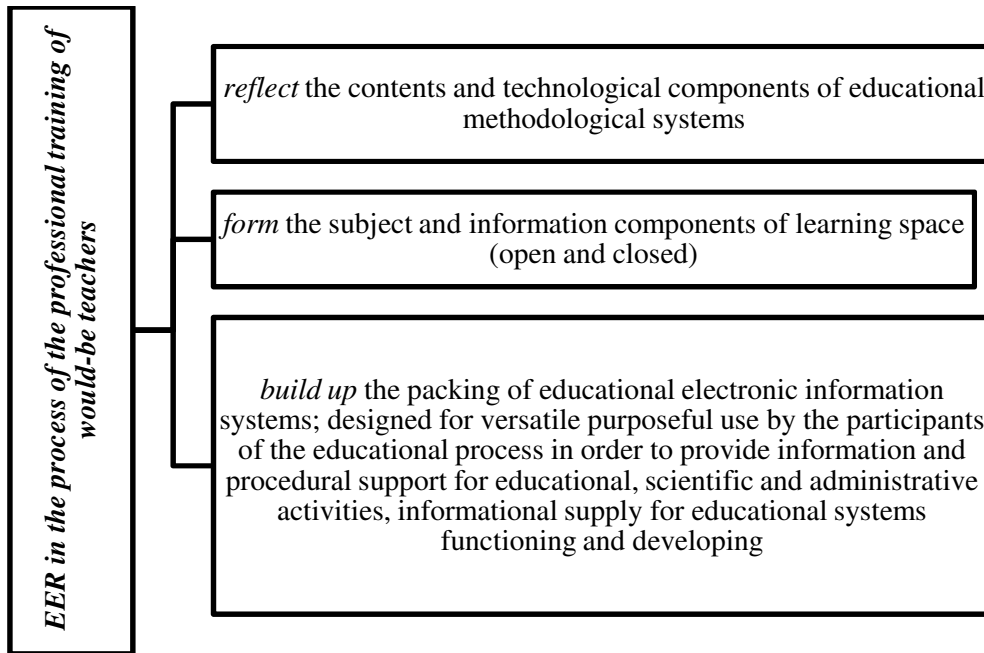


Fig. 1. Facilities of using EER in the process of the professional training of would-be teachers

The problems concerning the design of such resources are studied by V. Bykov, R. Gurevych, M. Zhaldak, N. Morze and other scholars. They claim that among the EREF available nowadays, the leading role in the professional training of specialists is played by electronic learning and methodological package (ELMP).

The analysis of the definitions of the concept of ELMP is summarized in Table 1.

Table 1

Analysis of definitions of ELMP

Basis for interpretation of the concept of electronic learning and methodological package	General contents and interpretation	Authors of the definition
Information educational resource	Provides guidelines for the user, covers the contents of the exercises, laboratory works, tests, recommendations for self- assessment and self-development	N. Klokar [6, p. 34], H. Kharchenko [7, p. 272]
Learning educational issue	Provides the continuity and fullness of a didactic cycle of the learning process and contains organizational and systematized theoretical, practical, assessing materials designed in accordance with the principles of interactivity, adaptability, informational openness and distant availability	O. Zhukova [24]
Electronic version of learning and methodological materials	Comprises traditional learning and methodological packages of a subject, learning and methodological packages for different kinds of practice, and learning and methodological packages for final governmental certification of school-leavers	M. Kademiia [9]
Electronic book	Contains cross-references, accompanying sound, and animation, which liven the electronic book	W. Wulf [23]

The analysis of this notion shows that there is no unified approach towards its definition. In the context of the present research, it should be mentioned that an ELMP is a EER designed for educational purposes which includes methodological information, training materials and assessment materials and provides learning, scientific and administrative activities through the use of hyperlinks.

ELMP designing is a long-term and laborious process; thus, it is especially important to determine the main stages of this process and to analyze potential difficulties at each stage of it. The preparatory stage implies the selection of an EER according to its educational purpose. At this stage the author analyzes available EER on the subject, foresees the expenses and time needed for the designing and considers the peculiarities of the students' professional training.

The analysis of the methods of EER designing demonstrates lack of the unified pedagogical concept. There is a need for substantial theoretical research in order to use its results as didactic basis for producing high-quality ELMP.

The main stages of ELMP designing are shown in *Fig. 2*.

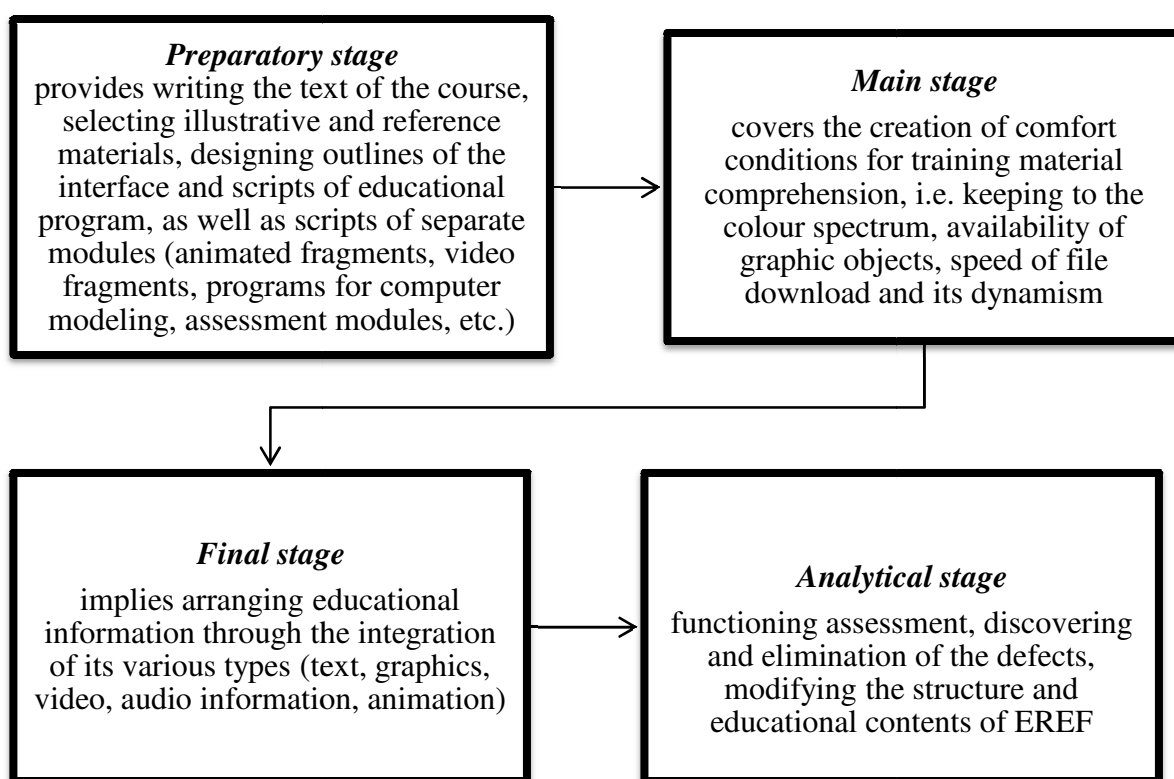


Fig. 2. Stages of ELMP designing

At the preparatory stage the author elaborates optionally (or of necessity) versions of educational material presentations that differ by their form as well as contents according to the psychological characteristics of the students; this may also require on-entry psychological testing. In the process of working with educational course it undergoes structuring with determination of a precise list of compulsory topics which should be taught within the course and division into units, sections, etc.

The script of the ICT component of the course and the text of the course are elaborated simultaneously. The script of ICT includes a precise list of the components and topics of the course, as well as the prospective outline of its structure which will be realized later on. It comprises the description of the animated, audio and video fragments, illustrations, etc. While designing the script, the authors take into consideration the capabilities of the chosen software

and available materials. The full script of the course embraced the use of the usual text and hypertext with links leading to the related themes, modules or concepts, as well as pictures, sound files, video fragments, tables, illustrative materials (graphs, diagrams, and figures), animated pictures, photos, computer models.

At the main stage the authors design the ELMP. Its pages should not contain unnecessary graphic or textual information that could distract readers' attention. The background should be monochromatic, but not necessarily white.

Adding graphics to the ELMP, we took into consideration the fact that the pages will be viewed in the systems with different graphic resolutions and colour depths, so we focused on computer facilities available to the majority of educational program users. Employing graphic formats which support image compression (GIF, JPEG, etc.) enables reduction of the total volume of the educational program.

Animation offers virtually unlimited capabilities in the sphere of situation imitation and demonstration of mobile objects, enabling users to perceive visual look of text fragments and sound. Sound is one of the elements that heavily influence the comprehension of the training material. Sound can be present in the forms of phrases pronounced by the speaker, a dialogue of characters or sound accompaniment to the video fragment. The course designers have at their disposal a variety of software capable of playing, recording and synthesizing sounds.

Different elements of ELMP can be created simultaneously; they are combined at the *final stage*. ELMP is divided into topics and the system of hyperlinks is formed. Considerable mass of information inherent in ELMP will be available only through well-organized interface and navigation system.

ELMP testing and revision take place at the *analytical stage*. Course support after its probation is of great help: it enables the elimination of possible mistakes, the addition of new supplementary modules, the renewal of reference information, etc.

In view of the foregoing, we can state that the contents of the training material, its systematizing and visualizing are important components of ELMP. Thus, we think it relevant to determine the principles of ELMP design alongside with its stages. ELMP must meet the requirements of the educational and qualification standards, syllabi and curricula. ELMP designing process should adhere to a range of general and specific principles [12, p. 34].

In the process of ELMP designing we held to the general principles elaborated by M. Holovan [10, p. 17]:

Table 1

Principle of ELMP designing	Main points of the principle
Principle of quantification	This principle implies breaking the training material into units which consist of modules (of minimal length but closed in content).
Principle of fullness	Each module contains the following elements: <ul style="list-style-type: none"> – theoretical main body; – test questions on the theoretical material; – samples; – tasks and exercises for independent work; – test questions on the whole module content (with answers); – test; – context reference (Help).
Principle of visualization	Each module consists of a collection of shots with the minimum of text; visualization facilitates the

	comprehension and memorizing of new concepts, assertions, and methods.
Principle of ramification	Each module is connected with other modules by hyperlinks, so that the user has the choice of switching to any other module. The principle of ramification does not exclude but, on the contrary, assumes the possibility of such switching which implements the consistent learning of the subject.
Principle of regulation	Students manage moving to the next frame on their own and can get any number of examples on the screen, do a number of tasks according to their needs and of particular levels of complexity assigned by themselves or the teacher, and also check themselves by completing a quiz or doing a test of the assigned complexity level.
Principle of adaptability	ELMP assumes the adaptation to the needs of a particular user in the learning process and enables variation of the depth and complexity of the material studied as well as its practical orientation depending on the students' prospective specialization. It also generates supplementary illustrative materials which meet the needs of the user and give them graphic and geometrical interpretations of the concepts studied.
Principle of computer support	At any time students can get computer support which frees them from the routine work and enables them to concentrate on the contents of the material studied, to consider more examples and to complete more tasks.
Principle of structural properties	ELMP is designed in the formats which let combine them into unified electronic complexes, extend and supplement them with new units and topics, and arrange electronic libraries.

The specific principles of ELMP designing include the principle of process modeling by means of ICT; the principle of appropriate use of audiovisual facilities, animation of phenomena and processes, and effects (animation effects, audio effects, static materials); the principle of feedback; the principle of addable training material presented in the coursebook; the principle of variability of forms and contents of learning, programs and facilities; the principle of efficiency, processing and systematization of the products of learning activities; the principle of interactive learning; the principle of the diversification of the forms of presenting information; the principle of self-administration.

Adhering to the above principles in the process of ELMP designing will facilitate students' comprehension of the training material and make its use necessary at all types of classes at higher institutes of education.

Authoritative scholars [15, p. 95] have argued that in order to provide high-quality educational process, the structure of ELMP can include the following elements: electronic training manual; computer-based tutorial on laboratory modeling; testing system; networked Web-version of the course, etc. [16, p. 358]. Such complexes should be distributed through educational institutions' servers; they should be notable for the authorization simplicity, flexibility, availability, variability and purposefulness.

To give an example, we can discuss the server of Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University (VSPU) (mode of access: <http://vspu.edu.ua>) which operates on

the basis of Ubuntu Linux server, with deployed Apache Web-server, database servers MySQL, POSTGRES, PHP, Tomcat, the system of institutional repository DSpace, and international system with open source code for keeping reviewed journals OJS, etc.

VSPU site hosts the system for access to the materials providing the educational process. Educational portal of the department of innovative and information technologies in education (mode of access: <http://ito.vspu.net>), for instance, contains the ELMP elaborated by the lecturers.

Training would-be teachers for Bachelor’s degree in specialty 015. Professional training (computer technologies)

The image shows a colorful header for the ELMP titled "Методика викладання інформаційних технологій" (Methodology of teaching information technologies). Below the header, there are icons for "WEB", "Adobe Photoshop", and "WEB". The main content is organized into a table with three columns: "Методична інформація" (Methodological information), "Навчальний матеріал" (Educational material), and "Матеріали для контролю знань" (Materials for knowledge control). The text in the table describes the development of information technology teaching methods, the need for a complex of trends in modern education (standardization, technologization, humanization), and the importance of preparing future teachers with a professional pedagogical orientation.

Fig. 3. ELMP for the discipline “Methods of teaching information technologies” elaborated by S. Kizim, PhD in Education

The image shows a colorful header for the ELMP titled "Комп'ютерно-аналітична діяльність у системах управління та навчання" (Computer-based analytical activities in educational and administrative systems). Below the header, there are icons for a globe, charts, and a laptop. The main content is organized into a table with three columns: "Методична інформація" (Methodological information), "Навчальний матеріал" (Educational material), and "Матеріали для контролю знань" (Materials for knowledge control). The text in the table describes the implementation of strategic tasks of professional-technical education (PTO), the need for a competent management generation, and the importance of developing information-analytical competencies (IAK) for management personnel.

Fig. 4. ELMP for the discipline “Computer-based analytical activities in educational and administrative systems” elaborated by S. Kizim, PhD in Education



Fig. 5. ELMP on the discipline “Methods of teaching information technologies at higher institutes of education” elaborated by S. Kizim, PhD in Education

The analysis of the approaches towards the determination of ELMP structure and contents enabled us to single out the following indispensable components:

- summary;
- methodological recommendations for the teacher and the user;
- training program and thematic outline;
- working program;
- educational and methodological materials for all types of classes (lectures, seminars, practical trainings);
- glossary or index (alphabetical list of keywords and terms in the form of references to the theoretical materials);
- tasks for initial, formative, and final assessment in the form of a list of question or tests;
- tasks for independent study;
- references and EER.

The advantage of EEMC in the process of the future teacher’s professional training is that the students can use EEMC in different subjects according to their individual needs at different stages of the lesson with their own trajectory of studying the educational discipline [18].

In the process of studying the professional training disciplines employing ELMP students analyze its educational content which includes the tables, illustrations, graphs or texts prepared in advance which can be displayed on the student’s demand. ENMK enables interactive activities: testing systems, e.g. *My Test*, give an opportunity to assess students’ achievements, to grade and to analyze the mistakes.

Among the principal approaches is the gradual increase in the amount and complexity of information as students acquire professional knowledge and practical experience.

Employing ELMP in the process of would-be teachers’ professional training enhances the efficiency of teaching, influences the development of students’ intellectual potential,

builds up their capability of independent learning, searching and researching activities, enriches their information skills, which leads to the improvement of training quality and promotes educational individualization and differentiation.

Among the distinctive features of an ELMP are interactive components, hypertext structure of training materials, the adaptive system of training administration with the elements of artificial intelligence, and self-control modules. Our research proves that it should not be considered as an alternative to the traditional educational facilities, but as a didactically advisable supplement to them. The use of three-dimensional graphics, video fragments and audio support in ELMP contributes to better comprehension of training materials due to employing various memory types (visual, auditory, and associative). The capability of free search for educational content, convenient navigation system, hyperlinks and switching to any passage of the text, prompt alternation and addition, and compactness make ELMP suitable for the use at lectures, laboratory and practical classes, as well as students' unsupervised work.

The practice of professional training shows that teaching with the use of hypertext technology leads to better training standards not just because of the visualization of the information. Employing dynamic hypertext helps diagnose the student's level of training, and then automatically choose one of the possible levels of studying the particular unit. Hypertext educational systems present information in such a way that students guided by the graphic or textual references can choose from a range of modes of working with training material. All the above provide suitable conditions for the implementation of the differentiated approach to teaching [15, p. 57].

The scientists' prognosis is that massive technological innovations in education will be caused by the use of EER (ELMP in particular). Teachers are now elaborating ingenious teaching methods and styles, increase the proportion of students' practical activities and establish the environment that encourages students to make creative decisions in completing professional tasks based on their background theoretical knowledge.

Practical use of ELMP in would-be teachers' professional training shows that compared to the traditional teaching materials, they have the following advantages:

- interactivity;
- supplementing by animations and presentations;
- prompt renewal of training materials;
- the possibility to add large quantities of structured information;
- the access to training materials through the hypertext;
- active students' involvement in training process and concentration of their attention on the most important aspects of the material;
- diagnosing the quality of educational achievements through the use of various testing programs for both students' self-assessment and assessment carried out by the teacher;
- the use of innovative teaching methods (project method, modular training, distant training, problem-based training, etc.) [16, p. 6].

ELMP can be presented as EREF accessed through the educational institution's local network or distributed on optical transmitters. Most ELMPs are available on educational institutions' local networks; thus, they are accessible only to the teachers and students of a particular institution. Educational packages in open access have a range of drawbacks; they need further elaboration and extension. They do not meet some requirements and are not suitable for the use in training process.

Teaching facilitated by the use of ELMP cannot replace a teacher, but it can supplement and improve the methods of teaching and develop students' independence and creative thinking skills. The use of Web 2.0 services is of great assistance in training would-be

teachers as it enables would-be professionals not just browse through the Internet, but also co-operate and deposit textual and media information on the Web. Students' transition to the level of the members of network community promotes efficient ICT implementation in professional teaching activities and gives would-be teachers an opportunity to improve their mental outlook; to develop their skills in communication on the Internet; to arrange interpersonal interaction; to co-operate within groups; to systematically develop their cultural, technological and information competence. The ELMPs we have designed in order to improve the quality of would-be teachers' professional training comprise cloud services, including blogs. *Blogger* is now a popular service for educational blogging. The platform enables the users to publish posts, to configure the look of the blog, and to add information recourses, which makes the educational site convenient and compact.

Fig. 6 shows the sample of an educational site available at <http://svitlanakizim.blogspot.com/>. The site combines a range of *Blogger*'s technical capabilities. We use this blog in teaching the course of Methods of Teaching Information Technologies. It can be employed for students' independent work, in teachers' preparation for classes, for students' and teachers' self-education, and for practical work.

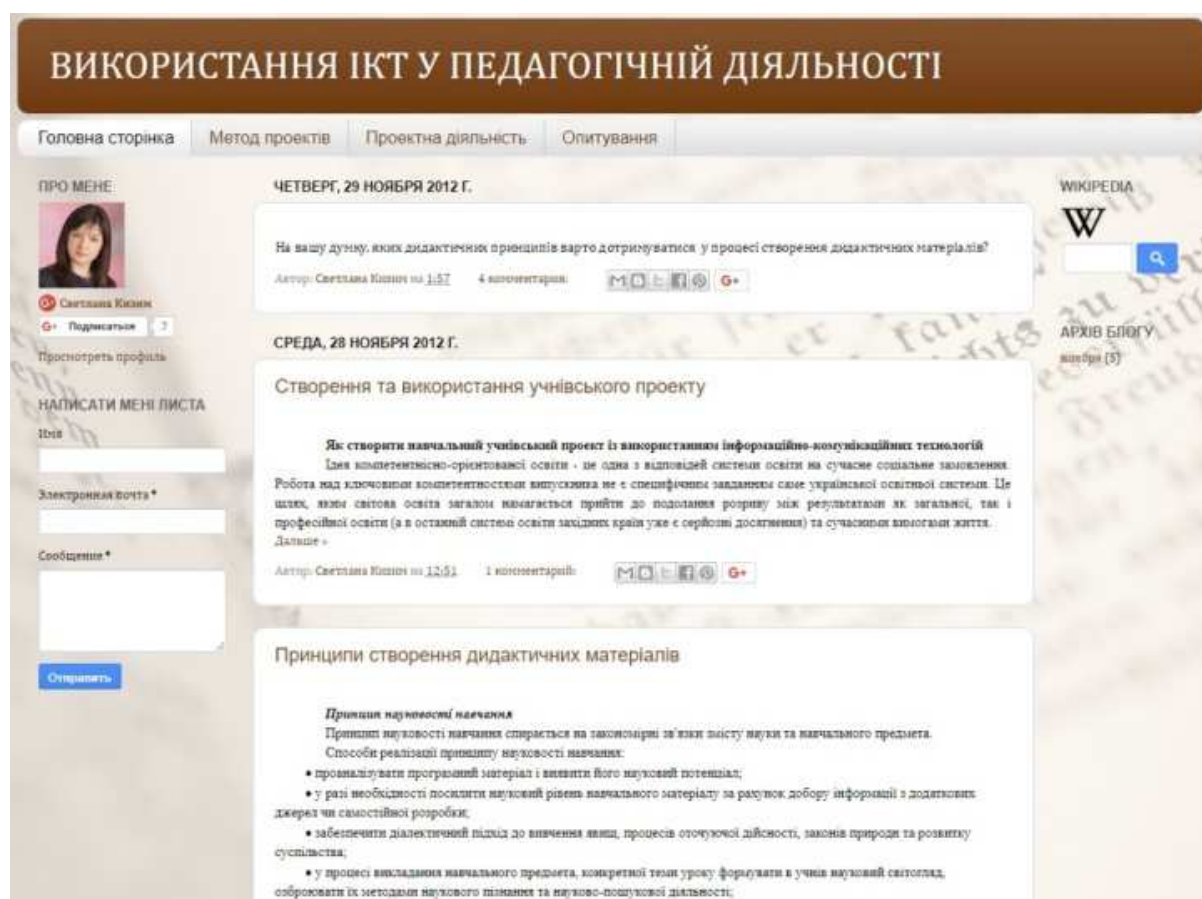


Fig. 6. Teacher's blog "The Use of ICT in Educational Work"

The above blog can be viewed as a variant of the personal teacher's space, a facility for organizing co-operative work of a particular group of students, and a suitable environment for modeling learning situations. The blog contains short notes (posts) of contemporary importance sorted in backward chronological order (the latest post is on the top) reflecting personal students' thoughts and the author's materials. Students and teachers are mostly

interested in the blog's interactivity: the teacher can add training materials in any form and the students can use, improve, evaluate and comment on them.

ELMP should also contain cross-curricular materials, video materials and interactive models which will enhance the comprehension of the training material and facilitate remembering.

The combination of ICT facilities, EREF and cloud services as parts of ELMP provides considerable benefits:

- interactivity (the capability of ELMP to react upon students' inquiries enabling a dialogue with the training system);
- actualization (the possibility to introduce references to other electronic sources of information into the ELMP);
- adaptation (the possibility to modify ELMP according to the student's individual needs and abilities through varied learning paths and tests of different complexity levels);
- visualization (the capability to use coloured styling of training materials, animation, videos and audio files);
- hypertext structure which enables the student to work with the components of the package in free mode and to get information in different ways, thus choosing their individual learning strategy.

The long-term use of ELMP in the process of would-be teachers' professional training enables us to determine their main functions summarized in Table 2.

Table 2

Functions of ELMP in the process of would-be teachers' professional training

Function	Content
Information	Fixes the necessary subject contents and forms of students' activities
Explanatory and illustrative	Provides training process with verbal or visual facilities
Scientific and research	Promotes problem solving and research instead of mere memorizing the material
Training and practical	Connects theory and practice
Social and pedagogical	Contributes to the formation of knowledge, outlook, aesthetic and other behavioral norms
Transformational	Concerned with knowledge transformation and processing taking into consideration the principle of consistency
Systematizing	Provides a strict consequence and systematization of the training material
Cognitive and converting	Provides the transformation of knowledge and skills within the dialectics of true cognition
Self-educational	Forms the ability of independent knowledge acquisition
Generalizing	Implies the analysis and generalization of the training information
Pedagogical	Implements the principle of the interconnection between teaching, upbringing, and forming the scientific outlook
Training tasks	At the stage of materialized students' activities provides the completion of all training tasks in the form of diagrams, figures, etc.
Rationalizing	Provides the rational approach towards training materials presentation

Interpreting	Provides the unambiguity of training information
Projecting	Provides the possibility of projecting the processes studied
Problem researching	Develops students' tendency towards problem researching activities
Synthesizing	Provides mental integration of analytically studied training objects
Abstractive and comparative	Provides the elements of training abstracting and comparison
Coordinative	Provides the most efficient use of training facilities, including extra-curricular ones
Correcting	Implies the possibility of training materials correction or specification
Referential	Provides students' orientation in original sources on training disciplines
Methodological	Implements the functions of training administration through ELMP
Consolidating	Forms the purposefulness of students' activities supervised by the teacher
Self-controlling	Assists students in acquiring sound knowledge of the compulsory training material
Motivational	Forms positive motivation towards learning
Stimulating	Encourages students to search for information beyond the scope of ELMP
Adaptive	Provides training individualization with the elements of adaptation to training information
Prognostic	Implies the choice of training materials considering the prospects of science and the field development
Feedback between a student and ELMP	Provides obtaining the information about the course of training (feedback)
Systematic connection with other didactic facilities	Regulates students' relations with other EREF

The multifunctionality of ELMP in professional training of would-be teachers has been proved by the results of the pedagogical experiment in Vinnytsia Mykhailo Kotsiubynskiy State Pedagogical University. In the course of the experiment the use of ELMP in professional training of would-be teachers (specialty 015. Professional Training (Computer Technologies)) received approval. The results of the experiment demonstrate the efficiency of the use of EER and ELMP in particular in would-be teachers' professional training. 21 respondents were involved in the pedagogic experiment. The students' professional knowledge in the process of studying "Methods of teaching information technologies" was evaluated according to the indices of the formation of academic achievements, theoretical knowledge and practical skills.

As the experimental and control groups were not numerous, we shall restrict ourselves to the methods of mathematical statistics for small representative groups. In order to test the elaborated methods for the use of ELMP in would-be teachers' professional training the students of Vinnytsia Mykhailo Kotsiubynskiy State Pedagogical University were grouped as follows: control group – 9 students; experimental group – 12 students.

Students belonging to the experimental group were taught according to the elaborated methods of the use of ELMP available at <http://ito.vspu.net/ENK/index.htm>. In the course of the experiment the positive dynamics of the students' academic achievements in conditions of

the use of ELMP on Methods of Teaching Information Technologies were recorded in the experimental group. (Fig. 7).

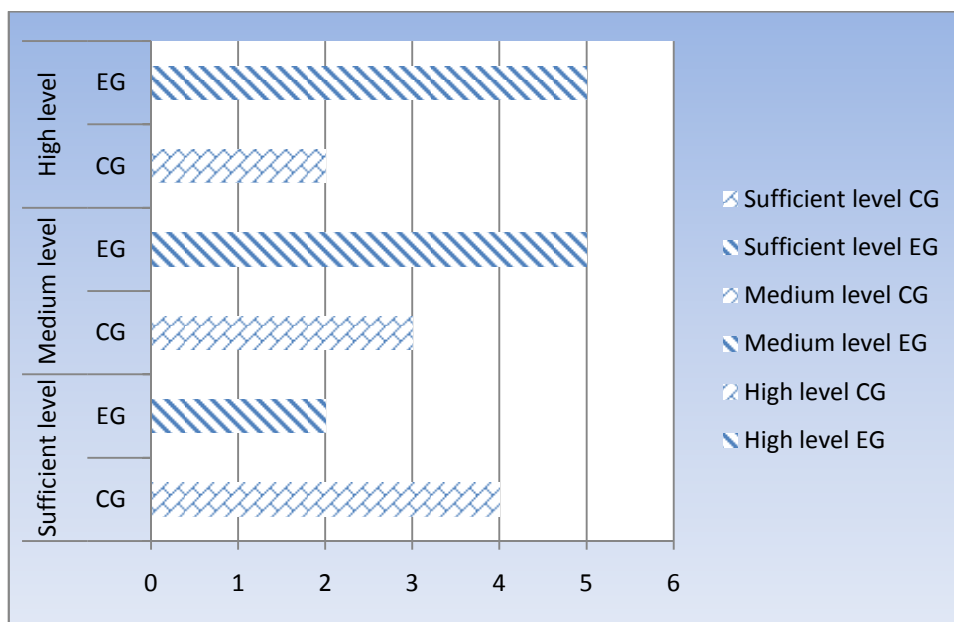


Fig. 7. Comparative diagram of the distribution of academic achievements of the students of control and experimental groups

Thus, the pedagogical experiment proved the efficiency of the elaborated methods for the use of ELMP in would-be teachers' professional training.

The diversity of ELMP's functions in the process of would-be teachers' professional training proves that the ELMP elaborated according to the definite structure, general and specific principles contribute significantly to would-be teachers' substantial professional training and develop their professional competence.

3. CONCLUSIONS AND PERSPECTIVES FOR FURTHER RESEARCH

The analysis of literary sources [18, p. 140], [20, p. 3], participation in the activities of scientific-research laboratory on the problems of the use of information technologies in education of VSPU and the Institute of Information Technologies and Educational Facilities of the National Academy of Sciences of Ukraine (http://ito.vspu.net/eksperiment_robota/lab_IITZN/monograf_ios.pdf), the conducted research and our own pedagogical experience enabled us to determine the ELMP structure as follows:

1. Methodological information: summary; training program; working program; primary and supplementary literary sources; the Internet resources.
2. Training materials: theoretical material; materials for practical and laboratory classes; glossary.
3. Testing materials: assessment criteria; tests; tasks for students' independent work; quizzes; exam questions.

Having researched the problem, we defined the following peculiarities of the use of EREF in the process of would-be teachers' professional training:

1. ELMP is viewed as a unified system of EER integrated in order to store, organize, process, transmit and present training materials and information of other types to both students and teachers according to the chosen educational technology.

2. All the EREFs integrated into ELMP are interconnected, have the common information basis and are developed in accordance with the chosen educational technology and within the common conception of would-be teachers' professional training.

3. ELMP can be used via local and distributed networks of an educational institution and on the Internet.

Further research should be done on the improvement of the EREF structure, the integration of educational EREF and cloud services within ELMP in order to provide high-quality professional training of would-be teachers, the stipulation of the ability to use ELMP on various modern electronic devices and different operating systems.

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ОСОБЛИВОСТІ ПРОФЕСІЙНОЇ ПІДГОТОВКИ МАЙБУТНІХ ПЕДАГОГІВ В УМОВАХ ВИКОРИСТАННЯ ЕЛЕКТРОННИХ ОСВІТНІХ РЕСУРСІВ

Кізім Світлана Степанівна

кандидат педагогічних наук, доцент кафедри інноваційних та інформаційних технологій в освіті
Вінницький державний педагогічний університет імені Михайла Коцюбинського, м. Вінниця, Україна
ORCID ID 0000-0003-1451-3950
skizim2012@gmail.com

Анотація. У статті представлено результати дослідження проблеми використання освітніх електронних ресурсів у професійній підготовці майбутніх педагогів, проведено класифікацію електронних освітніх ресурсів. Належне місце у нашому дослідженні належить електронним ресурсам навчального призначення, зокрема електронному навчально-методичному комплексу (ЕНМК). У ході дослідження охарактеризовано етапи, принципи створення ЕНМК та визначено функції його використання у професійній підготовці майбутніх педагогів у вищих навчальних закладах. Процес конструювання ЕНМК передбачає інтеграцію традиційних й інноваційних дидактичних засобів, електронних освітніх ресурсів та методів навчання з метою активної співпраці викладачів і студентів.

Використання ЕНМК забезпечує ефективну й якісну підтримку різноманітних форм професійної підготовки; інтенсифікацію розвитку інтелектуальних і творчих здібностей студентів; посилення мотивації навчання за рахунок використання вдалого інтерфейсу ЕНМК; поліпшення якості засвоєння навчального матеріалу; прискорення формування професійних умінь і навичок майбутніх педагогів; підвищення професійної компетентності у сфері інформаційних технологій; гнучкість мислення під час розв'язування фахових завдань у професійній підготовці майбутніх педагогів у ВНЗ.

До переваг використання ЕНМК у професійній підготовці майбутніх педагогів відносимо: високу технологічність створення й експлуатації; високий рівень системності подання навчально-методичних матеріалів; реалізацію різноманітних функцій; розширення можливостей у процесі представлення (візуалізації) навчального матеріалу. ЕНМК, як показали наші дослідження, в порівнянні з електронними освітніми ресурсами навчального призначення значно підвищує ефективність викладання навчальних дисциплін, за рахунок здатності ЕНМК реагувати на запити студентів, створюючи можливість діалогу з навчальною системою; можливість своєчасного оновлення навчального матеріалу; можливість включення до складу ЕНМК посилань на інші електронні освітні ресурси; можливість ЕНМК «підлаштовуватися» під індивідуальні можливості та потреби студента за рахунок представлення різних траєкторій вивчення навчального матеріалу, різних рівнів складності контролюючих завдань, що входять до складу ЕНМК.

Ключові слова: електронні освітні ресурси; професійна підготовка педагогів; електронний навчально-методичний комплекс; вищі навчальні заклади.

ОСОБЕННОСТИ ПРОФЕССИОНАЛЬНОЙ ПОДГОТОВКИ БУДУЩИХ ПЕДАГОГОВ В УСЛОВИЯХ ИСПОЛЬЗОВАНИЯ ЭЛЕКТРОННЫХ ОБРАЗОВАТЕЛЬНЫХ РЕСУРСОВ

Кизим Светлана Степановна

кандидат педагогических наук,

доцент кафедры инновационных и информационных технологий в образовании

Винницкий государственный педагогический университет имени Михаила Коцюбинского,

г. Винница, Украина

ORCID ID 0000-0003-1451-3950

skizim2012@gmail.com

Аннотация. В статье представлены результаты исследования проблемы использования образовательных электронных ресурсов в профессиональной подготовке будущих педагогов, проведена классификация электронных образовательных ресурсов. Надлежащее место в нашем исследовании принадлежит электронным ресурсам учебного назначения, в частности электронному учебно-методическому комплексу (ЭУМК). В ходе исследования охарактеризованы этапы, принципы создания ЭУМК и определены функции его использования в профессиональной подготовке будущих педагогов в высших учебных заведениях. Процесс конструирования ЭУМК предусматривает интеграцию традиционных и инновационных дидактических средств, электронных образовательных ресурсов, а также методов обучения с целью активного сотрудничества преподавателей и студентов.

Использование ЭУМК обеспечивает эффективную и качественную поддержку различных форм профессиональной подготовки; интенсификацию развития интеллектуальных и творческих способностей студентов; усиление мотивации обучения за счет использования удачного интерфейса ЭУМК; улучшение качества усвоения учебного материала; формирование профессиональных умений и навыков будущих педагогов; формирование профессиональной компетентности в области информационных технологий; гибкость мышления при решении профессиональных задач в профессиональной подготовке будущих педагогов в вузе.

К преимуществам использования ЭУМК в профессиональной подготовке будущих педагогов относим: высокую технологичность создания и эксплуатации; высокий уровень системности представления учебно-методических материалов; реализацию различных функций; расширение возможностей в процессе представления (визуализации) учебного материала. ЭУМК, как показали наши исследования, по сравнению с электронными образовательными ресурсами учебного назначения значительно повышает эффективность преподавания учебных дисциплин, за счет способности ЭУМК реагировать на запросы студентов, создавая возможность диалога с обучающей системой; возможность своевременного обновления учебного материала; возможность включения в состав ЭУМК ссылок на другие электронные образовательные ресурсы; возможность «подстраиваться» под индивидуальные возможности и потребности студента за счет представления различных траекторий изучения учебного материала, различных уровней сложности контролируемых задач, входящих в состав ЭУМК.

Ключевые слова: электронные образовательные ресурсы; профессиональная подготовка педагогов; электронный учебно-методический комплекс; высшие учебные заведения.

