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USE OF CLOUD-BASED MULTIMEDIA EDUCATIONAL RESOURCES IN THE PREPARATION OF FUTURE PRIMARY SCHOOL TEACHERS

Abstract. Most educational support materials include graphics, animation, audio and video snippets, infographics, and text that can be accessed through the Internet. In recent years attention paid to the pedagogical design of teaching and learning tools using cloud-based technologies (CBT) has been increasing in the world. Such facilitates as the friendly interface of computer-based and web-based applications, the speed, availability and security of CBT provoke higher interest among educators to the constant use of products offered by these technologies. The above-mentioned points to the problem of designing a quality cloud-based multimedia educational resource (CBMER), as well as the need to determine the effectiveness of the use of projected CBMER in the educational process. Based on the analysis of scientific articles and research by specialists in the educational sphere the stages of designing were distinguished, the basic principles (didactic, qualitative and technical) which should be observed during introduction in the educational process were described; the functions that perform CBMER and the operating modes were specified. For the use of the author's CBMER in the educational activities of teachers of higher education institutions, a number of recommendations have been put forward and the author's system of evaluation of the quality of the multimedia educational resource has been proposed. The peculiarities of teaching with the use of CBMER are described in detail based on the case of the discipline «Special Workshop on Informatics» for students of specialty «013. Primary education» of Borys Grinchenko Kyiv University. It is statistically justified that the author's CBMER containing interactive tasks, dynamic elements, audio and video elements contribute to the formation of professional competences.

Keywords: multimedia educational resource; cloud-based technologies; cloud-based multimedia educational resource (CBMER); training of future primary school teachers; development of professional competences.

1. INTRODUCTION

An educator as an active figure faces the need to constantly update the methods and means of carrying out educational activities. Increasingly, the educational and methodological support of the discipline includes the author's electronic materials, developed by the teacher, in particular: lectures, the main content of which is presented through multimedia presentations; methodical instructions and recommendations containing graphs, diagrams, diagrams, images, etc.; individual tasks, accompanied by short video instructions; collections of situational tasks (cases); examples of solving typical tasks or completing typical tasks digital illustrations and more.

In many countries, the design and implementation of electronic resources including multimedia into the educational process is carried out in accordance with internationally accepted recommendations, protocols, standards and other regulations [1]. For example, the

International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) have formed a specialized standardization system in the field of information technology and created a joint technical committee, within which a package of regulations managing e-content for educational purposes was developed – «STANDARDS BY ISO/IEC JTC 1/SC 36 Information technology for learning, education and training» [2]. The EU Science Center for the Advancement of the Contemporary Educator has developed the «The European Framework for the Digital Competence of Educators» [3]. The document contains a science-based framework that describes what it means for educators to be proficient in digital technologies and details how digital technologies can be used to improve the quality of education and learning. The international project «iTEC – Innovative Technologies for an Engaging Classroom» [4] was created to provide a sustainable model of a fundamental re-engineering of digital teaching and learning processes. In addition, each country puts forward a number of requirements for multimedia educational resources in terms of the individual characteristics of its citizens and educators.

To support the pedagogical design and implementation of digital content, including cloud-based multimedia educational resources (CBMER), Ukraine also has a clear vector in the educational process, which is regulated in the following governing documents: Law of Ukraine «On the Concept of the National Program of Informatization»: «Application and development of modern information technologies; formation and support of the market of information products and services; integration of Ukraine into the world information space, etc.» [5]; *National Program «Electronic Ukraine»*: «ensure the use of the latest information and telecommunication technologies in the field of education; provide broad access to information resources, national and global networks; comprehensively promote computer literacy, etc.» [6]. In *«National Strategy for the Development of Education in Ukraine until 2021»* it is stated in particular: «creation of electronic textbooks and encyclopedias for educational purposes; providing access to information resources, etc.» [7, pp.10-11] and others. Thus, the concept of pedagogical design of educational e-resources, its components, structure and content in Ukrainian pedagogy is relevant and widely researched by scholars in literature references, in particular the theoretical substantiation of psychological and pedagogical principles of multimedia content design of electronic educational resources for higher educational institution (HEI) can be found in the dissertation research by Svitlana Denysenko [8]; Olena Hrybiuk [9] determines that designing in the learning process will be more effective by giving students the ability to choose the level of immersion in the course material; asynchronous work with educational material, including in the form of hypertext; the transition from reading texts from your computer screen to interactive activities; Valerii Kyrychuk [10] points out that in the course of psychological and pedagogical designing it is necessary to use computer complexes with reliable and valid methods of objective and prompt evaluation of the dynamics of physical, mental, social development of the learner. Victor Demianenko, Halyna Lavrentieva and Mariia Shyshkina [11] in composite work provided methodical recommendations on the selection and use of electronic tools and resources for educational purposes. The issues of development and implementation of educational resources with e-content and ways of distinguishing general and specific didactic conditions are considered in the scientific papers by the researchers V.Bykov, Ya.Vovk, T.Habai & N.Talyzina [12]; V.Bykov, O.Spirin, O.Pinchuk [13]; M.Synytsia [14]; in scientific papers [15]-[16] the classifications of digital tools and examples of their application at various stages of training in HEI are presented by the authors. The study by N. Morse, V. Vember and M. Gladun [17] identified the level of interest of three groups of respondents (pedagogical staff and students of institutions of higher education and teachers of general secondary education institutions) in the proficiency in digital tools and the ability to use them effectively in the educational process.

The topic of cloud-based multimedia educational content for educational process support is widely presented on international level. Thus, Hans van der Meija and Paul Dunkel in their research [18] present the experiment which proves the effectiveness of overview educational videos as an additional tool for performing learning and practical tasks. In the article by Chen Y. and Kong D. the research [19] is presented where the authors prove the effectiveness of learning with the help of multimedia content and point out a significant increase in the level of understanding, perception and effectiveness of learning materials mastering as well as admit improvement in teaching level. In research articles [20]-[22] by foreign researchers the problem of digital content design including multimedia educational content design is highlighted as a background for educational process modernization. The positive impact of such content on students' competences development and the level of education quality in general is discussed. Also many scientific papers deal with the question of cloud-based technologies integration into the process of future teachers preparation. For example, in the research [23] it is offered to introduce a learning course for beginner level teachers which would help integrate web-technologies into learning and teaching.

Taking into account previous research developments and international standards, in our study, we will briefly outline the conceptual framework for CBMER design and describe the main results of its use in the educational process of future primary school teachers.

The aim of the research is to highlight a number of recommendations on designing CBMER and to demonstrate the positive impact of cloud-based multimedia content of a discipline on the level of general and professional competences of future primary school teachers.

Research methods: interviews and questionnaires, monitoring students' activity and initiative in completing assignments, analysis of the quality of completed assignments and the depth of learning material.

In order to achieve this goal, a pedagogical experiment was conducted, which was implemented through the phased implementation of the following tasks: the stages of the experiment were defined and described; the number of participants and membership of the groups (experimental and control) have been selected; the level of formation of professional competences was checked; the hypothesis of the study has been empirically tested; the effectiveness of CBMER use for educational purposes has been evaluated.

2. CONCEPTUAL PRINCIPLES OF CBMER DESIGN

To improve the quality of original CBMER it is advisable to follow a clear sequence of design steps:

1. *Analysis.* At this stage, the needs of the target audience have to be analyzed; the type of content (text, images, graphs, tables, diagrams, audio, video, or animation) has to be determined; rules for the stages and time of creation have to be established.

2. *Planning.* Establish the purpose of CBMER creation and what educational goals the resource should provide; think about the content and application process.

3. *Development.* Includes content creation, technical verification. The result is ready and published CBMER.

4. *Implementation.* Applying of CBMER in educational conditions.

5. *Evaluation.* The effectiveness of the designed CBMER is analyzed and decisions are made to improve the resource.

6. *Finalization.* It is necessary to constantly monitor the relevance of information, serviceability of the elements and features of the target audience.

When designing CBMER, it is also very important to follow the *didactic, qualitative and technical principles.*

Didactic principles are intended to regulate the observance of the norms of the educational process, CBMER must meet a learning objective that is clearly articulated and recorded. Learning outcomes are formulated with a focus on the learner: what the learner can do and under what conditions. Well-formulated learning outcomes contribute to a better understanding of the quality of designed CBMER. Educational content should be engaging and motivating. In general, CBMER should ensure that the following didactic principles are met: scientific, accessible, systematic and consistent, problematic, visual, developing the intellectual capacity of the learner, and activity.

Qualitative principles reflect how relevant the material is, whether design decisions are easily perceived, whether the media is properly selected (images, dynamic graphics, video, sound, etc.), or whether CBMER is technically functional and visually appealing, defines or helps to formulate the competencies laid down. Navigation elements (content, menus, navigation buttons, etc.) should be designed in the same style and in user-friendly locations, such as the content to the right or left of the main information field, the "forward" / "back" buttons below, and the "input" / "Exit" – in the upper right corner of the screen. If the CBMER is volumetric and combines a large number of elements, tasks, audio and video, it is advisable to follow this structure:

1. *Introduction.* This section describes the basic rules for using CBMER and the technical requirements, specifying what types of tasks are foreseen and specifying the learning outcome.

2. *Main content*. It is given as a combination of text, graphics, animation, audio and video.

3. *Activities*. Activities to consolidate training material and self-control (e.g., interactive tasks, self-tests, discussion, etc.) are considered.

4. *Additional information*. Links to additional materials, instructions, activities, tips, thesaurus, etc are included.

A CBMER developer needs to think through which design solutions to frame own educational product and adhere to. Design is the layout of content, the selection of colors, the principles of using graphics (drawings, images, and animations), the choice of style and size of text, etc. The basic details of the training material should be easy to find, large enough and clearly distinguishable from the background. The colors of the text and background should be chosen as contrast as possible. The font and text are selected to highlight important information.

Technical principles regulate the correctness of internal and external links; display the information available through the link; correct operation of the navigation elements; determine whether content is compatible with as many different types of devices, web browsers, and operating systems as possible.

If deficiencies are identified at any of the stages of the CBMER design it is necessary to correct, extend and supplement the system of measures to eliminate them.

Projected CBMER can be used at all stages of the educational process: explaining (introducing) new material, mastering, repeating, controlling, etc. In such a case, CBMERs perform the following functions:

- source of training information;
- educational game stimulation;
- intensification of clarity;
- diagnostic and monitoring tool;
- simulator and more.

It is also advisable to note that the use of CBMER in the educational process has several modes:

1. *Demonstration* (demonstration mode is implemented; the student has only a contemplative function). For demonstration mode, it is enough for a teacher to have one multimedia complex by which CBMER is displayed.

2. *Individual* (requires a student to take active action while working with CBMER, designed for one-on-one interactive work). To organize individual work, each student must be provided with a personal computer and access to the global Internet.

3. *Combined*.

3. APPLYING CBMER IN THE EDUCATIONAL PROCESS

Before you apply an original CBMER in educational activities, you must evaluate the quality of the educational resource. For this purpose, in our pedagogical experiment, a rating system was developed in which 0 to 3 points can be obtained for each indicator (Table 1).

Table 1

Quality assessment of the projected CBMER

№	Indicator	Wf*	Score
1.	Content (completeness, validity, relevance, etc.)	0,1	
2.	The logic of sequence	0,1	
3.	An interactive component	0,05	
4.	Comprehensibility of terminology	0,05	
5.	Ergonomics	0,1	
6.	Quality of visual materials (drawings, diagrams, tables, etc.)	0,1	
7.	The complexity of designing	0,15	
8.	Feasibility of use	0,1	
9.	Didactic potential	0,1	
10.	Promotes the development of intellectual potential	0,15	
	Score based on Wf		
	Total point score		

** Wf – weight factor*

Taking into consideration the heterogeneity of indicators to determine the quality of the projected CBMER the approach was chosen, based on the determination of weighting factors (Wf) indicators. We used formulas 1-2 to calculate points:

$$O_n = p_n * k_n \quad (1),$$

$$H_n = O_1 + \cdots + O_n \quad (2),$$

where p_n – Quality Score Value (from 0 to 3); k_n – weight factor (from 0,05 to 0,15); O_n – Score on the indicator taking into account *Wf*, where n – indicator ordinal number; H_n – overall point score given Wf, where n – the ordinal number of the projected CBMER.

For the designed CBMER you can get the maximum score considering Wf – 3. The Harrington scale [24, pp. 495] was chosen as the basis for quality determination of the final educational product and its indicators were adapted to our study (Table 2).

Table 2

The value of quality of CBMER

Linguistic assessment	Value intervals
Very good	2,4 – 3
Good	1,89 – 2,4
Satisfactory	1,11 – 1,89
Bad	0,6 – 1,11
Very Bad	0 – 0,6

CBMER, rated «Bad» and «Very Bad», require thorough refinement and are not allowed for educational purposes, CBMER rated «Satisfactory» need adjustment and improvement with the possibility of application for educational purposes after re-examination, mark «Good» indicates high quality of CBMER and allows it to be used for educational purposes after eliminating minor flaws, «Very good» means CBMER is ready to be introduced to the educational process. Note that designing CBMER is a complex and creative process, and work on product refinement never stops, and constant updating and updating of content is a major requirement.

Teachers who train future primary school teachers who plan to systematically apply CBMER to their classes, need to take a number of steps:

- continually work on improving own digital competence;
- be flexible in the selection of teaching methods and tools;
- improve design skills of CBMER;
- study the implementation of CBMER in the educational process;
- diagnose the effectiveness of CBMER application;
- continually update CBMER in accordance with changes in content, technical and didactic components.

Here are the peculiarities of teaching a discipline «Special Workshop on Informatics» for specialty students «013. Primary education» of Borys Grinchenko Kyiv University using original developed CBMER.

Target group: future primary school teachers (students), 4th year.

A number of steps have been taken to improve the content:

- e-course in the LMS Moodle was developed;
- CBMERs to support educational discipline were designed;
- system of CBMER implementation into educational activities was developed;
- a student support system for practical and self-study work by CBMER (recommendations and instructions) was developed;
- the main learning outcomes of future primary school teachers using CBMER in the discipline were identified and described.

The study of discipline provides such forms of teaching as lectures (6 hours), practical and laboratory classes (36 hours), self-study work (50 hours) and module control work.

Lectures on discipline «Special Workshop on Informatics» provide a presentation of material on the organization of educational-methodical and organizational activities of the teacher, methods of supporting the educational process by means of multimedia and interactive applications, as well as the development of materials for the control and analysis of students' success with the tools of pedagogical software. Obviously, the theoretical material should be thorough and sufficiently voluminous, so interactive publications and dynamic presentations were developed to explain the theoretical information (Powtoon, Prezi, Ourboox). The information that shows the relationship and hierarchy was represented by cloud-based applications that generate information in the form of mind maps (MindMeister, Bubbl). Cloud-based time-lapse services were used to clarify the dynamics of change over time. (Timeline JS). All of these cloud-based services and platforms allow you to integrate text and hyperlinks, graphics, videos and interactive elements. Due to the refinement, diversity and interesting presentation of information, students master the theoretical material with greater enthusiasm that contributes to the deepening of knowledge.

To deliver a lecture with CBMER, it is enough to have one computer (laptop), a white board (SMART Board) and a projector in the lecture hall. If HEI logistics enables all students to connect to the institution's high-speed Internet, then it may be appropriate to provide material to anyone with a hyperlink (such as a QR code) at the beginning of the class, so that students can move together with the teacher and better navigate the material, and any information that has been received in the classroom remains available for future reuse.

Practical and laboratory classes are intended to consolidate the acquired knowledge (both during the whole educational activity and in the lessons of a specific discipline) through practical activity. In such classes, students consolidate and summarize the material they have passed; fill in the gaps in previously acquired competences. They improve their level of independent work, collaboration, communication ethics and teamwork, reflection and self-reflection skills. Engaging CBMER in such activities raises learning activities motivation, increases interest in the topic of study, enhances concentration and retention, and enhances creativity. The role of the teacher is transformed, and it is sufficient for him to be a tutor and a mentor. Students have all the tools to accomplish the tasks, and the teacher only has to direct and advise in case of difficulties, the atmosphere in the classroom is calm and friendly, the students minimize the feeling of fear and uncertainty because of the opportunity. CBMERs designed to support these learning activities can be divided into infographics (Piktochart or Visual.ly), didactic materials in the form of a game (LearningApps, Zondle), presenting information in the form of comics (Pixton, Canva), services for storage and joint discussion of presentations, publications, illustrations, videos (Flickr, Slideshare, Google Docs).

Self-study work of students studying the discipline «Special Workshop on Informatics» consists in the independent learning of theoretical (lecture) material; preparation for practical work; finding and analyzing sources submitted for study; preparation for modular control. All these activities are aimed at developing the competencies outlined in the educational program. It should be noted that the students' self-study work is performed under the methodical guidance and control of the teacher without his direct participation.

Modular control work (MCW). Testing was chosen as the MCW form for the discipline of «Special Workshop on Informatics». In order to extend the functional range of the test tasks, cloud-based platforms were chosen to create interactive tests, they allow creating graphical questions and answers, embedding pictures and images; contain a wide range of question types; support scoring based on question category and more (Google Forms, ProProfs Quiz).

Teaching future primary school teachers is a complex educational process, as students must not only be able to accumulate knowledge but also be able to apply them to solve complex and unusual professional tasks, be able to independently search and analyze information, be aware of various aspects of pedagogical methods adherence to psychological-pedagogical and didactic principles, to move from the theoretical phase to the practice-developer phase. Therefore, it is important while choosing a cloud-based service for MER design to define the aim and purpose of its application to determine whether the projected CBMER meets all requirements, since it not only performs educational functions but also forms a general idea of the future specialist on visibility. Laid fundamental knowledge will help future educators in their professional activities and during self-development, and the innovative nature of teaching will facilitate easy entry into reformed working conditions and adaptation to changing educational requirements.

4. CHECKING THE EFFECTIVENESS OF CBMER IMPLEMENTATION IN THE PREPARATION OF FUTURE PRIMARY SCHOOL TEACHERS

To test the effectiveness of the proposed methodology for the use of CBMER for educational purposes control and experimental groups were formed:

1. The control group (CG) consists of future primary school teachers who studied the discipline «Special Workshop on Informatics» according to the traditional method (without using CBMER) – 52 persons.

2. The experimental group (EG) consists of future primary school teachers who have studied the subject of «Special Workshop on Informatics» by author's method (using CBMER) – 50 persons.

Statistical hypotheses that were tested:

H_0: Samples (CG and EG) do not differ in the level of knowledge in the discipline «Special Workshop on Informatics».

H_1: Samples (CG and EG) differ significantly in the level of knowledge in the discipline «Special Workshop on Informatics».

We used the Kolmogorova-Smirnova test [25, pp.52-53] to compare the levels of knowledge in CG and EG after completing the study course «Special Workshop on Informatics». The results are presented in Table 3.

Table 3

Calculation table for the Kolmogorova-Smirnova criterion when comparing the levels of knowledge of students of CG and EG on the results of training in the discipline «Special Workshop on Informatics»

Level of knowledge	Empirical frequencies		The empirical proportion		Accumulated empirical proportions		Difference d
	CG	***EG***	***CG***	***EG***	***CG***	***EG***	
High	8	17	0,15	0,34	0,15	0,34	0,19
Sufficient	22	27	0,42	0,54	0,57	0,88	0,31
Average	19	6	0,37	0,12	0,94	1	0,06
Initial	3	0	0,04	0	0,98	1	0,02

The information was obtained as follows:

1. *Empirical frequencies* – number of CG and EG students according to the respective levels of knowledge;
2. *The empirical proportion* is calculated by the formulas:

$$f_{emp}^{1} = \frac{n_j^{(1)}}{n_1}, \quad (3)$$

$$f_{emp}^{2} = \frac{n_j^{(2)}}{n_2}, \quad (4)$$

where f_{emp} – empirical proportion of this level of knowledge; n1 and n2 – number of observations (sample volumes), respectively in CG and EG.

3. *Accumulated empirical proportions* for CG and EG were calculated by the formulas:

$$\sum f_i^* = \sum f_{i-1}^* + f_i^*, \quad (5)$$

where $\sum f_{i-1}^*$ – proportion, accumulated at the previous level; *i* – level sequence number; f_i^*– empirical frequency of the i_{-th} category;

4. *Absolute differences (d)* – the difference between the empirical accumulated proportions for each level (|CG-EG|).

The final step in the calculations is to determine the empirical value of the criterion ($\lambda_{емп}$) by the formula:

$$\lambda_{emp} = d_{max} * \sqrt{\frac{n_{cg} * n_{eg}}{n_{cg} + n_{eg}}}, \quad (6)$$

where maximum difference (*dmax*) between the accumulated empirical proportions is 0,31; n_{cg}= 52; n_{eg}= 50. After calculations we get λ_{emp}=*1,52.*

Decision-making. The empirical value of the criterion λ_{emp}=1,52 more than the critical value λ_{cg}=1,36, therefore, there are reasons to believe that the differences between the distributions are significant. Hypothesis H_0 is rejected, but hypothesis H_1 is accepted at the level of significance 0,05. Thus, the levels of knowledge in CG and EG are significantly different, which indicates the effectiveness of the use of CBMER in the study of «Special Workshop on Informatics», the percentage increases in the levels of knowledge «Sufficient» and «High» that demonstrates the positive dynamics in the acquisition of future primary school teachers of basic skills, which are embedded in the curriculum competencies of the educational program.

5. CONCLUSIONS AND PROSPECTS FOR FURTHER RESEARCH

The process of change of society and all spheres of human activity is natural and conditioned by the course of human development. The constant updating of the substantive, logistical and technological basis of various forms of social activity led to a change in the methods and means of training future specialists. The task of modern education is to identify long-term trends for improvement. The volume and content of the educational material is changing, the restructuring of programs of educational subjects (courses) is taking place, the CBMER is being integrated into all kinds of educational activities, etc. All the above-mentioned changes the components of learning theory, which causes a change in the paradigm of pedagogical science (a system of basic scientific theories and methods of pedagogical science, the model of which organizes the research activities and practices of scientists – educators, aimed at developing a strategy for content, organizational forms, teaching and upbringing methods selection).

The use of CBMER in the educational process contributes to the deepening and modernization of educational and methodological support of disciplines (illustrative and demonstration material; methodical instructions and instructions for various types of work; diagnostic and control tools, etc.), diversifies teaching methods and promotes the development of program and life competencies. All these factors have a positive impact on the competitiveness of professionals and provide flexibility and openness of the educational process. The introduction of pedagogical innovations, the use of modern teaching methods, as well as the involvement of digital and cloud-based technologies promote a positive attitude to learning activities, stimulate research activities, motivate the expansion of horizons and professional competences, and increase motivation for learning. Continuous counseling and student support for self-study and remote work play a major role in further efforts to independently search and analyze information.

The results of the research can be used by higher education institutions for designing original cloud-based multimedia educational resources, creation of educational and methodical e-tutorials, improvement of working and typical programs of educational disciplines, in the process of improving educational and methodological provision of educational disciplines for students of pedagogical specialties, as well as in the system of advanced training of teachers of higher educational institutions and postgraduate education.

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ЗАСТОСУВАННЯ ХМАРО ОРІЄНТОВАНИХ МУЛЬТИМЕДІЙНИХ ОСВІТНІХ РЕСУРСІВ У ПРОЦЕСІ ПІДГОТОВКИ МАЙБУТНІХ УЧИТЕЛІВ ПОЧАТКОВОЇ ШКОЛИ

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Анотація. Більшість матеріалів, які забезпечують підтримку освітньої діяльності, містять графіку, анімацію, аудіо- та відеофрагменти, інфографіку та текст, доступ до яких можна отримати через мережу Інтернет. Останніми роками у світовій практиці все більша увага приділяється педагогічному проєктуванню навчально-методичних засобів із застосуванням хмаро орієнтованих технологій (ХОТ), оскільки дружній інтерфейс комп'ютерних додатків та вебзастосунків, швидкодія, доступність і безпека ХОТ сприяють переходу до постійного застосування та використання продуктів, які пропонують ці технології. Вищезазначене вказує на існування проблеми проєктування якісного хмаро орієнтованого мультимедійного освітнього ресурсу (ХОМОР), а також на потребу з'ясувати ефективність застосування спроєктованих ХОМОР при здійсненні освітнього процесу. У статті окреслено головні передумови до застосування хмаро орієнтованих мультимедійних освітніх ресурсів під час підготовки майбутніх учителів початкової школи у закладах вищої освіти. На основі аналізу наукових статей та досліджень фахівців в освітній сфері було виділено етапи проєктування, описано основні принципи (дидактичні, якісні та технічні), яких необхідно дотримуватись під час упровадження в освітній процес; названо функції, які виконують ХОМОР та зазначено режими роботи. Для застосування авторських ХОМОР в освітній діяльності викладачів закладів вищої освіти запропоновано ряд рекомендацій та авторську систему оцінювання якості мультимедійного освітнього ресурсу. Детально описано особливості викладання із застосуванням ХОМОР на прикладі навчальної дисципліни «Спецпрактикум з інформатики» для студентів спеціальності «013. Початкова освіта» Київського університету імені Бориса Грінченка. Статистично обгрунтовано, що авторські ХОМОР, які містять інтерактивні завдання, динамічні елементи, аудіо- та відеоелементи, сприяють формуванню професійних компетентностей.

Ключові слова: мультимедійний освітній ресурс; хмаро орієнтовані технології; хмаро орієнтований мультимедійний освітній ресурс (ХОМОР); підготовка майбутніх учителів початкової школи; розвиток професійних компетентностей.

ПРИМЕНЕНИЕ ОБЛАЧНЫХ МУЛЬТИМЕДИЙНЫХ ОБРАЗОВАТЕЛЬНЫХ РЕСУРСОВ В ПРОЦЕССЕ ПОДГОТОВКИ БУДУЩИХ УЧИТЕЛЕЙ НАЧАЛЬНОЙ ШКОЛЫ

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Аннотация. Большинство материалов, которые обеспечивают поддержку образовательной деятельности, включают графику, анимацию, аудио- и видеофрагменты, инфографику и текст, доступ к которым можно получить через Интернет. Последние годы в мире все чаще уделяется внимание педагогическому проектированию учебно-методических материалов с применением облачных технологий (ОТ), поскольку дружественный интерфейс компьютерных приложений и веб-приложений, быстродействие, доступность и безопасность ОТ способствует переходу к постоянному применению и использованию продуктов, которые предлагают эти технологии. Вышеупомянутое указывает на существование проблемы проектирования качественного облачного мультимедийного образовательного ресурса (ОМОР), а также на необходимость выяснить эффективность применения спроектированных ОМОР при осуществлении образовательного процесса. В статье описаны основные предпосылки к применению облачных мультимедийных образовательных ресурсов при подготовке будущих учителей начальной школы в высших учебных заведениях. На основе анализа научных статей и исследований специалистов в образовательной сфере были выделены этапы проектирования, описаны основные принципы (дидактические, качественные и технические), которые необходимо соблюдать при внедрении в образовательный процесс; названы функции, которые выполняют ОМОР и указаны режимы работы. Для применения авторских ОМОР в образовательной деятельности преподавателей высших учебных заведений выдвинут ряд рекомендаций и предложена авторская система оценки качества мультимедийного образовательного ресурса. Подробно описаны особенности преподавания с применением ОМОР на примере учебной дисциплины «Спецпрактикум по информатике» для студентов специальности «013. Начальное образование» Киевского университета имени Бориса Гринченко. Статистически обоснованно, что авторские ОМОР, содержащие интерактивные задания, динамические элементы, аудио- и видеоэлементы способствуют формированию профессиональных компетентностей.

Ключевые слова: мультимедийный образовательный ресурс; облачные технологии; облачный мультимедийный образовательный ресурс (ОМОР); подготовка будущих учителей начальной школы; развитие профессиональных компетентностей.