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### **The Creation of Educational Video Content in the Learning Management System of Higher Education Institution**

**Abstract. Introduction.** A Learning Management System (LMS) is used to create, manage, and deploy online educational courses and resources, as well as track student activity. The creation of educational video content for LMS can significantly enhance the learning process and make materials more accessible to students. Well-structured and engaging educational video content can promote effective learning of the material.

**Purpose.** The article presents a method for creating educational video content within a higher education institution's learning management system. The proposed method addresses the challenges of presenting audio-visual content in this environment.

**Results.** The preparation of educational video content includes the following stages: creating a presentation for an audio-visual lecture, preparing text or graphic information to explain the material on the slide, recording an educational video and placing it in the learning management system. The learning management system of a higher education institution requires educational video content to include an annotation and tasks to ensure the quality of material comprehension. The content should be clearly structured. In separate logical parts of a video lecture or an audio-visual explanation for the performance of practical or laboratory work, the goals and objectives of the topic should be clearly defined, the presented content should be supplemented with graphics, mathematical and logical formulas and expressions, structural and logical diagrams, computer animation methods. An experimental study was conducted to analyze the quality of knowledge before and after the implementation of the developed technology. The results before and after the experiment were evaluated by the Pearson correlation coefficient.

**Conclusions.** The higher education institution implemented technology for creating educational video content in their learning management system. This was accompanied by a distance course, where video lectures were posted in open access and structured according to the curriculum. The article describes the stages involved in introducing educational video content into the educational process. These stages include preparation, evaluation of the video lecture, and its presentation in the learning management system and educational and methodological literature. The experimental verification of the proposed technology for creating educational video content supports its feasibility for application in the learning management system of a higher education institution.

**Keywords:** educational video content, pedagogical technology, applicants of higher education, learning management system.

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### **Технологія створення навчального відео контенту в системі управління навчанням закладу вищої освіти**

*Система управління навчанням (LMS) використовується для створення, управління та користування освітніми онлайн курсами та ресурсами, а також відстеження активності студентів. Створення навчального відео контенту для систем управління освітнім процесом може значно полегшити процес навчання та зробити матеріали більш доступними для здобувачів вищої освіти. Навчальний відео контент, який добре структурований та привертає увагу, може сприяти ефективному засвоєнню матеріалу.*

*Метою статті було визначення підходів до створення навчального відео контенту в системі управління навчанням закладу вищої освіти, а також обґрунтування способу подання аудіовізуального контенту в умовах системи управління освітнім процесом.*

*Підготовка навчального відео контенту охоплює такі етапи: створення презентації для аудіовізуальної лекції; підготовка текстової або графічної інформації для пояснення матеріалу на слайді; запис навчального відео та його розміщення в системі управління навчанням. Окреслено вимоги до навчального відео контенту в системі управління навчанням закладу вищої освіти: він повинен містити анотацію та завдання для контролю якості засвоєння навчального матеріалу, який повинен бути чітко структурований. В окремих логічних частинах відео лекції або аудіовізуального пояснення до виконання практичних або лабораторних робіт повинні чітко визначатись цілі та задачі теми, представлений контент доцільно доповнювати графікою, математичними, логічними формулами та виразами, структурно-логічними схемами, методами комп'ютерної анімації. Перед впровадженням розробленої технології та по завершенню було проведено експериментальне дослідження, яке включало аналіз якості знань. Отримані результати до і після експерименту перевірені за допомогою статистичного критерію Пірсона.*

*Впровадження технології створення навчального відео контенту в системі управління навчанням закладу вищої освіти супроводжувалось дистанційним курсом, де у відкритому доступі і структурованому вигляді за навчальним планом було розміщено відео лекції. Описано етапи впровадження навчального відео контенту в освітній процес, а саме: підготовку, оцінювання відео лекції та її представлення в умовах системи управління навчанням та в навчально-методичній літературі. На основі експериментальної перевірки впровадження запропонованої технології створення навчального відео контенту можна зробити висновок про доцільність її застосування в системі управління навчанням закладу вищої освіти.*

**Ключові слова:** навчальний відео контент; педагогічна технологія; здобувачі вищої освіти; система управління навчанням.

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**Formulation of the problem.** The informatization of education aims to utilize modern information technologies to achieve the pedagogical goals of professional training for higher education applicants. A learning management system (LMS) is software that effectively manages the learning process in educational institutions or organizations. It is used to create, manage, and deploy training courses and resources, as well as track student activity. The main characteristics of a Learning Management System (LMS) include creating and organizing training courses, adding videos, tests, and other learning materials, monitoring student activity, enabling communication and discussion between students and tutors, and storing and providing access to electronic resources. LMSs greatly facilitate the learning

process and provide educational institutions with an effective way to utilize resources. In LMS conditions, new technologies for learning and providing educational content are emerging, and forms and methods of professional student training are being improved. The latest information technologies should form the basis of the professional training of higher education applicants. A video lecture is the optimal way to present educational material during distance learning stages. Discovering the key principles of working with modern computer models and utilizing equipment and technologies is essential. Modern information technology is a versatile tool that enables the exploration of various aspects. In blended learning environments, educational videos are a primary means of training higher education applicants. Therefore,

there is a need to supplement educational material during distance education and face-to-face lectures with video content. Considering the stated requirements, it is essential to develop technology for creating electronic educational content within the learning management system.

**Analysis of recent research and publications.** The issue of training higher education applicants is extensively examined in pedagogical theory [1], [2]. The authors emphasize that specialists' professional training is based on years of experience operating technical systems, utilizing the best practices of global engineering, and developing modern computer technologies [3]. In recent decades, education has undergone global changes associated with the expansion and application of technologies and principles of Industry 4.0 [4]. Researchers noted these changes. The demand for research in the field of electronic engineering and information technology, as well as the provision of appropriate conditions in the labor market for graduates, has been determined using primary data collected from student surveys [5]. Tutors train future professionals from the basic stage to the professional stage, as a result, this type of specialists is suitable for work in various industries [6]. The article discusses research on the integration of theory and practice in teaching electrical engineering at an applied university [7]. It also covers studies on the reform of blended learning for higher education applicants [8], as well as the theoretical and practical aspects of training students in professional education [9]. Additionally, the study examines the leading directions and issues of virtualization in specialist training [10]. Scientists addressed the challenges of utilizing a mixed platform for modeling software in technical science teaching experiments using MATLAB [11]. Nowadays it is necessary to improve teaching methods and technical resources [12]. The significance of education in promoting economic development is emphasized [13]. Based on a survey of industry employees, scientists have identified key skills, which may help to outline professional competencies [14]. Additionally, a collection of cloud-based tools for collaborative learning activities, categorized by section, editing, communication, and discussion, has been presented [15]. The article identifies current educational trends, including the theoretical foundations of multimedia learning, concepts and principles, educational design and individual differences, motivation and metacognition, as well as video and hypermedia [16]. The use of multimedia is suggested as a way to activate students' cognitive activity during lectures [17]. Multimedia tools are increasingly used for teaching. The interaction between words and slides is crucial for the educational effectiveness of lectures, making it a fundamental problem in higher education didactics [18]. The peculiarities of using the Prezi platform for creating interactive multimedia presentations are considered, the technology of developing and designing slide

presentations is revealed, the main attention is paid to work with animations, images, video files and sound, the didactic expediency of using an interactive software product is revealed [19]. Video resources of pedagogical disciplines allow to implement the relevant topic in the curriculum of the discipline [20]. Video lessons make it possible to automate the learning process, redistribute the learning time in favor of independent work of students, provide time for the completion of the classroom for teaching theoretical issues of the course, aimed at improving the basic nature of learning [21].

Researchers have paid attention to the issues of implementation of technology for training of future agricultural engineers in the information and educational environment [22], training masters in electrical engineering for electrical installation and commissioning [23], use of competency training simulators in the information and educational environment for studying of general technical disciplines [24]. However, the technology of creating educational video content in the learning management system of a higher education institution has not been the subject of a specific study.

**Formulation of research goals.** Development and experimental verification of the creation of educational video content in the learning management system of a higher educational institution.

**Outline of the main research material.** Technology is a system of functioning of all components of the educational process, built on a scientific basis, which ensures the achievement of planned results. The technology of creating educational video content in the LMS requires careful preparation. It is important to determine which recording technology is suitable for the teacher individually. A video lecture is a type of lecture visualization, i.e. a visual form of presentation of lecture material using audio and video technology. The reading of such a lecture for students is reduced to a long or short commentary on visual materials. For example, natural objects - people during their professional activities when dealing with diagrams, drawings, photos, slides, reagents, machine parts, as well as tables, graphs, models. The universal way of presenting audio-visual content is a video recording of the explanation of the presentation. The preparation of this type of educational content includes the following stages:

1. preparing a presentation to create the audio-visual content;

2. preparing textual information to explain the educational material on the slide;

3. recording and creating an educational video.

1. Preparing a presentation to create the audio-visual content. When creating presentations for audio-visual content, the educational material should be presented in small logically coherent blocks in a clear sequence in accordance with the hierarchical structure of the original material of the discipline - ensure the availability of structural and logical schemes for studying. The structure of the presentation should be logical, not overloaded

with textual material. Visualization in slides should be presented in such a way that students can draw the necessary conclusions on their own. It is appropriate to use animation effects to demonstrate various types of physical, chemical and technical processes. All slides in the presentation should be in a single style and the number of slides should be kept to a minimum. Then the presentation will be concise and effective. It is advisable to pay attention to the colour selection of visual, animated and graphic information:

- colour schemes should be contrasting to facilitate reading of information;
- it is better to present numerical data in the form of tables, charts and graphs;
- slides should not be overloaded with information;
- images (drawings, photographs, diagrams) should be intended exclusively for illustrating textual information;
- animation effects are used exclusively to attract the attention of listeners or to demonstrate the dynamics of the development of any process.

2. Preparing textual information to explain the educational material on the slide. Textual information can be presented in the form of a short reference plan and contain a structure. It is advisable to use notes on the slides to place text information. Then, during the demonstration of the presentation, it is convenient to use blanks of text material and present only graphic and visual objects on the slide.

3. Recording and creating an educational video. This process involves using specialized computer programs to record and edit videos. When recording a lecture or practical/laboratory work instruction, it is important to choose the right software. recording and editing functions. The screen camera provides all the necessary tools to create a comprehensive online course. The software enables users to record computer or laptop screen video and audio, edit the footage, and save it locally or in cloud storage.

Prior to recording a video lecture, it is recommended to manually adjust the recording area's width and height. Speaker mode is preferable for recording videos as it allows for simultaneous display of the current slide and the next one, as well as any accompanying notes.

After recording, it is necessary to edit the educational video. This includes adding an introduction, explanatory text or images, sound effects, and correcting any mistakes made during recording. The resulting edited video can be stored locally or in cloud video services.

Some methodological requirements for the creation of audiovisual content have been outlined. The specified type of content for distance learning must include a commentary (in which the goals and tasks of the topic are indicated) and tasks for quality control of the learning material. Teaching materials should be clearly structured. The introductory part of the lecture or explanation of

practical or laboratory work should define the goals and tasks of the discussed topic, reveal its connection with other disciplines of study and note the peculiarities of the initial material of the topic. For better assimilation of the material, it is advisable to divide the content of the lecture or practical or laboratory work with audio-visual content into separate parts. Video lecture should allow the student to choose an individual pace of learning. The presentation of the material should not be monotonous. When creating audio-visual content it is necessary to use both spoken language and conventional language in the form of graphics, mathematical and logical formulas and expressions, structural and logical schemes, as well as computer animation methods. Computer animation should be combined with off-screen information: the lecturer's commentary and other forms of information presentation. In materials based on audiovisual content, it is possible to add a link to the presentation itself.

Figure 1 shows the stages of creation of educational video content in the learning management system, namely: preparation of the video lecture, evaluation of the presented video lecture and presentation of the video lecture in the conditions of the online learning management system and in the pedagogical and methodological literature. The preparation stage includes preparation of the presentation, text information and video recording. The preparation of the evaluation of the presented video lecture consists in the attribution of competences when placing the video lecture in the conditions of the learning management system and obtaining points for the completion of the lecture by the applicants of higher education. The final stage is the presentation of the video lecture in the conditions of the learning management system and in the pedagogical and methodical literature. In the conditions of the learning management system, the video lecture is placed by creating an implementation code and uploading the video lecture to the appropriate section of the specified environment. In pedagogical and methodical literature a video lecture can be presented by means of a QR code, which is a link to it.

The research methodology included theoretical analysis and synthesis of Ukrainian and foreign scientific, pedagogical, methodological sources and empirical methods, as well as analysis of the obtained results. The implementation of the technology of creating educational video content in the learning management system was accompanied by a distance course, where video lectures and audio-visual content for practical and laboratory work were published in open access and structured according to the curriculum. Before the implementation of the developed technology and after its completion, an experimental study was conducted, which included an analysis of the quality of knowledge. The results obtained before and after the experiment were checked using Pearson's  $\chi^2$  statistical test [25].

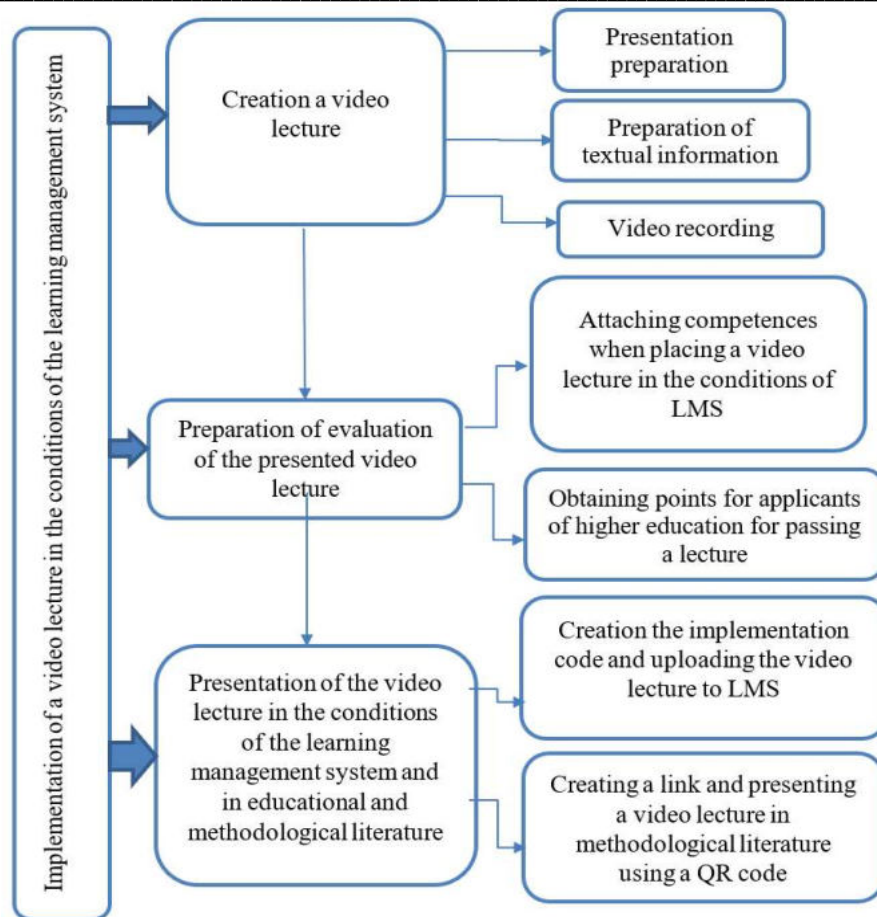


Figure 1 – The technology of creation educational video content in the learning management system

Source: authors' development

The proposed technology for creating educational video content in the learning management system was tested at the Mykolaiv National Agrarian University for three semesters. 317 people participated in the experiment, out of which 158 students of higher education were the control group (CG) and 159 were the experimental group (EG).

The results of the experimental work are presented in the form of a table. Thus, the levels of the quality of knowledge of the applicants to higher education in the control and experimental groups are presented in Table 1.

Table 1 Levels of quality of knowledge of higher education applicants in control and experimental groups at the beginning and at the end of the experiment

Level	Before the experiment				After the experiment			
	%, EG	Empirical frequency $n_i$ (EG)	%, CG	Empirical frequency $n_{i1}$ (CG)	%, EG	Empirical frequency $n_{i1}$ (EG)	%, CG	Empirical frequency $n_{i1}$ (CG)
A	3,14%	5	4,43%	7	15,09%	24	11,39%	18
BC	17,61%	28	16,46%	26	33,33%	53	20,25%	32
DE	35,85%	57	38,61%	61	44,65%	71	43,04%	68
FX	43,40%	69	40,51%	64	6,92%	11	25,32%	40
Total	100,00%	112	100,00%	109	100,00%	112	100,00%	109

Source: authors' calculation

The empirical value of Pearson's  $\chi^2$  is calculated at the beginning and at the end of the experiment in the control and experimental groups. The empirical value of Pearson's  $\chi^2$  at the beginning of the experiment:

$$\chi^2 = \sum_{x=1}^3 \frac{(n_i - n_{i1})^2}{n_{i1}} = 1,38 \quad (1)$$

At the end of the experiment in the control and experimental groups, the empirical value of Pearson's  $\chi^2$ :

$$\chi^2 = \sum_{x=1}^3 \frac{(n_i - n_{i1})^2}{n_{i1}} = 36,94 \quad (2)$$

The degree of freedom is defined as:  $u=3$  ( $u=k-1$ ,  $k=4$ ). The critical value for  $\chi^2$  is determined for levels of statistical significance  $p \leq 0,05$  і  $p \leq 0,01$ .

$$\chi_{кр2} = \begin{cases} 7,815; (p \leq 0,05) \\ 11,345; (p \leq 0,01) \end{cases} \quad (3)$$

The obtained empirical value of Pearson's criterion  $\chi^2$  before the experiment is lower than the critical value, which means that it belongs to the zone of insignificance. At the beginning of the experiment, the level of knowledge quality of higher education applicants in the control and experimental groups does not differ significantly. The obtained empirical value of Pearson's  $\chi^2$  at the end of the experiment is higher than the critical value, which means that it belongs to the zone of significance. At the end of the experiment there are significant differences in the level of quality of knowledge of applicants to higher education in the control and experimental groups. It is obvious that the creation of educational video content in the learning management system is promising.

**Conclusions.** The technology of creating educational video content in the Learning Management System requires careful preparation. Audio-visual content is a specially prepared educational product that contains the necessary elements to improve the perception of the original material and maintain interest in the discipline. The quality of instructional video content depends on the

creativity of the instructor. A universal way of presenting this type of content is a video recording that explains the presentation. Preparation of a video lecture or audio-visual explanation of a laboratory or practical task in the learning management system includes preparation of the presentation, preparation of textual information to explain the educational material on the slide, as well as recording and creation of an educational video. This type of presentation of educational content for higher education candidates has a number of additional positive qualities that correspond to educational goals and objectives: multimedia and dynamism of transmitted information using animation, video, sound, text in one exposure. The language of the video lecture, which is not overloaded with unnecessary information, in accordance with the prepared text information and the face of the teacher on the screen, ensures the realism of personal communication, which breaks the monotony of slides. The above aspects contribute to the improvement of the perception of the educational material. The proposed technology consists of the following stages: preparation of a presentation for audio-visual content and textual information, recording of the educational video, presentation of the video lecture in the conditions of the online learning management system and in the pedagogical and methodological literature. Within the limits of the experiment the levels of the quality of knowledge of the applicants to higher education in the control and experimental groups at the beginning and at the end of the experiment are presented. According to the result of conducting the experiment it can be claimed that the proposed technology is perspective. Prospects for further research are the study of the perception of different types of video lectures and the development of methods for it.

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