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СТВОРЕННЯ НАВЧАЛЬНИХ ВІДЕОРЕСУРСІВ ЗА ДОПОМОГОЮ BLENDER VIDEO EDITOR

Досліджуються можливості щодо використання вільно поширюваного програмного засобу Blender 3D, модуля створення і редагування відео та формування відеоматеріалів за допомогою сервісу, для організації відеоконференцій під час проведення онлайн занять. Надаються рекомендації на прикладі розробки відеоресурсів. Здійснено експериментальне дослідження ефективності використання вказаного ресурсу в процесі навчання, яке описує його впровадження у навчальний процес на прикладі викладання окремих дисциплін, зокрема «Сучасні операційні системи. ОС Linux» та навчальнометодичних семінарів для викладачів. Експериментальна перевірка доводить, що ефективність навчальних занять значно підвищується за умов використання відеоресурсів, розширюються можливості для індивідуалізації й диференціації навчання, самостійної та індивідуальної роботи студентів.

Ключові слова: середовище онлайн навчання, відеоресурс, відеолекція, електронний курс, Google Meet, Blender Video Editor, LCM Moodle.

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TOOLS FOR CREATING EDUCATIONAL VIDEO RESOURCES WITH BLENDER VIDEO EDITOR

The article explores the opportunities of using the free and open software Blender 3D, a module employed for creating and editing videos, for the formation of video materials, for organizing video conferencing during online classes. On the example of video development recommendations are provided on the creation and publication. An experimental study of the effectiveness of the resource, which describes its implementation in the educational process on the example of teaching certain disciplines, in particular "Operating Systems. Linux" and training seminars for university teachers, has been conducted. Experimental verification proves that the use of video resources leads to the significant increase in the effectiveness of training, expands opportunities for individualization and differentiation, independent and individual work of students.

Keywords: online learning environment, video resource, video lecture, e-course, Google Meet, Blender Video Editor, LCM Moodle.

Educational video resources, in accordance with the basic principle of learning – the principle of visuality, have been used since the advent of on-screen sources of information (projectors, cameras, television sets, video recorders, computers, etc.). The development and use of video materials in teaching has been changing along with the refinement of computer technologies. Initially, the use of video was reduced to the use of movies or slides, which allowed to present more information in a concentrated form. With the advent of computer technology, it became possible to display information on the screen without the involvement of additional technical aids [5].

Video lesson is a modern trend, which is actively developed and used in the educational process. The popularity of educational videos is confirmed by the analysis of domestic and foreign publications, as well as a large number of video lessons on various educational topics. A significant number of educational videos are posted on the Internet every day. Special services have been created for their publication, viewing and distribution.

Over the years of using multimedia technologies in education a significant scientific basis has been created in the field of methods of their use. Most modern research is devoted to the development of electronic teaching aids, electronic hypertext textbooks, the use of these tools in higher and secondary education; application of certain teaching aids. Unfortunately, there is still no systematic assessment of the effectiveness of educational video resources in education; analysis of presented educational video resources in terms of suitability and expediency of their use in education; technologies of their creation [1], [2], [10], [11], [17] [18], [19].

Key issues of informatization of education, analysis of the pedagogical potential of the use of multimedia technologies in education were considered by N. Apatova, N. Balyk, L. Belousova, V. Bykov, M. Zhaldak, Yu. Zhuk, V. Klochko, N. Morze, Yu. Ramsky, O. Spivakovsky, Yu. Trius, W. Allen, A. Smith, C. J. Brame., K. Pernice, and others.

At present teaching is interpreted as a purposeful pedagogical process of organizing and stimulating students to actively master scientific knowledge, skills, development of their creative abilities, outlook, moral and ethical views and beliefs [12]. Teaching is a two-way process of interaction between the learner and the teacher. The regularities of educational process, which

objectively exist and are called didactic principles, influence the organization of education, the selection of content, forms, methods and teaching aids. The developed learning resources, teaching aids etc. must be subject to these principles.

The purpose of the article is to provide recommendations for the creation of educational videos in accordance with generally accepted educational principles to be used during face-to-face and distance (online) learning on the example of an educational video clip.

The development of video resources must be subject to the rules and principles of video production. The main process which leads to the creation of a video film is video editing.

L. Kuleshov proved that editing is not an exclusive feature of cinema or television, editing is a feature of our thinking and is manifested in the process of perception of the environment and in the creative process [7].

The video editing process consists of a series of sequential operations, each of which plays an important role in creating a video. Its effectiveness depends on the skills, artistic taste and experience of the author. Considerable experience of use of various effective techniques, which provide a high-quality result, has been accumulated.

The development of educational video is subject to the same stages as the creation of a "big movie" [6]. However, it is necessary to take into account the educational implication of the end result. Here are the main stages of creating an educational video:

- 1. Formulation of the purpose and working title of the film.
- 2. Development of a film script.
- 3. Development of a psychological and pedagogical model of the film and its coordination with the script.
- 4. Creation of new and selection of ready video materials, graphic and photo images, presentations, writing the text for the future film, selection of music and sound effects.
- 5. Development of a frame-by-frame layout of the film in accordance with the script and psychological and pedagogical model, with a detailed indication of all scenes, transitions, effects and their approximate duration.
 - 6. Editing according to the developed layout of the film.
 - 7. Selection of a soundtrack, creating subtitles.
 - 7. Combining soundtrack, subtitles with the edited video.
 - 8. Production of the film in the required format for further distribution and viewing.

Since the creation of an educational video should be subject to psychological and pedagogical requirements and at the same time requirements for the creation of video products, including editing scenes, the use of transitions between frames as well as video effects, it is necessary to formulate recommendations for editing educational video:

1. The total duration of the educational video should be 20-25 minutes.

Determining the maximum duration of an educational video we took into account the experimentally proved fact that students can perceive new information for a limited time, approximately 20–25 minutes.

Division of video into scenes (frames) of short duration. If there is need to show a scene of considerable duration, in order to reduce the viewer's fatigue it is advisable to show the scene from several angles or break in the place of the least logical load in order to create a transition or pause.

It is impossible to give general recommendations on the choice of frame duration (scene). When choosing the duration of the scene in which a single action is presented, it is necessary to focus on the viewer's speed of information perception. According to studies in different age groups [9], the speed of perception differs. The following recommendations should be taken into account when determining the duration of a scene [3,6]:

- 2.1) the average frame duration time should not exceed 3–6 minutes;
- 2.2) the minimum time of display of the object on the screen should not be less than 2–3 seconds; in less time, the viewer just does not have the opportunity to pay attention to the object;
 - 2.3) the average duration of the transition is 3-4 seconds.
- 3. It is advisable to break the transition between logically completed scenes with a black screen or a simple transition effect between frames.
 - 4. There should be no more than 6–7 objects in each scene.

- 5. It is advisable to attract attention by scaling (enlarging or reducing the area) or changing the color, for example, to temporarily show the desired fragment of the scene in a monochrome (black and white) image.
 - 6. Lack of sound is compensated by subtitles.
- 7. The effect of the teacher's presence can be achieved by a special method of editing "frame by frame" using a video recording of the teacher in class or his/her photo.
- 8. If the film consists of several logical sections, it is recommended to mark each section in some way: logo, color scheme, signature.
- 9. It is advisable to refrain from using too many special effects in the middle of scenes. Significant use of special effects complicates perception and distracts from the main purpose of watching videos.
 - 3. Example of Creating an Educational Video
 - 3.1. The purpose of the film

Demonstration of the basic components and techniques of using (launching programs and switching between them) desktops UNITY and KDE Linux operating system (UBUNTU 20.04).

3.2. Video script

We show the main elements of the Gnome desktop of the Linux operating system (Ubuntu 20.04), each element is displayed for 3–4 seconds; work with the main menu Dash; launch programs: terminal, file manager, Internet browser; demonstrate switching between running programs.

We show the main elements of the KDE desktop of the Linux operating system (Kubuntu 20.04), each element is displayed for 3–4 seconds; work with the main menu; launch programs: terminal, file manager, Internet browser; demonstrate switching between running programs.

Creating the effect of the teacher's presence is achieved by demonstrating a photo of the teacher or a scene in which the teacher is shown in class.

As the film is without sound, the necessary information is presented in subtitles.

3.3. Psychological and pedagogical model of the developed educational video

The teaching material will be organized in accordance with the principle from general to partial and from simple to complex. At the beginning the film will present the general concepts of interface construction with their subsequent refinement, the components of the desktop. Since the explanation is based on the principle from simple to complex, at first general information about the desktop and its purpose is provided, and then during the presentation of the components of the desktop their peculiarities, purposes and methods of use are explained. During the development of the film, we will assume that the target audience is already familiar with the Windows operating system and the basic techniques of its use and understands the terms that mean actions when using the mouse. To update this information, an illustrated video glossary of terms used in the film will be provided at the beginning of the film.

The film must be divided into logically complete scenes, which will be combined with the help of transition effects (in order to temporarily reduce the information load on the viewer). There should be no more than 6–7 active subjects in each scene.

3.4. Selection and creation of videos

To record worksheets, it is necessary to install the Linux operating system with Unity and KDE desktops. Materials (screencast) can be recorded with special software like video conferencing services Zoom, Google Meet. The recording of the scene with the teacher in class is carried out with the help of a video camera.

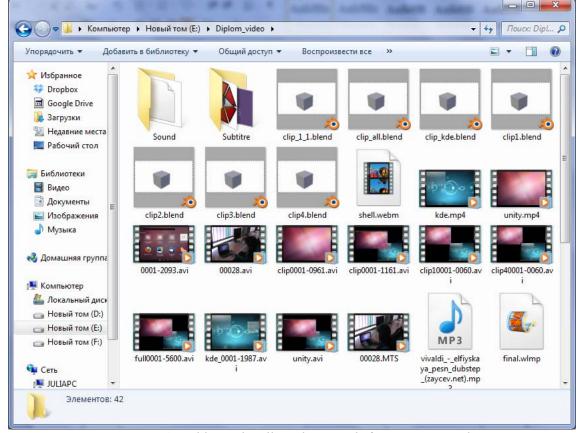


Fig. 1. Folder with collected materials for creating a video.

All collected videos, graphic, audio materials are placed in one folder (Fig. 1). For further processing of the created video materials and editing of a film it is necessary to bring them to the general format of representation, for example to the MPEG 2 format. For this purpose it is expedient to use the Avidemux software tool or any other video converter.

3.5. Development of a frame-by-frame layout of the film

The frame-by-frame layout of the film facilitates the editing process and allows to imagine the future result in advance. The layout of the film can be done in the form of drawings or in the form of a table where all the scenes, transitions with indication of duration and appropriate effects are indicated.

Table 1

Frame-by-frame layout of an educational video

	Trume by frame layout of an educational video						
№ scenes	Scene description	Effect	Transition	Duration in seconds			
1	2	3	4	5			
1	Static titles without effects and animation contain the title and information about the author of the film and/or the teacher.		At the end of the scene transition exit from eclipse	4			
2	The home screens of both desktops are displayed on the screen at the same time	Picture in picture editing		3			
3	Smooth transition from Unity desktop image to full screen desktop display.		Scaling	3			
4	Show the basic elements of the Unity desktop			4			
5	Dark screen	·					

6	On an Dorl	1		3
7	Open Dash Increase the Dash to full screen		Caaling	4
8			Scaling	8
8	Demonstration of the basic techniques of			8
0	using Dash to find installed programs		C - 1'	2
9	Return to the desktop		Scaling	3
10	Dark screen			2
11	Open Dash and run the terminal emulator			3
	software			
12	Move the terminal emulator window to the			3
	lower left corner			
13	Open Dash and launch the Mozilla			3
	FireFox Internet browser			
14	Expand the Mozilla FireFox window to			3
	full screen			
15	Open the launcher panel			3
16	Switch to the terminal emulator window			3
17	The home screens of both desktops are	Picture in		3
	displayed on the screen at the same time	picture		
		editing		
18	Smooth transition from KDE desktop		Scaling	3
	image to full screen desktop display.			
19	Show the basic elements of the KDE			4
	desktop			
	Dark screen			
20	Open the KDE menu			3
21	Enlarge the KDE menu to full screen		Scaling	4
22	Demonstration of basic techniques for			8
	using the KDE menu to find installed			
	applications			
23	Return to the desktop		Scaling	3
24	Dark screen			2
25	Open the KDE menu and run the terminal			3
	emulator software			=
26	Move the terminal emulator window to the			3
	lower left corner			=
27	Open the KDE menu and launch the			3
	Mozilla FireFox Internet browser			-
28	Expand the Mozilla FireFox window to			3
	full screen			-
29	Show the KDE taskbar			3
30	Switch to the terminal emulator window		At the end of the	3
	The state of the s		scene use the	J
			eclipse transition	
31	Static final titles without effects and			3
	animation: information about the editing			5
	and distribution license of the film			
			l .	

As it can be seen from the frame-by-frame layout, the film will contain 30 scenes, the approximate total duration of the film is 90 seconds. During editing, it is possible to change the frame layout and increase the duration of the display of individual scenes in order to achieve the purpose of the film.

3.6. Educational film editing

Video editing is a multi-stage process, at each step of which a specific operation is performed. The convenience and results of each subsequent operation largely depend on the quality of the previous one. Since the preparatory stage serves as the foundation on which the whole subsequent

video editing process is built, it needs to be treated with special care.

Video editing consists of a series of sequential operations, each of which plays an important role in creating a video. The effectiveness of video editing depends on the skill, artistic taste and experience of the author. Long-term practice of film production has developed a number of techniques, the use of which contributes to satisfactory results. At the same time there are techniques that can deteriorate video. It is necessary to take them into consideration in order to avoid or reduce the number of errors when creating a film [8]. For film editing, we recommend using Blender 3D, the Blender video creation and editing module.

The next step is to cut the recorded material into scenes according to the layout of the film and place the scenes on the editing table in the planned sequence (Fig. 2).

According to the frame-by-frame layout we either create or do not create effects between the scenes. The transition from one scene to another is supposed to be without effects except for the frames with subtitles. Besides, for scenes number 2 and 16 we use special techniques of picture in picture editing and scaling.



Fig. 2. Editing a video in the Blender editor.

3.7. Creating initial and final titles.

Static titles are developed with the help of a software tool for creating presentations, followed by converting the slides into a drawing or in a graphic editor. The obtained initial and final titles are placed on the editing table at the beginning and end of the film, respectively.

From the created video it is necessary to get a video file in a format suitable for common video viewers, such as Windows Media Player. For the final product it is advisable to adjust the render parameters: video file format – avi, video codec – h264, sound – mp3.

3.8. Creating subtitles.

Subtitles are edited with the help of Aegisub software. The subtitles can be used with any video player that supports the subtitle viewer function (for example, most video players for personal computers). If you do not know in advance how to view the created film, then it is advisable to use the built-in subtitles embedding them in the video file.

Embedding program subtitles in the created video is carried out by the software Avidemux (Fig. 3).

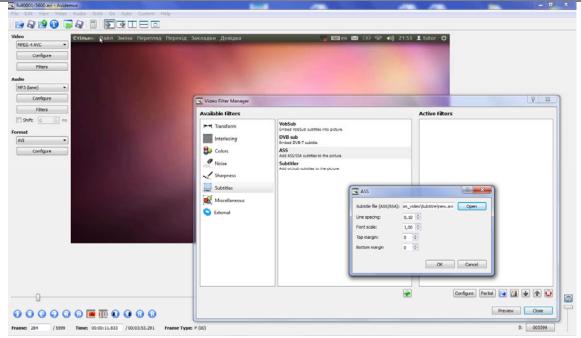


Fig. 3. Create hardcode subtitles with Avidemux video editor.

The received video file with subtitles is ready to be seen during classes or by students individually. Additionally, it can be converted to a format for viewing on mobile devices or for placement in video content distribution services.

1. Results.

To assess the effectiveness of video resources for educational purposes, a survey was conducted among 142 students (1–4 years of study) of the Faculty of Physics and Mathematics of Ternopil Volodymyr Hnatiuk National Pedagogical University. The results of the survey prove the expediency, even necessity of using educational web resources in the educational process (Fig. 4–6).

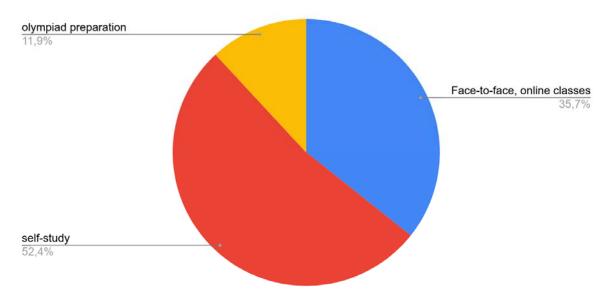


Fig. 4. The results of the survey on the effectiveness of the use of educational video resources. As it can be seen from Fig. 4, answering the question "Evaluate the effectiveness of the use of educational video resources on a 3-point scale" students responded that they want to use them during face-to-face or online classes – 35.7 % (1), for self-study – 52.4 % (2), can not decide – 11.9 % (3).

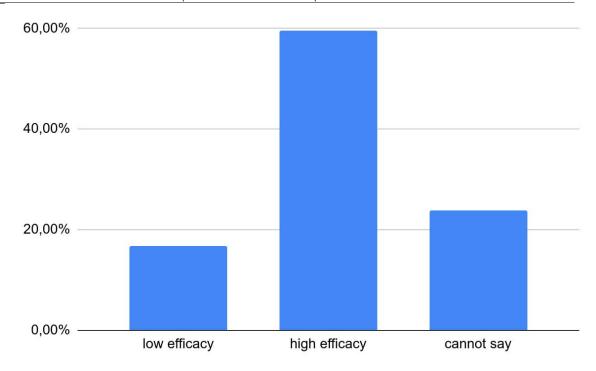


Fig. 5. The results of a survey on the increase of students' level of competencies with the use of an educational video.

Regarding the question "Do educational videos integrated in the electronic course contribute to the increase of the level of competencies?" 16.7 % of respondents indicated low contribution (1), 23.8 % could not evaluate (2), and 59.5 % noted high contribution of the educational video to the competencies promotion (3).

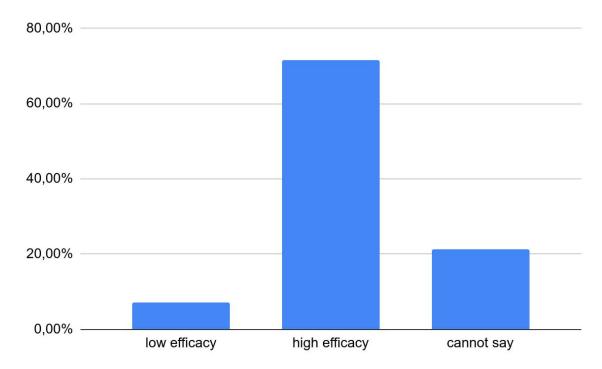


Fig. 6. The results of the answers to the question "How effective is the use of educational video during classs".

Answering the question "How effective is the use of educational video during online classes" 7.2 % of respondents indicated their low efficiency (1) 21.4 % could not answer (2), and 71.4 % noted the importance of using video (3).

Among the main problems of using online video resources, students noted absence of a powerful Internet channel for watching videos, lack of a synchronous consultation with the teacher, length of video, lack of time management skills.

The article presents the main approaches to the creation (shooting, editing etc.) of educational video. Recommendations for the development of educational video in accordance with the considered principles of teaching and video creation are offered. The following conclusions can be drawn from the example of the educational video "GNOME desktop of the UBUNTU 20.04 operating system", developed in accordance with the formulated recommendations.

Screencast and videocast are the most accessible types of educational video resources to be created by a teacher. Screencast, videocast is actually a film, and during its development it is necessary to follow the same principles and rules which are applied for creating any film. It should be taken into accoung that the educational implication of the film requires conformity to the general didactic principles.

It is possible to achieve the goal if you follow the basic rules and techniques of film editing considered in the article. Comparison of the edited film with the film obtained by a simple combination of recorded materials proves that as a result of the use of special editing techniques in compliance with the psychological and pedagogical principles of teaching, the expressiveness and information content of the film increase. The use of such effects as picture in picture, scaling allows the viewer to focus on key points of the film. Using transitions between shots, a short scene with a dark background image indicate the completion of the current part and the transition to a new part of the film.

Creating even a simple educational video is a very time consuming process and requires skills of working with videos, graphics and sound.

REFERENCES

- 1. Balyk, N. R., Barna, O. V., Grod, I. M.: About the Use of Digital Technologies in Teaching Students of Different Specialties. http://dspace.tnpu.edu.ua/bitstream/123456789/18281/1/Grod.pdf, last accessed 2021/05/11.
- 2. Bykov, V. Yu.: Modern Tasks of Informatization of Education. Information Technologies and Learning Tools. Vol. 1 (15) (2010).
- 3. Zhaldak, M. I.:The System of Teacher Training for the Use of Information Technology in the Educational Process. Dissertation. Moscow (1989).
- 4. Zhuk, Y. O, Sokolyuk, O, M., Sokolova, I. V., Sokolov, P. K.: Computer-based Teaching Aids in Physics at School: manual. Kyiv: Pedagogical Thought (2011).
- 5. The Use of Multimedia Technologies in School. http://www.curator.ru/pedagog/media.html, last accessed 2021/05/11
- 6. Krasnova, G.A., Belyaev, M.I., Solovov, A.V.: Technologies for Creating Electronic Learning Tools. http://ido.rudn.ru/ido.aspx?id=book2 (2009), last accessed 2021/05/11.
- 7. Kuleshov, L.: Alphabet of Film Directing. 2nd ed. Moscow: Art (1969).
- 8. Mikhlin, E. M.: How to Edit and Record a Video Using a Home PC and Adobe Premier, Ulead Media Studio, Ulead Video Studio, Pinnnele Studio, MGI Video Wave, Movie Maker. Moscow: LLC "DiaSoftIOP" (2005).
- 9. Morse, N. V.: Methods of Teaching Information Technology. In: Methods of Teaching Computer Science: textbook. Kyiv: Textbook (2003).
- 10. Pinchuk, O. P.: The Use of Multimedia Products in the System of General Secondary Education. Information Technologies and Learning Tools. http://www.nbuv.gov.ua/e-journals/ITZN/em4/content/07popeso.htm, last accessed 2021/05/11.
- 11. Seitvelieva, S. N.: Video tutorial as an element of educational technology. http://www.nbuv.gov.ua/portal/soc_gum/Sitimn/2010_24/videoyroku%20kak.pdf, last accessed 2021/05/11.
- 12. Osadcha, K., Osadchy, V., Spirin, O., Kruglyk, V.: Implementation of Individualization and Personalization of Learning by Means of Moodle. http://mir.dspu.edu.ua/article/download/228274/227419, last accessed 2021/05/11.
- 13. Stetsenko, G. V.: Design and Use of Educational Web Resources by Future Teachers of Computer Science. http://www.ii.npu.edu.ua/files/Zbirnik K0SN/13/09.pdf. (2010), last accessed 2021/05/11.

- 14. Tabakov, V. Z.: Create Interactive Educational Computer Video Courses in Camtasia Studio. http://www.nbuv.gov.ua/e-Journals/nd/2008-3/08tvzocs.pdf, last accessed 2021/05/11.
- 15. Trius, Y. V, Gerasymenko, I. V.: Combined Learning as an Innovative Educational Technology in Higher Education. http://www.ccjournals.eu/ojs/index.php/e-learn/article/download/353/340, last accessed 2021/05/11.
- 16. Spivakovsky, A., Petukhova, L., Anisimova, O., Horlova, A., Kotkova, V., Volianiuk, A.: ICT as a Key Instrument for Balanced System of Pedagogical Education. https://yahootechpulse.easychair.org/publications/preprint download/bcjz, last accessed 2021/05/11.
- 17. Allen, W.A., Smith, A. R.: Effects of Video Podcasting on Psychomotor and Cognitive Performance, Attitudes and Study Behavior of Student Physical Therapists // Innovations in Education and Teaching International. Vol. 49. P. 401–414 (2012).
- 18. Brame, C. J.: Effective Educational Videos: Principles and Guidelines for Maximizing Student Learning from Video Content. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5132380/, last accessed 2021/05/11.
- 19. Pernice, K. F-Shaped Pattern of Reading on the Web: Misunderstood, But Still Relevant (Even on Mobile). https://www.nngroup.com/articles/f-shaped-pattern-reading-web-content/, last accessed 2021/05/11.

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НАВЧАЛЬНЕ ВІДЕО ЯК ТВОРЧИЙ ПРОЄКТ СТУДЕНТІВ-ЖУРНАЛІСТІВ В УМОВАХ ДИСТАНЦІЙНОГО НАВЧАННЯ (НА ПРИКЛАДІ ДИСЦИПЛІНИ «СПЕЦІАЛІЗАЦІЯ: ІНТЕРНЕТ, ТЕЛЕБАЧЕННЯ»)

Акцентовано на значенні ефективної організації навчального процесу в підготовці майбутніх фахівців із журналістики. Окреслено роль студентоцентризму як орієнтації вищої освіти на особистість здобувача, активне його залучення у навчальний процес. Обтрунтовано актуальність впровадження інноваційних практик в період дистанційного навчання студентів-журналістів. З'ясовано дефініцію понять «навчальне відео», «відеосупровід», «відеолекція», «туторіал», «скринкаст». Класифіковано види навчального відео. Проаналізовано алгоритм створення студентами навчального відео як медіапродукту і використання такого формату як ефективного інструменту в освітньому процесі. Обтрунтовано вибір YouTube-каналу як інтерактивної платформи для презентації навчальних відео студентів-журналістів. Охарактеризовано особливості проведення навчальних відеолекцій четвертокурсниками — майбутніми журналістами: тематику, зміст, специфіку створення і використання технічних програм. Зосереджено увагу на порадах і рекомендаціях здобувачів вищої освіти щодо доцільності впровадження таких форм занять у навчальний процес.

Ключові слова: дистанційне навчання, інноваційні практики, медіапродукт, навчальне відео, YouTube-канал.