



REVISTA INCLUSIONES

HOMENAJE A CLAUDIA PEÑA TESTA

Revista de Humanidades y Ciencias Sociales

Volumen 7 . Número Especial

Octubre / Diciembre

2020

ISSN 0719-4706

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**INFORMATION TECHNOLOGIES IN EDUCATION:
APPLICATION OF STREAM TECHNOLOGIES**

Dr. Svetlana Nikolaevna Kurbakova

Moscow Aviation Institute (university), Russia

ORCID: 0000-0002-2775-7068

svetlanakurbakova@yandex.ru

Ph. D. (c) Irina Vladimirovna Evgrafova

State Marine Technical University of St. Petersburg, Russia

ORCID: 0000-0001-5502-3523

inter@smtu.ru

Ph. D. (c) Kazakbay Abdualievich Zhanatayev

Ahmet Yassawi University, Kazakhstan

ORCID: 0000-0002-3135-7227

kazakbai-61@mail.ru

Ph. D. (c) Irina V. Polozhentseva

K.G. Razumovsky Moscow State University of Technologies and Management

(the First Cossack University), Russia

ORCID: 0000-0002-1944-9567

vipperh@yandex.ru

Ph. D. (c) Raziya Sulaybanovna Rabadanova

K.G. Razumovsky Moscow State University of technologies and management

(the First Cossack University), Russia

ORCID: 0000-0002-1083-3212

raziyat@bk.ru

Fecha de Recepción: 03 de junio de 2020 – **Fecha Revisión:** 09 de junio de 2020

Fecha de Aceptación: 18 de septiembre 2020 – **Fecha de Publicación:** 01 de octubre de 2020

Abstract

The article deals with using stream learning information technology in the context of teaching students of humanitarian specialties. The authors consider the theoretical views of researchers on the stream learning features, the presentation of educational material using video materials, which is a didactic tool that increases the level of perception and understanding of teaching information. Based on the students' survey, the authors have revealed their attitude to using the stream learning method, creating and using educational videos by teachers, as well as types of educational activities where it is advisable to use stream technologies in the educational process. The article considers also the advantages and disadvantages of using stream technologies in the educational process. The authors consider various types of videos, the possibilities of their use in the educational process, requirements for their preparation, recommendations for use, and options for combining with other multimedia.

Keywords

Educational process – Stream learning – Stream technologies – Multimedia – Educational videos

DR. SVETLANA NIKOLAEVNA KURBAKOVA / PH. D. (C) IRINA VLADIMIROVNA EVGROFOVA

PH. D. (C) KAZAKBAY ABDUALIEVICH ZHANATAYEV / PH. D. (C) IRINA V. POLOZHENTSEVA

PH. D. (C) RAZIYAT SULAYBANOVNA RABADANOVA

Para Citar este Artículo:

Kurbakova, Svetlana Nikolaevna; Evgrafova, Irina Vladimirovna; Zhanatayev, Kazakbay Abdualievich; Polozhentseva, Irina V. y Rabadanova, Raziya Sulaybanovna. Information technologies in education: application of stream technologies. Revista Inclusiones Vol: 7 num Especial (2020): 264-278.

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Introduction

Using electronic educational resources (EER) in the organization of the educational process at the university has become a common practice¹. University teachers are increasingly using multimedia presentations in lectures, virtual experiments in laboratory practicals, and electronic materials in practical studies that, in turn, requires appropriate knowledge and skills in the development of these tools, since EER are different from traditional means of training. The differences are both in the role of the teacher and the ways of interaction between the subjects of the educational process.

The defining feature of the contemporary EER is its multimedia nature, which is primarily characterized by the integration of heterogeneous data in the presentation of educational material². Due to this feature, the educational material can be presented not only in the form of a text, which is typical for traditional education but also supplemented with other media, such as images, audio, animation, and video. Such an approach contributes to the comprehensive acquisition by students of knowledge, skills, and abilities because each of the media has its peculiar potential that can have positive impact on different means of communication with the audience, including those in teaching and learning³. The application of such teaching tool as a video requires special consideration because the video is both traditional technologies since it has a rich history of use in the educational process, and a contemporary means because it requires new technologies, tools, and methods of the creation and application. Initially, stream technology was used by computer game enthusiasts, where players used it to show other gamers how to pass a difficult game interval. This technology has also proved its effectiveness in the field of education. Thus, S.S. Arbuzov understands stream learning technology as "a set of methods for preparing, translation, and storing audio-visual information from the screen of a personal digital device and a webcam during distance learning using modern telecommunications services on the Internet"⁴.

Griban O.N.⁵ believes that the use of stream learning technology is promising not only in distance learning but also in the case of offline learning.

¹ A. N. Al-Kaisi; A. I. Arkhangelskaya; M. A. Bragina; B. A. Bulgarova y O. I. Rudenko-Morgun, "Teaching the Russian language in polyconfectional classes with the use of integrating tools", *European Journal of Science and Theology* Vol: 14 num 1 (2018): 47-59.

² S. V. Savina, "Artificial intelligence in analyzing the capital structure effect on financial stability", *Bulletin of the National Academy of Sciences of the Republic of Kazakhstan* Vol: 1 num 383 (2020): 277-287 y J. Hernández de Velazco; A. C. Chumaceiro y E. Atencio Cárdenas, "Quality of Service and Human Resources: Case Study of a Department Store", *Revista Venezolana de Gerencia* Vol: 14 num 47 (2009): 458-472.

³ L. P. Muhammad; S. G. Persiyanova; B. I. Karadzhev y V. N. Levina, "Teaching foreign students to develop a monologic discourse based on cataphoric means", *Amazonia Investiga* Vol: 8 num 23 (2019): 17-26; A. S. Troshin; A. P. Sokolova; E. O. Ermolaeva; R. M. Magomedov y T. L. Fomicheva, "Information Technology in Tourism: Effective Strategies for Communication with Consumers", *Journal of Environmental Management and Tourism* Vol: 11 num 2 (2020): 322-330 y L. N. Yasnitsky, "Algorithm for searching and analyzing abnormal observations of statistical information based on the Arnold – Kolmogorov – Hecht-Nielsen Theorem", *International Journal of Advanced Trends in Computer Science and Engineering* Vol: 9 num 2 (2020): 1814-1819.

⁴ S. S. Arbuzov, "Ispol'zovanie strim-tekhnologij pri distancionnom obuchenii IT-disciplinam", *Pedagogical Education in Russia* Vol: 6 (2017): 6-12.

⁵ O. N. Griban y I. V. Griban, "Tekhnologiya strim-obucheniya v obrazovatel'nom processe: sposoby i perspektivy primeneniya", *Pedagogical Education in Russia* Vol: 1 (2019): 38-43.

Researchers⁶ focus on the specifics of the audio-visual image implemented in the educational video, which provides an optimal combination of verbal and visual forms of presenting learning material. This is because the nature of audio-visual communication is related to the peculiarities of the human psyche in direct and indirect perception of the surrounding world. In the teaching process, audiovisual data intend to ensure the efficiency in getting ideas about the environment and the various types of educational-cognitive activity of learners as the audio-visual means of presenting the material play the role of the intense, clear, nondistorted signals aimed at improving the acquisition of knowledge. At that, scientists⁷ note that the audio-visual method of presenting educational material is not something new, and has a long history of application in education (educational films, educational television, and video recordings).

Video is a fairly rich and flexible didactic tool that increases the level of perception and understanding of teaching information⁸. Following the research results of P. Riismandel⁹, 91% of respondents (educators, teachers, educational institution employees) believe that video has a positive effect on students' satisfaction with learning, while 82% note that using video leads to an increase in academic performance. Moreover, the video presentation has a significant motivating effect, since it can heighten interest, and encourage learning. It is also effective in terms of the emotional perception of objects since a dynamic demonstration can attract students, as well as create the illusion of presence, and the desired atmosphere. Besides, video ensures long-term keeping of the acquired material in human memory¹⁰. Empirical studies¹¹ show that visual media make concepts more accessible to humans than text materials, and easier to remember in the future. Berk R.¹² in his work asks a simple question: "Why do students remember everything that is shown on television, but forget what they listen to in class?" The answer is quite simple – visual media help them to commit to memory concepts and ideas in the form of images.

According to researchers¹³ video is characterized by the following advantages:

⁶ H. Choi y S. Johnson, "The effect of context-based video instruction on learning and motivation in online courses", *The American Journal of Distance Education* Vol: 19 num 4 (2005): 215-227; E. M. Lubkova; A. E. Shilova y G. S. Ermolaeva, "New Reality of the Banking Market: E-Banking and M-Banking (The Russia Case Study)", *Journal of Advanced Research in Law and Economics* Vol: 10 num 2 (2020): 574-582; M. M. Nimatulaev; K. K. Sirbiladze; O. N. Tsvetkova; L. I. Ivanova y E. E. Konovalova, "Improvement of information technologies in the hotel business", *Turismo: Estudos & Práticas* Vol: 9 num 1 (2020): 1-9 y I. Y. Fedorova; A. A. Urunov; I. B. Rodina y V. A. Ostapenko, "Financing and quality of housing construction: introduction of information systems as a regulatory tool", *Revista Inclusiones* Vol: 7 num Especial (2020):328-339.

⁷ W. Shewbridge y Z. L. Berge, "The role of theory and technology in learning video production: The challenge of change", *International Journal on E-learning* vol: 13 num 1 (2004): 31-40.

⁸ H. Odhabi y L. Nicks-McCaleb, "Video recording lectures: Student and professor perspectives", *British Journal of Educational Technology* Vol: 42 num 2 (2011): 327-336.

⁹ P. Riismandel, "The state of education video", *Streaming Media* vol: 13 num 2 (2016): 44-50.

¹⁰ Z. Ittzes Abrams, "Using film to provide a context for teaching pragmatics", *The system* Vol: 46 (2014): 55-64.

¹¹ O. B. Maia; H. S. Yehia y L. de Errico, "A concise review of the quality of experience assessment for video streaming", *Computer Communications* Vol: 57 (2015): 1-12.

¹² R. A. Berk, "Multimedia teaching with video clips: TV, movies, YouTube, and mtvU in the college classroom", *International Journal of Technology in Teaching and Learning* Vol: 5 num 1 (2009): 1-21.

¹³ T. Hartsell y S. C.-Y. Yuen, "Video streaming in online learning", *AACE Journal* Vol: 14 num 1 (2006): 31-43 y C.-M. Chen y C.-H. Wu, "Effects of different video lecture types on sustained attention,

DR. SVETLANA NIKOLAEVNA KURBAKOVA / PH. D. (C) IRINA VLADIMIROVNA EVGRAFOVA

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- 1) a large number of sources and types of records, of which each can explain the necessary concepts, processes, etc. within a short period;
- 2) possibility to familiarize students with contemporary technologies, techniques, and processes;
- 3) possibility to combine the information learned in the classroom with its implementation and application in life;
- 4) possibility to help to attract and maintain the attention of students to the studied theories and concepts, as well as demonstrate them in action;
- 5) the possibility to develop the analytical skills of students by analyzing demonstrated material being studied.

The purpose of the present research is to analyze the use of mixed learning methods when studying the discipline "English as a foreign language" in higher education institutions and to find out the attitude of students to the use of mixed learning in the English classes.

The purpose of the article is to study several issues: to identify the students' opinions regarding their expectations for the use of video and stream learning in the educational process; to determine the didactic capabilities of the video in computer-mediated learning; to determine the features of preparing video materials and to study the aspects of combining video with other media.

Research hypothesis is as follows: the use of video in the stream learning is positively perceived by students and is a powerful didactic tool that contributes to improving the effectiveness of learning.

Based on the research results, it can be concluded that the goal set in the study was achieved.

Methods

To conduct the study, the authors used a set of general scientific theoretical, empirical, and statistical methods, namely, systemic analysis of scientific studies on the stream learning in higher education that allowed determining the possible aspects of its consideration. Besides, the methods included classification, abstraction to determine a set of attributes according to the study objectives, as well as the descriptive method.

To determine the prospects for the stream learning development of students of humanitarian specialties, an anonymous survey was conducted among first-year students on the topic: "Educational material presentation forms", whose results confirmed the need to use stream learning in the educational process. The questionnaire was designed to identify students' opinions about their expectations for using video in the educational process. The purpose and structure of the survey were explained to students before filling out the response forms. The questionnaire was presented to the respondents in printed form.

emotion, cognitive load, and learning performance", *Computers and Education* Vol: 80 (2015): 108-121.

The survey participants were informed about the purpose of the survey, and that the survey organizers intended to publish in the future the results of the study in a generalized form.

The research procedure included the following stages: inviting registered participants; distributing and collecting survey materials; processing and verifying the integrity and reliability of survey data.

Results

According to the survey results, most students would like teachers to create and use video materials in the learning process (Figure 1).

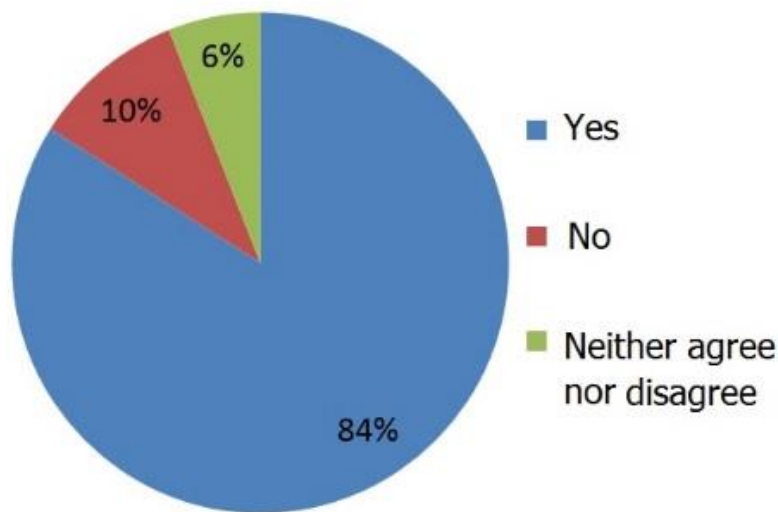


Figure 1
Students' attitude to the creation and use of educational video materials by teachers

Among the various types of educational activities, students expect to use video materials for distance learning, independent work, and laboratory work guidelines (Table 1).

No	Possible answer	% of the sample
1	Distance learning	63.3
2	Independent work	44.2
3	Laboratory work guidelines	34.6
4	Individual work	22.5
5	Demonstration at a lecture	21.3
6	Other	1.8

Note: multiple responses are possible

Table 1
Types of educational activities where using stream technologies in the educational process is advisable

According to students, they better perceive and assimilate the material presented in the form of video materials and dynamic illustrations. The material presented as a text is well absorbed by just 6.3% of students (Figure 2).

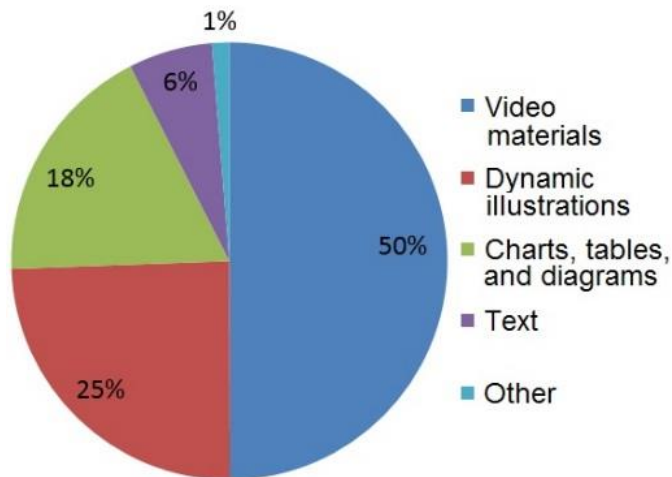


Figure 2
Mastering the educational material by students

During the survey, students were asked to indicate the advantages and disadvantages of using video materials in educational possess. The most typical students' responses are presented in Table 2.

No	Advantages
1	easy to remember
2	facilitate the learning process
3	the demonstrative character of the material, so it is easier to understand
4	enliven the learning process
5	ease of use and perception
6	can increase interest in a particular discipline
7	today, young people perceive videos much better than text
8	demonstrate the modernity of the educational process
9	increase cognitive activity
10	it is interesting, and one doesn't get tired for a long time
11	provide the appearance of persistent images
12	create better emotional perception of the material
13	enhance mental activity
14	provide individualization of the educational process

15	provide a large amount of accumulated scientific information taking into account the latest scientific achievements
16	are distinguished by their affordability, since the student has the opportunity to get a significant amount of scientific information which is saturated with the latest material, in a relatively short time
17	direct the interests and encourage the students to further develop the covered topic
18	allow multiple demonstrations of educational video materials directly in the classroom and the ability to repeat it at home
19	increase the level of independent practical work, and significantly improve the quality of their implementation
No	Disadvantages
1	video tutorials are well perceived only by people with a developed visual memory
2	with a large number of people in the audience, it may be hard to see and hear the demonstrated video
3	detailed video tutorial requires constant pauses for better absorption or reproduction of actions and instructions
4	additional effects in the video can distract
5	video tutorials that last more than 10 minutes can get bored
6	creating video tutorials is time-consuming

Note: compiled based on students' responses.

Table 2

Advantages and disadvantages of using stream technologies in the educational process

Discussion

The results of the survey confirm that students are not only ready to percept learning material using video but also strive to do so.

The choice of the type of video materials when using stream technologies in teaching students, first of all, depends on the subject taught and the goals of a particular class. The video can be used as a video compliment, a demonstration, a mini-lecture on a specific issue, a problem for a group discussion, a student project, or an example of an action ("Do it like on the video"), etc.

There are several ways to get video materials. The easiest way is to make one's own video recording on a video camera, web camera, or digital camera that allows shooting videos with sufficient quality. One can also capture videos as a presentation or sequence of frames. Another option is using ready-made videos on various topics available at online resources (both paid and free). The resulting video materials must be processed using a computer to ensure their convenient use in the created multimedia educational materials (combine or cut out video fragments, provide them with titles, superimpose sound, etc.)¹⁴.

¹⁴ H. Fredriksen, "A case study of an experiment using the streaming of lectures in teaching engineering mathematics", Teaching Mathematics and its Applications Vol: 34 num 1 (2015): 44-52.

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Creating and editing video materials can be carried out using software tools, such as Videomach, VirtualDub, Adobe Premiere, and some others. But the built-in standard Windows Movie Maker is the most affordable video editor. This software allows editing (changing) video files and creating slideshows. Videos can be created from both video materials and photos, with the ability to merge and crop, overlay sounds, and transitions, add titles and cinema captions, as well as create various video effects (sepia, negative, retardation, acceleration, etc.). The finished video can be saved on a computer, copied on an external storage medium, sent by email, or uploaded to the Internet. In addition to these features, this program has another important advantage: ease of mastering and use¹⁵.

Video materials can reflect both abstract and specific examples, and thus are very useful.¹⁶ They can be used for the following purposes:

- to demonstrate tests or experiments (observation of macro- or microscopic phenomena; expensive equipment; inaccessible or dangerous phenomena, or phenomena which are difficult to observe without special equipment);
- to demonstrate certain procedures or events related to dynamic changes or movement (technological processes; application of a variety of tools; physical skills; phenomena in environments that cannot be observed directly; animated, slow motion video, or accelerated demonstration of certain changes over time);
- to illustrate abstract notions using specially constructed physical models;
- to develop interpersonal communication skills, to reflect specific examples and complicated situations, and to make decisions;
- to present outstanding works of literature, drama, music, or other arts to the audience;
- to view the video material at any convenient time, in any place, and the required number of times.

However, the use of stream technologies and video materials has several problematic aspects. In particular, the production of a video is quite complex, since it requires significant time and financial expenses, as well as a high level of developer's skills. Therefore, its use should be justified by the goals that the video resource is aimed at¹⁷.

¹⁵ K. Shephard, "Questioning, promoting, and evaluating the use of streaming video to support student learning", *British Journal of Educational Technology* Vol: 34 num 3 (2003): 295-308 y C.-K. Chang, "Constructing a streaming video-based learning forum for collaborative learning", *Journal of Educational Multimedia and Hypermedia* Vol: 13 num 3 (2004): 245-263.

¹⁶ A. V. Uskov; V. L. Uskov y A. D. Ivannikov, "Strimming tekhnologii v elektronnom obuchenii", *Educational Technologies and Society* Vol: 1 num 11 (2008): 449-462; M. Magasic, "The in-class movie theatre: How to use streaming video in the classroom", *Accents Asia* Vol: 8 num 1 (2015): 12-16 y I. Kosterelioglu, "Student views on learning environments enriched by video clips", *Universal Journal of Educational Research* Vol: 4 num 2 (2016):359-369.

¹⁷ W. Jinxia, L. Xiaoming, Y. Wenxia, "Multimedia courseware design based on streaming media technology", *Application Research of Computers* Vol: 4 (2013): 70-71.

The low level of students' interactivity is also a weak side of the video¹⁸ since a favorable educational atmosphere is formed through the active learning activities of students, while passive video watching is unlikely to contribute to this. Therefore, it is advisable to organize the watching video materials in an educationally effective form (informing students before the watching concerning the issues considered in the video to draw students' attention to important points of the video; answering questions after watching; discussing what they saw; conducting "video case" method, etc.).

Contemporary video materials are a valuable tool for organizing stream learning. Being able to control the playback (stop, start, and rewind), the teacher can pause and ask questions to students to predict the result of video demonstrations, discuss issues, and review the fragments for better understanding of the key ideas. Short video fragments combined with discussion allow avoiding turning the student into a passive observer, while, on the contrary, make him an active participant in the educational process¹⁹.

The teacher can start a video demonstration at any stage of the lesson. At the beginning of the lesson, the video material can perform a motivating function, and raise interest in a new topic. During the lesson, the teacher can use the video to illustrate the studied subject. At the final stage, video can be used to generalize the learned educational material. Besides, video materials can also be effective when monitoring and assessing students' knowledge and skills, being incorporated in electronic test systems.

Below are the various types and features of videos that can be used in the stream learning of students of humanity subjects (Table 3).

	Video types	Features
1	Professional educational video	This type of video is created in professional recording studios using sophisticated equipment. They can be used to highlight complicated production processes, demonstrate natural phenomena, show the activities of specialists in various fields, and create other stories that are difficult to reproduce in everyday life. These include educational and popular science professional films, video lectures, and video tutorials
2	Studio and full-scale video lectures	Full-scale video lectures are created directly during the lecture sessions. They can create a participation effect for students who view the video lectures. This is achieved because the teacher works with live audience and sees its response to the material that is being presented. Studio video lectures are recorded at film sets and subjected to video processing, which significantly improves the quality of the lecture. The lecturer can stay in the background or next to the presented material, staying at the background of an ordinary blackboard or in front of a glass board, use the "picture in picture" or "close-up" effects.

¹⁸ F.J. Boster, G.S. Meyer, A.J. Roberto, C. Inge, R. Strom, "Some effects of video streaming on educational achievement", *Communication Education* Vol: 55 num 1 (2006): 46-62.

¹⁹ C. Amino, "Effectiveness of two to three-minute movie segments as teaching materials: A pilot study based on surveys and ability tests", *The Association for Teaching English Through Movies* Vol: 12 (2007): 24-20.

3	Video scribing	Animated videos have a very characteristic feature – a drawn image is created right in front of the viewer. The main advantage of video scribing is its ability to hold the viewer's attention for a long time. The very process of drawing images acts hypnotically: despite creating an animated image, the viewer already wants to know how the story of the video will develop and how it will end. Video scribing can be conditionally divided into professional, semi-professional, and amateur. Professional Video scribing requires considerable skills and technical knowledge, while the latter two types are very widely used by ordinary users since there are special services that allow creating a story using already developed scenes, characters, and scenarios
4	Infographic videos	Infographics is a graphic visual representation of data or knowledge that is designed to display complex material quickly and clearly. The infographic video format enhances the impact on a person by using graphics in motion, as well as adding music and sound effects. Creating the effect of extended reality, video infographics is especially used for presenting a large amount of data involving the user in active research when analyzing the necessary material
5	Screencast	A screencast is a digital video recording of information that is displayed on a monitor screen. A screencast is often accompanied by voice comments. Screencasting is actively used in educational processes by both students and teachers. Due to the ease of creating such videos, screencast has acquired different forms of implementation and presentation of the material
6	Demonstrations	This video contains a demonstration of tests, laboratory work, operation of equipment, or software, as well as equipment assembly and disassembly. A video can be created from photos reflecting process stages, or based on objective video recording
7	Interactive videos	Videos of this type are combined with texts, maps, or even surveys. In an interactive video, one can select individual elements using the mouse, view 3D models from different sides, as well as pass online testing. One can create any content: from an illustrated historical tour with soundtracks, images, event location maps, one's vocal accompaniment, and video drop-ins, to incredible multimedia videos and stories
8	3D-visualization	The main purpose of this type of video is to give movement (animation) to a 3D model or to simulate movement among 3D objects. Universal 3D graphics software has a very wide range of opportunities to create animations
9	Pseudo video	This type of video includes videos that consist of static objects that create the effect of a track being played quickly
10	Video timeline	The video timeline allows demonstrating an object in time, as well as visually display the order of moving objects following each other. For example, one can demonstrate the history of Europe over the past 1,000 years on a map in three minutes

Table 3

Types of videos that can be used in stream learning

For video materials used in the stream learning process to be effective and have a didactic result, they must meet certain technical, ergonomic, psychological, and pedagogical requirements²⁰, namely:

- provide a visual demonstration of a specific issue intended for study;
- be of high quality (good camerawork, clear sound, good diction of the speaker, clarity of drawings and text on video frames, absence of interference and distractions);
- provide a deep and accessible presentation of material using animation, which should emphasize certain points of the presentation, drawings, and formulas;
- the video must be simple, clear, and easy to use;
- the video must be short and substantial (lasting no more than 10 minutes to avoid students from getting bored, but to reveal the key points);
- have display controls (so that the student or teacher, if necessary, could stop viewing, go to or view repeatedly the desired part, as well as control the volume or screen size);
- have a corresponding alternative source of information (titles, phonic or text accompaniment).

Conclusion

The research results have confirmed the hypothesis that the use of video in stream learning is positively perceived by students being a powerful didactic tool that contributes to improving learning effectiveness.

Thus, the inclusion of video materials makes the learning environment more saturated, while the learning process – more intense. However, important is not the mere presence of video but its compliance with the training objectives, the quality of the content material, video recording specifications, as well as the optimal combination of video with other training means. If used properly, educational videos can play an important role, especially for students studying humanity subjects. Students can use audio-visual materials to study more deeply concepts and topics that are delivered to them at speciality lectures. The video images will allow reinforcing all the concepts that students have studied before based only on printed learning materials, as well as those which they misunderstood and had difficulty when remembering without viewing audio-visual materials.

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²⁰ L. Anderson; S. Banks y P. Leary, "The effect of interactive television courses on student satisfaction", *The Journal of Education for Business* Vol: 77 num 3 (2002):164-168.

DR. SVETLANA NIKOLAEVNA KURBAKOVA / PH. D. (C) IRINA VLADIMIROVNA EVGRAFOVA
PH. D. (C) KAZAKBAY ABDUALIEVICH ZHANATAYEV / PH. D. (C) IRINA V. POLOZHENTSEVA
PH. D. (C) RAZIYAT SULAYBANOVNA RABADANOVA

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DR. SVETLANA NIKOLAEVNA KURBAKOVA / PH. D. (C) IRINA VLADIMIROVNA EVGRAFOVA
PH. D. (C) KAZAKBAY ABDUALIEVICH ZHANATAYEV / PH. D. (C) IRINA V. POLOZHENTSEVA
PH. D. (C) RAZIYAT SULAYBANOVNA RABADANOVA