

# *Assessment of the effectiveness of the use of technology of stream-learning at the university*

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**Abstract** — The processes of globalization and the widespread use of the Internet led to changes in all spheres of human life, and above all - in education. In modern conditions, when Russia faces the strategic task of creating a digital educational environment, and almost every pupil or student spends a significant part of their time with gadgets, the teacher has to constantly learn new technologies, introduce them into the pedagogical process, be ready to quickly and effectively adapt to changes in the education system. There are major changes in the organization of the learning process, new methods and tools constantly appear. One of the modern learning technologies is streaming technology. This article considers the problem of assessing the effectiveness of the use of stream-learning at a university. The authors determined the forms of using stream-technology by both the teacher and students, and also determined the criteria of the effectiveness of stream-technology at different stages of its use: at the preparation stage, mainly in the educational process, in project activities.

**Keywords** — *stream technology, e-learning, distance learning, information technology, digitalization of education, digital educational environment, information technologies in education, information competence of a teacher, innovations in education, web resources, gadgets.*

## I. INTRODUCTION

In today's world, digitalization is essential condition and a factor of the development of all spheres of human activity. Under the terms of the formation of the information society, radical changes also takes place in the field of Russian education. In accordance with the tasks, formulated in the Decree of the President of the Russian Federation of May 7, 2018 No. 204 "On national goals and strategic tasks of the development of the Russian Federation for the period until 2024" [1] within the framework of the national project "Education" in the next 5 years, 10 federal projects should be implemented, 3 of which are directly aimed at creating the conditions for a diverse and consistent digitalization of education:

- "Modern school" (the task is to introduce new methods of learning and upbringing, modern educational technologies into Russian schools);

- "Digital educational environment" (the task is to create a modern and secure digital educational environment, that ensures high quality and availability of education of all types and levels);
- "Teacher of the future" (the task is to introduce a national system of professional growth of teachers, covering at least 50% of teachers of educational institutions) [2].

The key task in the framework of the national project "Education" is not only ensuring the global competitiveness of Russian education, but also the becoming of Russian Federation to be one of the 10 leading countries in the world in terms of the quality of general education.

In these conditions, pedagogical universities are faced with the task of preparing future teachers and retraining existing teaching staff, who are able to quickly respond to changes in the field of education and adapt to professional activities in the context of digitalization of education.

An analysis of the current state of the teacher training system allows to say, that one of the key obstacles to the development of the modern educational environment in Russia, in our opinion, is the lack of a developed methodology of the implementation of information technologies in the pedagogical process. Everyone says, that it is necessary to use information technologies, but in practice, this is not always realized to the proper degree and at a high level. In addition, it should be noted, there is the lack of universal authoring methods of teaching, using the resources of the digital educational environment (the use of modern mobile devices, gadgets, interactive equipment, podcasting, screencasting, streaming, augmented and virtual reality technologies, as well as web services, mobile applications and alternative software) [3].

In this article, the authors consider modern approaches to the problem of assessing the effectiveness of the use of a new pedagogical technology of stream-learning at a university.

## II. RESEARCH METHODS

The methodological basis of the study is a competence approach in which information competence is considered as one of the key ones in the structure of bachelor degrees (L.V. Bocharova, V.I. Baidenko, A.S. Belkin, G.B. Golub, E.F. Zeer, I.A. Zimnaya, V.V. Kraevsky, E.F. Morkovina, G.K. Selevko, A.V. Khutorskoy, K.V. Shaposhnikov and others). We consider readiness and the ability to improve our knowledge in accordance with the requirements set by the state and society for vocational education, including the readiness to be an active participant in the digitalization process, as one of the components of information competence of the individual in modern conditions.

Key research methods were: analysis of psychological, pedagogical and scientific-methodical literature, documents on educational issues, existing regulations on informatization and digitalization of education, a comparative historical method, synthesis, comparison, generalization.

Under the technology of stream-learning at a university, we understand the set of learning methods and forms, using broadcast (podcasts, screencasts) and streaming video (streams) on the Internet, ensuring the achievement of specific results and aimed at the formation of competencies, provided by the Federal State Educational Standard of Higher Education [4, p. 85].

When using pedagogical technology of stream-learning in the process of teaching of specific disciplines at a university, we consider it necessary to take into account the following basic principles of:

- 1) an objective orientation of the content (it is extremely important to take into account the latest achievements in this particular field);
- 2) effectiveness (the teacher should focus on the achievement of the intended result);
- 3) efficiency - the goal should be achieved in the shortest time and with the least effort;
- 4) reflexivity (the teacher, as a designer and moderator of educational impact, should consider his personal qualities as an important factor in the efficiency of the impact);
- 5) personal orientation - a concrete personality should always be considered as an effect of educational impact;
- 6) harmonicity - each educational impact should be included in the bachelor's training system so as to contribute to the achievement of the main effect - personal development [5, p. 55].

## III. RESULTS

A modern teacher must learn to use new technological tools and practically unlimited information resources. Virtual reality technologies create a unique opportunity to use a variety of simulator programs that are not referred to a single workplace. Mobile learning technologies makes it possible to study anytime, anywhere. At the same time, the digital environment requires teachers to be ready (primarily psychologically) for innovation, changing their mentality, forming a new picture of the world, a completely different way and forms of working with students.

We believe, that the project to create a digital educational environment and the switchover to a digital school in the near future can only be realized, if conditions for training teachers, who are able and ready to constantly update their knowledge and to be involved in the continuous process of improving forms, tools, teaching methods, using digital technologies, are already created. One of the most popular direction of activity today in the framework of digitalization of education is the development of methods of using specific technologies in teaching. The team of young teachers of the Ural State Pedagogical University developed and tested the technology of stream-learning with students of various directions of learning [6; 7].

Based on the designed technology of stream-learning at the university, the learning process was organized in the framework of several disciplines: "Information and communication technologies in education", "Architecture of information systems", "Computer networks", "Methods of learning and upbringing technology", "Computer graphics", "Computer video and sound", "3D modeling", "Physical education", "Internet technologies in international relations", "Web design". An integrated approach contributed to the effectiveness of the designed models of the organization of the educational process: a combination of classroom, remote and mixed forms of work, as well as created instructions for working with the educational process management system Google for education (in particular, the Classroom application) and the program for capturing the desktop screen of a personal computer - Open Broadcaster Software. These models and instructions allowed young scientists to gradually actualize and optimize the content, methods and forms of teaching their disciplines to the level of pedagogical technology of stream-learning at the university.

As a result, since 2016 to the present, the coverage of students, who studied using the technology of stream-learning at the university, is about 1000 people. Wherein, every year there is a tendency to increase students' motivation and interest in the studied disciplines using podcasting, screencasting and stream-technologies. It is worth noting, that more than 60% of students, after mastering the necessary competencies at a basic level, successfully deal with the stage of individual or group project activities and receive higher grades. In a specially created information portal, [стрим-обучение.рф](http://стрим-обучение.рф), as well as on the "Computer science" YouTube-channel, it is possible to familiarize with examples of student video works in various academic disciplines.

Within the framework of the developed technology, the so-called learning podcasts, screencasts, and streams can be actively applied by teachers both during lectures, master classes, public presentations, seminar and practical classes, and as a tool for remote counseling students on the fulfillment of proposed tasks or final project works.

In turn, students can apply the technology of stream-learning as follows:

- as a video-abstract on lecture materials;
- as theoretical video answers to control questions on lecture materials;

- as video reports on completed practical exercises;
- as video reports on completed final project works.

In the process of introducing technology into the learning process, the construction of classroom, distance and mixed models of the organization of the educational process, focused on the use of stream-learning technology at the university, was completed. The construction of such models is due to the fact, that, depending on the form of learning (full-time, home study, evening or distance), the teacher can choose the most optimal activity path for the organization of the educational process in each specific pedagogical case. Wherein, if the teacher mainly conducts classes in classrooms and, for some reason, is forced to be absent at several classes, then he has the opportunity to change the classroom or mixed model of the organization of the educational process to remote and vice versa for the while.

These models have the general logic of the organization of learning activity, consisting of the following stages:

1) *Preparation*: the teacher plans the course of classes, selects and develops electronic educational resources, publishes them in the educational process management system.

2) *Main learning process*: the teacher holds lectures and practical classes, publishes assignments, as a result of which, students report in the format of video answers to control questions on theoretical material and video reports on completed practical work. This stage is aimed at students mastering the basic minimum in a separate learning course. The result of successfully passing this stage is getting the grade of pass or passed.

3) *Project activities*: the teacher assign the final project tasks, consults with students on their fulfillment, the report on these tasks is being the protection of the project in an audiovisual format. The result of successfully passing this stage is getting the grade of good or excellent.

The analysis of research by D.V. Chernilevsky [8], that concern the effectiveness of the use of pedagogical technologies in the learning process, allows to distinguish the following groups of criteria and indicators of assessing the technology of stream-learning at the university:

- at the stage of design of technology;
- at the stage of functioning of the technology;
- in detecting the efficiency of learning results.

As part of the assessment criteria at the stage of designing the technology of stream-learning, we distinguish the following:

- technological sequence - the division of the process into internal, interrelated stages, phases, operations, procedures;
- Algorithmicity - the unambiguity of the carrying out procedures and operations, included in the technology, as well as functional completeness;
- A particular criterion for managing the learning process, which allows to assess the designed learning technology from the point of view of the possibilities of

controlling and correcting the actually implemented learning process.

When assessing the functioning of the technology of stream-learning, we distinguish the following quantitative and qualitative indicators of effectiveness:

- the amount of time, given and spent by students to solve the assigned task, using the technology of stream-learning;
- the pace of the course of studies using information technology;
- the degree of teacher assistance to students in organizing their independent activities in classrooms, equipped with computer equipment;
- the digestion of learning material, determined by the ratio of the volume of learning material, digested by students during a unit of time, to the material, reported to the student for the same time;
- the number of learning materials, created by students during classroom and independent work;
- reflection of the modern level of development of scientific knowledge, the evolution of technical devices, software, the availability and ease of their use in the content of the learning;
- compliance of learning methods with the real material and technical base of the university and the given learning time;
- ensuring the principles of visualization and availability of learning through the use of additional resources and examples;
- the complexity of the use of broadcast and streaming video (podcasts, screencasts, live broadcasts on the Internet) in the educational process (during lecture and practical classes, student counseling, etc.);
- universality of use and ease of use of technical devices and software during classroom and independent work;
- noticeable changes in the state of the students (in their motivation for activity, knowledge, skills, emotions, etc.) in the process of implementing stream-learning technology.

The main indicators of the effectiveness of the obtained results in the framework of using the technology of stream-learning at the university are as follows:

- the formation of competencies among students, in accordance with the Federal State Educational Standard of Higher Education, at a basic or advanced level;
- the possibility of applying the materials, on the best final project work, received from students, as part of further research, to participate in scientific events, as good examples for further teaching in the framework of a specific discipline.

#### IV. DISCUSSION

The problems of the readiness of Russian universities to participate in the digitalization of education and the creation of a digital economy are considered in the works of N.V. Dneprovskaya, which rightly notes, that "the key source of the development of the digital economy are specialists, who are prepared to work with information technologies". In the research, conducted by the author, it was concluded that "only individual universities passed the stages of automation, informatization, and are confidently moving to the digital economy" [9].

One of the least developed issues at present is the assessment of the efficiency of the use of digital technologies in the educational process.

On the whole, the issues of assessing the efficiency of pedagogical technologies at different times were considered by S.Y. Batysheva, V.P. Bepalko, G.K. Selevko, D.K. Smolyakova, B.E. Starichenko, R.S. Fomichev, D.V. Chernilevsky, Y.K. Chernova, A.N. Yarygin and others. Researchers pointed out, that the efficiency of pedagogical technologies should be based on the correspondence of the final learning result with the planned result.

As for assessing the efficiency of the use of modern information technologies and e-learning, a lot of attention was paid to this topic in the pedagogical literature in the last few years. So, a researcher from Udmurt State University I.K. Voitovich distinguishes four groups of indicators of the efficiency and quality of e-learning: Indicators, aimed at content; at teachers, at the infrastructure and electronic learning environment at the university, as well as didactic and technological indicators, focused on students" [10].

Among the practice-oriented researches of the problem of creating a modern digital educational environment, it is necessary to note the fundamental research by the staff of the National Research Tomsk State University G.A. Krasnova and G.V. Mozhaeva [11]. The methodological foundations of the formation of a modern digital educational environment at school and university are considered in a collective monograph by I.V. Avadaeva, S.K. Anisimova-Tkalich et al. [5]. The authors note, that "the efficiency of the use of digital educational resources can be increased, if:

- informatization will be directed to all components of the digital educational environment, and not just to one of them;
- learning technology will be thought over at all stages: from the motives of learning, goal-setting to the results of learning activities;
- the educational environment will be aimed not only at learning, but also at upbringing, development of the students's personality" [5, p. 54].

Actually, a relatively small amount of research is dedicated to the technology of stream-learning, the features and prospects of its use in the learning process, the assessment of the effectiveness of its use in modern pedagogical science. It is necessary to pay attention to the works of B.G. Angelopoulos,

M.N. Ishemgulova, T. Kunkel, O.G. Sharabaiko [12; 13; 14; 15]. At the same time, western researchers turned to this topic about ten years ago. So, we can note a research, conducted under the aegis of the European Commission in 2005. "Stream-media in education and their influence on the theory and practice of learning. The best examples and first observations of the results" [16]. According to the authors of the report, the key principle in choosing a method of working with video should be the principle of practicability: if the teacher comes to the conclusion, that the pedagogical benefit of watching a video is small (because too much time is spent on watching and the benefits are small), this method should be rejected as inappropriate.

At USPU for several years, the process of introducing stream-technologies has been studied by S.S. Arbuzov, O.N. Griban, A.N. Konstantinov, T.V. Perevalova, B.E. Starichenko [3; 4; 6; 7; 17].

Thus, the analysis of domestic and foreign literature, dedicated to assessing the effectiveness of using stream-technologies in the learning process allows us to conclude, that a unified, generally accepted and repeatedly tested method has not yet been developed. This problem requires further theoretical reflection.

#### V. CONCLUSIONS

In an interview on the interim results of the national project "Education", Minister of Education of the Russian Federation O.Y. Vasilyeva noted: "... In order to make a quantum leap precisely in working with children, we now have a very important task, and it is also included in the national project, this is the retraining of our teachers - 50 percent, so that they are ready for that new" [18]. In modern conditions, when the Russian Federation faces the strategic task of creating a digital educational environment, and students spend a significant part of their time with various gadgets, the teacher is forced to constantly learn new technologies, use them in the pedagogical process, be ready to constantly learn, improve, quickly and effectively adapt to changes in the education system.

One of the modern learning technologies is the streaming technology, which is actively used in the educational process by a team of young teachers of the Ural State Pedagogical University since 2016. Assessing the effectiveness of applying the streaming technology in the framework of teaching the disciplines "Information and communication technologies in education", "Architecture of information systems", "Computer networks", "Methods of learning and education of technology", and others, the authors distinguish groups of criteria for assessing effectiveness at different stages: at the level of preparation for classes, mainly in the learning process, in project activities. As the main indicators of the effectiveness of the obtained results within the framework of applying the technology of stream-learning at the university, the formation of competencies among students, in accordance with the Federal State Educational Standards of Higher Education, at a basic or advanced level, is distinguished; the possibility of using materials, received from students, on the best final design works as part of further research to participate in scientific events, as good examples for

organizing the educational process within the framework of a specific discipline.

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