Modern Information and Communication Technologies in the Advanced Education of Children

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Abstract: ***Scientific and technical progress in the modern world is increasing its pace and is actively being introduced into educational process. Accordingly, the impact of information and communication technologies on the younger generation cannot be avoided. The level of educational needs of modern students in the system of additional education of children is qualitatively new, so there is a need to create informational and educational environment as an effective means to meet educational needs of students in modern conditions.The purpose of the work is to develop and determine the effectiveness of the method of using modern information technologies in educational process of additional education for children. Therefore, the article discusses the use of information and communication technologies in education, theoretical foundations of the method of using modern information technologies in additional education of children. The article assesses the effectiveness of information and communication technologies implementation into the system of additional education for children. The authors conducted an experiment in which 26 children from the third year of study in the Navigation Circle of the city of Nizhny Novgorod took part. In order to investigate classes' effectiveness at the Center providing "Navigation" course from the inside, the authors carried out a rapid survey. The authors found that students tend to positively perceive the general nature of navigation lessons at the Center. The Center developed a method for conducting practical work using multimedia simulators, after introduction of which the survey among students was repeated. The authors obtained the following results: high levels of interest and student assessment of these classes is obvious for all selected items. The students began to take a more positive view of the lessons at the Center by navigation, responded to their novelty and non-traditional character, which effectively expressed itself in increasing learning motivation.The developed method of using information and communication technologies in the system of additional education of children can be proposed for implementation in the activity of a navigator teacher, taking into account the advanced methodological recommendations.***

Index Terms**: *information and communication technologies, additional education of children, navigation, students.***

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I. INTRODUCTION

According to the updated standards of the concept of additional education in the Russian Federation, the creation of informational and educational environment is one of the most effective means for achieving a qualitatively new level in education in teaching subjects in the framework of additional education of students. [1] Accordingly, the revision and implementation of information and communication technology is the main requirement for the content of classes in the system of additional education in the modern educational environment. [18] Specific research in the field of information and communication technologies will mean significant progress in improving educational sphere of the system of additional education for children. [19]

The problem of this work is the growing need of modern students in the system of additional education through advanced training programs, such as programs using information and communication technologies. [2]

For a long time, questions of the method of application of information and communication technology tools have been considered in the system of basic general education, while the additional sphere of children's education is still largely based on traditional and frontal forms of work. [16] Meanwhile, the need to improve the efficiency of the educational system in the field of additional education of children is more and more demanded. Therefore, it is advisable to study possibilities and potential of information and communication technology tools in the system of additional education. [22], [24]

The relevance of the topic is due to both insufficient theoretical development of the problem and the need for practical justification for information and communication technologies introduction in the additional education of children

II. LITERATURE REVIEW

The use of nontraditional pedagogical methods in teaching children in their work was done by many domestic researchers, however, today there are not many works devoted to information and communication technologies in the system of additional education. The concept of "information environment" as part of the educational process has appeared

relatively recently and has not yet had time to acquire a sufficient amount of research. However, among the researchers whose work is related to this issue, N.V. Apatov, E.O. Ivanov, I.A. Winter, A.A. Karacheva, A.K. Markov, E.S. Polat, A.Yu. Ground

Modern children begin to use information and communication technologies in their childhood. [6] It is necessary to carry out work on the formation of the use of information educational technologies in all cources of the main and additional cycle at school. [21] For the first time, this concept was introduced simultaneously with the appearance of the subject of Informatics and Computer Engineering in the school curriculum, as A.Yu. Ground. [14] In the work of this researcher, the concept of information educational technology is presented as "a set of specific skills for interacting with an automated computer environment for creating programming and computing products to solve a number of learning tasks". [7]

Immediately after this, the first studies of E.I. Mashbitsa, A.P. Ershova, E.Yu. Zanichkovsky and others appeared. They examined and justified the need to form the ability to interact with information educational technologies already at the stage of primary education in school. [12] E.I. Mashbitsa presents the concept of "information educational technology" as "a set of knowledge, skills and abilities to interact with the computer environment, aimed at meeting the informational, operational, intellectual needs of the user". However, it seems to us that the researcher Kershan represents the most complete definition. [8] He interprets the concept of information technology as "one of the aspects of technological education, which includes a set of knowledge in the field of computer science and computing, the internal structure of computer systems and computer capabilities, the ability to perform work in several operating systems through commands, the ability to perform work in at least one text editor, ideas about computer algorithms and programming languages, as well as experience in using specific utilities of educational programs ». [11]

How does the concept of information technology G.K. Selevko, in the context of this concept, includes "a range of specific operational actions with a personal computer", which reveals itself in the ability to use special software, work with electronic text, tabular material, create and present presentations, and form databases. [9]

V.N. Kaptelinin writes that the need for the timely formation of the ability to use information technologies among students of Russian schools is determined by the global processes of informatization of the entire domestic educational space. [3] In comparison with Western European processes of modernization of education, the author notes that the concept of "informatization of education" seems to be a truly national neoplasm, and takes into account only the specifics of the Russian school. [4], [17]

V.N. Kaptelinin adds that, depending on how comprehensively and fully the concept of information educational technology is defined in the educational space, the overall content of education in modern school also depends on IT introduction into learning process. Nevertheless, research in the field of the national theory of pedagogy in the field of education shows that at the moment there is no unambiguous definition of the concept of "information educational technology", since by its functional significance this category finds itself in most human life spectra: professional, intellectual. [10]

Thus, based on the definitions we have analyzed, we can derive the author's definition. [15] The concept of information and communication technology should be understood as one of the means of information technology education, which is a complex of specific educational actions of a student with a personal computer, its built-in services and programs for processing and solving educational problems and the subsequent optimization of the learning process in information educational environment of educational organization. [20]

III. METHODOLOGY

We have carried out a study of the features of the use in the process of additional education of children of modern information and communication technologies. The study was conducted on the basis of the "Navigation" circle in the framework of the Center for the Development of Children's Art in the city of Nizhny Novgorod. The experiment was attended by 26 people of the third year of study. In order to determine the level of student achievement in the course "Navigating", we examined pedagogical reports on the progress within the period from 2014 to 2018 academic years. The total number of students who demonstrated excellent academic success ranged from 10 to 20 people in a given period. The indicators of students who studied at 4 and 5 were also uneven, and did not carry either indicators of progress or indicators of regress: the number of pupils also varied on a quantitative scale from 14 to 13 children in different years. According to the results of the organization of the ascertaining stage of the study, it was found that the effectiveness of the forms and methods for organizing work with students in teaching navigation in the system of supplementary education for children exists at a level above the average, but it has enough disadvantages, because in the system of supplementary education in this area it is first of all, the frontal approach to the organization of work, which does not take into account the individual characteristics and inclinations of students. The content of the formative stage of the study included methodology for the use of simulators, as well as other means of information and communication technologies for the purpose of increasing the level of effectiveness of the implementation of additional education for children in the framework of the Navigation course. The implemented method implies that most of the time is allocated for interaction with the simulator which forms virtual learning environment. In addition, ICT tools were also introduced at other stages of the lesson to test the success of learning as well as to organize revising and control. [13]

Based on the results of testing a series of classes using information and communication technologies and simulators in teaching students' navigation in the system of additional education for children, we determined that this system of work is effective for the majority of students, but we should constantly work on

studying the quality of feedback from the student audience. Based on the results of the approbation of the classes, we identified a significant improvement in the quality of students' perception of the classes, however, with respect to a certain category of students, the persistence of low interest rates remained typical. In this regard, we would recommend a deeper and longer study of the interests of the student audience, as well as a more durable formative work on the application of information and communication technologies in the presentation and work with educational material.

IV. ANALYSIS AND DISCUSSION

The basis for organizing experimental research was the “Navigation” circle at the Center for the Development of Children's Art in Nizhny Novgorod. Students of 3 years of study in the amount of 26 people studying course "Navigation" were the participants of the experiment. Empirical research is subordinated to the goal of organizing work in accordance with the developed methodology for applying modern information and communication technologies in the process of additional education of children. In accordance with the goal of the empirical stage of the study, the following stages were organized: a statement of the effectiveness of navigation lessons (a study of the types of navigation lessons organized within an organization, the determination of their effectiveness when compared with the performance and quality of feedback from students); development and testing of methods for the use of information and communication technologies in conducting navigation lessons; assessment of the effectiveness of the implemented work system, formulation of recommendations. [5]

In order to determine the level of student achievement in the discipline "Navigating", we examined the pedagogical reports on the progress in the period from 2014 to 2018 academic years. Based on the analysis performed, we will present the results of this study in the form of Figure 1.

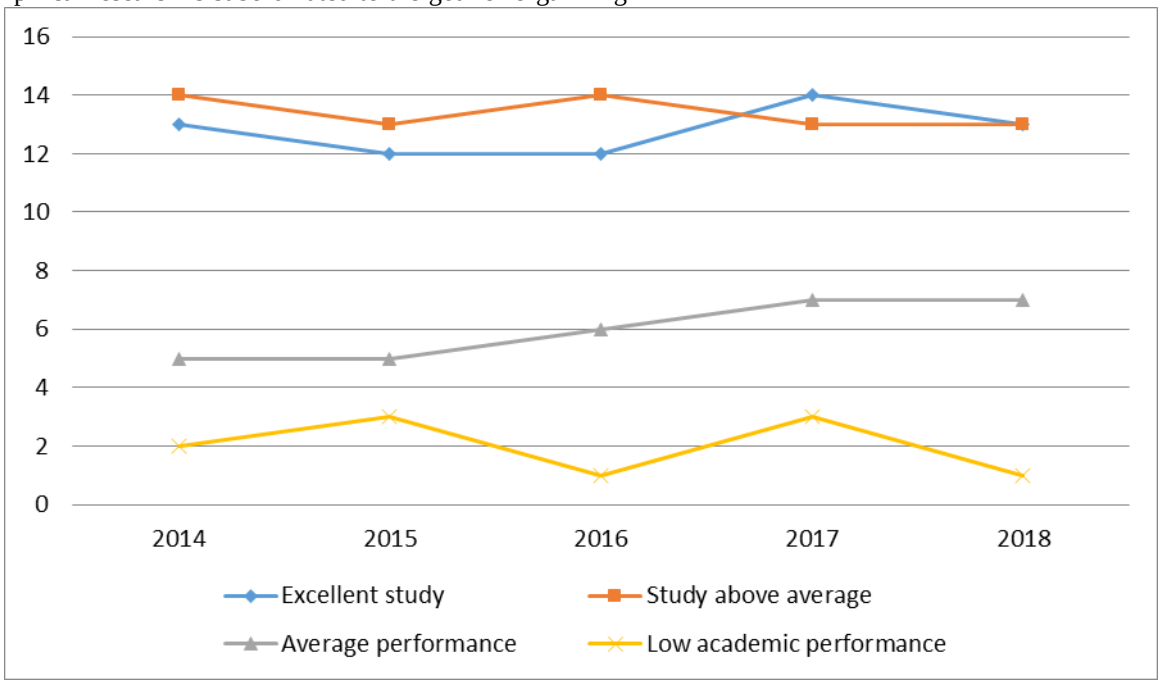

Figure 1. The Dynamics Of Student Performance In The Discipline "Navigation" In The Period From 2014 To 2018 School Years

As we can see from this diagram, the dynamics with respect to academic performance in different academic years was not constant. The total number of students who demonstrated excellent academic success ranged from 10 to 20 people in a given period. The indicators of students who studied with 4 and 5 grades (good and excellent results) were also uneven, and did not carry either indicators of progress or indicators of regress: the number of pupils also varied on a quantitative scale from 14 to 13 children in different years.

Nevertheless, the indicators of good and excellent studies are the most ambitious, while the indicators of average performance or low rarely reached similar limits in training in the discipline "Navigations". Based on this study, we can determine that in general, the system of classes, implemented as part of additional education of children using a predominantly frontal approach to learning, is quite effective, but the lack of ever-increasing progress indicates that pedagogical failures occurred in all years of traditional forms of work did not meet the curriculum needs and needs of the student audience, on the basis of which academic performance suffered. This again points to the additional need to make improvements to the classroom system using interactive technologies to improve efficiency in this regard.

In order to investigate the performance of classes at the Center on the course"Navigation" from the inside, we carried out a quick survey among students of 3 years of study. The survey included 4 simple questions. Do you like going to the sailing class? What forms of classes do you like best? Do you often have something unusual going on? Would you like (a) in the classroom at the Center there were situations when the teacher would use unusual forms of work?

Each of these questions allowed us to highlight the following aspects of students'

motivational interest: the general perception of navigation lessons at the Center; those types of activities that are most effective for children; the degree of novelty of navigation lessons in the Center; readiness of children to transform the educational environment.

The survey involved 26 children who are part of 3 years of study. Imagine a table of results in relation to the performance of navigation lessons in this category of students.

Table 1 The Degree Of Effectiveness Of Classes Navigation In The Opinion Of Students

Indicator	High level	Moderate	Low
1. The nature of the perception of children lessons	75%	18%	7%
2. The most effective classes	Tours, competitions		
3. The novelty of classes at the Center	43%	50%	7%
4. Children's readiness for change	32%	46%	22%

This table allows us to reveal that students tend to positively perceive general nature of navigation lessons at the Center: most children indicated that they like to learn as part of navigation lessons. According to the students, the most effective lessons were activity-related lessons which include a non-traditional approach to the organization of the educational process. This allows us to conclude that it is for the purpose of additional education that it is advisable to combine traditional and non-traditional approaches in the organization of classes, which causes a positive assessment of students.

Methodical recommendations for practical training are developed by us for students of the creative association “Young Boatmaster”. The list is presented in table 2.

Table 2 List Of Practical Works Using Information And Communication Technologies

PR№1 Visual signaling of ships. VVP rules
PR №2 Functional diagram of the gyrocompass
PR №3 Enable and use RLS
PR №4 Switching on and using wearable UKV radio station
PR №5 Inclusion and use of an emergency beacon
PR №6 Switching on and using the radar beacon-respondent
PR №7 Switching on and using UKV radio station, ZIV controller with 70 channel receiver VHF-1000
PR №8 Switching on and using the receiver NAVTEX NX-300

The developed list of practical work is designed for 18 hours and covers the use of information about the functionality of navigation equipment and practical operation. In order to master the relevant competencies, a student studying the program should be able to: determine the position of the vessel using satellite navigation systems; to be guided in the dangers and peculiarities of the area when sailing near the coast and in narrow areas; apply the rules of carrying the running and parking watch, monitor the implementation of the established requirements, norms and rules, maintain the ship in a navigable state; know: means of navigation equipment of various sections of inland waterways; rules for navigation on inland waterways; means of navigation equipment and fences; electronic navigation maps; the technique of conducting a radar strip and the concept of relative and true movement; methods of divergence with ships using radar and means of automatic radar plotting; physical and theoretical foundations, principles of operation, characteristic limitations and technical and operational characteristics of radio electronic and technical instruments and navigation and communication systems: magnetic compass, gyro compass, satellite compass, gyro-azimuth, gyro-tachometer, log, echo sounder, autopilot, ship radar, ground-based receivers space radio navigation systems, systems of automated radar strip, receiver of automatic identification system, emergency beacons, arrester “Atures” of automated mooring of large-tonnage vessels and integrated bridge systems.

The curriculum of the creative association "Young Boater" is a system of initial pre-vocational training in sea and river specialties. The relevance of the creative association "Young Master" is that in the process of learning, in addition to obtaining new knowledge, the child gets the opportunity to orient himself in the choice of his future profession.

The overall complexity of the program: 26 hours. The curriculum is presented in the form of table 3.

Table 3 Training And Thematic Plan

Section	Name of sections and courses	Number of hours	Form of control

		lectures	Training session	
1.	Input testing			test
2.	General provisions and introduction to the course.	2		poll
3.	Equipment of the simulator, ship controls, maneuverability of the vessels, the inclusion and configuration of the radar.	2		poll
4.	Safety when working with ship devices	2		poll
5.	Communication systems Basic principles. Use of ship equipment	2		poll
6.	Practical work 1		2	poll
7.	Practical work 2		2	poll
8.	Practical work 3		2	poll
9.	Practical work 4		2	poll
10.	Practical work 5		2	poll
11.	Practical work 6		2	poll
12.	Practical work 7		2	poll
13.	Practical work 8		2	poll
14.	Final testing	2		test
	Total	10	16	26

The method of application of practical work using multimedia simulators significantly improves the indicators characterizing the activity of thinking, speech, memory and stimulates an important component of the learning process, namely, the student's independent work. [23] It was emphasized that the work on simulators helps to reasonably apply the knowledge gained, generate hypotheses, formulate problematic issues, critically evaluate information.

The proposed practical work on the simulator can be used for repeated, systematic exercises in the study of such marine operations as turning on and using the radar, using a wearable VHF radio station, turning on and using the NAVTEX NX-300 receiver. They take into account the possibilities of self-control for students, through "feedback". Skills generated on simulators in their psychological structure correspond to real labor skills. Thus, the proposed simulators automate private skills, thereby helping the further development of more complex skills.

At the training complexes, with the help of practical work, students in an educational situation perform actions that imitate the actions of a professional, which helps them develop professional competence. The simulator allows you to reduce the gap between theory and practice and minimize the difficulty of the transition from the learning process to working with real technology.

The practical value of the work performed is that the use of IT can improve the quality of training of future boatmaster river fleet and thereby help reduce accidents on inland waterways.

Training on a simulator simulator makes it much more effective than traditional methods allow it to form the competence of the future master.

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To the main didactic principles of training at the training complexes, we include: the principle of conscious exercise, the principle of accessibility of tasks and the principle of individualization of the educational process.

The content of the formative stage of the study included a methodology for the use of simulators, as well as other means of information and communication technologies for the purpose of increasing the level of effectiveness of the implementation of additional education for children in the framework of the Navigation discipline. The implemented method implies that most of the time is allocated for interaction with the simulator, which forms the virtual learning environment. In addition, information and communication technology tools were also introduced at other stages of the lesson to test the success of learning, to organize repetition and control.

The purpose of the control stage of the study was to determine the effectiveness of the approved method of using information and communication tools in the system of additional education of students. For this purpose, a secondary study was conducted of the level of satisfaction with students of navigation lessons in the structure of the organization of additional education. Imagine the results of the rapid survey.

Table 4. The degree of effectiveness of classes using interactive technologies at the control stage of

Indicator	High level	Moderate	Low
1 The nature of the perception of children lessons	85%	13%	2%
2. The most effective classes	Independent interaction with the simulator, independent study of the problem, work with a computer		
3. The novelty of classes at the Center	75%	15%	10%
4. Children's readiness for change	65%	25%	10%

As far as the above table makes it possible to visually highlight the results of testing a series of classes using information and communication technologies in the system of supplementary education for children, we obtained the following results: high levels of interest and pupils' grades for these classes are obvious for all selected items. The students began to take a more positive view of the lessons at the Center by navigation, responded to their novelty and non-traditional character, which effectively expressed itself in increasing the motivation to learn. With regard to the most successful classes, students identified classes with a predominant independent component: students liked when they interacted with simulators, liked the experience of independent research and accessing electronic forms of working with educational material. The children were especially active in the performance and presentation of individual projects about outstanding navigation professionals in the form of research work with electronic presentation and the opportunity to demonstrate certain skills when working with the simulator.

Nevertheless, we should note the retention of a certain proportion of students, for whom it was typical to retain a negative and satisfactory assessment. In this direction, we see that the use of information and communication technologies may not satisfy the absolute number of students, or a more in-depth study of the degree of interest of students in the forms and methods of work should be carried out.

The methodical recommendations regarding the specific use of information and communication technologies to increase the effectiveness of lessons in the system of additional education for children include the following recommendations: taking into account the individual characteristics of students, in particular the most preferred type of information, the most effective forms of working with educational material; taking into account the age characteristics of students, including indicators of perseverance, discipline, interest in verbal, auditory, interactive forms of work, practice-oriented forms of work; the presence of continuous monitoring of the effectiveness of interactive technologies used in teaching navigation to maintain an adequately high level of motivational interest of students.

Thus, following the results of testing a series of classes using information and communication technologies and simulators in teaching students' navigation in the system of additional education for children, we determined that this system of work is effective for the majority of students, but we should constantly work on studying the feedback quality of the student audience. Based on the results of the approbation of the classes, we identified a significant improvement in the quality of students' perception of the classes, however, with respect to a certain category of students, the persistence of low interest rates remained typical. In this regard, we would recommend a deeper and longer study of the interests of the student audience, as well as a more durable formative work on the application of information and communication technologies in the presentation and work with educational material.

V. CONCLUSION

In this work, the authors achieved the goal set - to develop and determine the effectiveness of the method of using modern information technologies in the educational process of additional education for children. It has been substantiated that the use of information and communication technologies in the system of additional education for children requires deliberate planning and development in the process of preparing a lesson, compliance with the content and learning objectives of a particular artistic discipline, as well as preliminary testing on software in the classroom for so that the lesson is the most effective. When organizing a lesson using information and communication technologies in the system of additional education, the teacher can use QBASIC computer programming, an interactive whiteboard, Misrosoft Power Point software, as well as means for presenting video and audio files using embedded multimedia programs.

At the moment, the profile of the organizational activities of organizations of additional education in the city of Nizhny Novgorod is unusually extensive: not only concerts of classical and Russian folk music are organized, but also musical, educational and leisure-organizational forms of work for students, for joint performances of other creative teams of the city. Information and communication technology tools are also often used: during children's competitions, with the introduction of innovative forms of additional education (robotics, work with virtual and augmented reality). The structure of the method of application of information and communication technologies in the system of additional education on the example of the course "Navigation" includes the following types of information and communication technologies: information and communication technologies for the introduction of new material (training simulators), to control the acquired knowledge to accompany the process of learning also to increase the level of proficiency of students. The methods of work with the use of information and communication technologies in the lessons of navigation have become traditional and innovative forms of work: demonstration, reasoning, explanation, project method, interactive interaction with information and

communication technologies, game, virtual tour, discussion, problem-based learning. According to the results of the organization of the ascertaining stage of the study, it was found that the effectiveness of the forms and methods for organizing work with students in teaching navigation in the system of supplementary education for children exists at a level above the average, but it has enough disadvantages, because in the system of supplementary education in this area it is first of all, the frontal approach to the organization of work, which does not take into account the individual characteristics and inclinations of students. The content of the formative stage of the study included a methodology for the use of simulators, as well as other means of information and communication technologies for the purpose of increasing the level of effectiveness of the implementation of additional education for children in the framework of the Navigation course. The implemented method implies that most of the time is allocated for interaction with the simulator which forms the virtual learning environment. In addition, information and communication technology tools were also introduced at other stages of the lesson to test the success of learning, to organize repetition and control. Based on the results of testing a series of classes using information and communication technologies and simulators in teaching students' navigation in the system of additional education for children, we determined that this system of work is effective for the majority of students, but we should constantly work on studying the quality of feedback from the student audience. Based on the results of the approbation of the classes, we identified a significant improvement in the quality of students' perception of the classes, however, with respect to a certain category of students, the persistence of low interest rates remained typical. In this regard, we would recommend a deeper and longer study of the interests of the student audience, as well as a more durable formative work on the application of information and communication technologies in the presentation and work with educational material.

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