

Realization of an Interactive Education Model Using the Means of Information and Communication Technologies at a Technological University

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ABSTRACT--One trend of modern education is its informatization, which provides the use of interactive learning means. Therefore, the aim of this study is to analyze the interactive means of teaching political science as a means to enhance the educational and cognitive activities of students. The experimental work was realized in political science lectures with students of experimental and control groups. Based on the data obtained, it can be concluded about the effectiveness of the use of interactive means of teaching political science in a technological university.

Keywords-- technological institute, interactive education models, information and communication technology

I. INTRODUCTION

The most important regularity of the development of modern society is the rapprochement between countries and nations, strengthening of their interaction and globalization of the world. These processes affect all spheres of public life and cause their change, including intensive modernization in the sphere of education.

Education today is considered as a condition for self-determination and self-development of a person. Because of this, the paradigm of education itself is changing - from "education for life" to "education through life" [15]. As a result, the student must master the necessary competencies, learning strategies and the system of educational activities, creating their own learning trajectory and interacting with other participants in the educational process and the world as an active, autonomous, creative person.

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In the situation of informatization of the system of higher education, modern technology of organization of lectures in a technological university provides for the use of interactive means of teaching (IMT), flexible variation of which in the framework of classroom and extracurricular work provides an individual educational trajectory of professional self-improvement of students [2].

One of the effective ways to improve the quality of education, many of the researchers consider the use of IMT with great didactic potential [5]. The use of IMT involves active forms and methods of work, as well as the addition in the learning process of personal experience of students and independent activities, during which the teacher takes an active part as a partner and consultant, directing the work of students [1].

I. V. Robert [9] notes that in modern context computer learning tools have great opportunities for individualization, differentiation and intensification of learning. The use of computers and interactive equipment increases the efficiency and quality of education, as there is the most complete satisfaction of individual needs of students. But, as V.A. Krasil'nikova notes, teaching with computers requires not only changes in organizational forms of teaching, but also developing new activities for students and professors, with the integrated use of computer learning tools [3].

The use of IMT in educational practice led to the appearance of a third partner of educational interaction (student, teacher, IMT), which changed the role of the professor [9], which ceased to be the only source of information and the purpose of the learning process from "passive consumption of information" to "its active transformation" in the process of educational activity. The possibilities of IMT allow the professor to create conditions for the organization of students' activities in such a way that they independently discover, acquire and structure new knowledge, that is, to activate their educational and cognitive activity at lectures.

In the case of information and communication technologies, interactivity is a direct or indirect by means of learning interaction of participants in the educational process, in which the principles of feedback, providing educational dialogue, are implemented [11,12].

In this article IMT is understood as a set of technical (computer, its peripherals, interactive equipment and specialized software to them) and didactic (electronic educational resources and Internet resources) tools that allow to activate the educational and cognitive activity of students through the interaction of participants in the educational process during an interactive dialogue implemented in the electronic educational resource through

- ✓ the use of various types of feedback;
- ✓ the possibility of self-selection of students trajectories of learning segments of educational information, time and pace, volume and complexity of educational information;
- ✓ making a creative learning product in the process of active transformation of educational information.

This type of interactivity as feedback, which is one of the conditions for the communication processes, contributes to the achievement of these goals.

The pedagogical practice and scientific and pedagogical literature points out the most important possibility of using feedback in IMT [4,21].

In the traditional educational system, the exchange of information is carried out between the subjects of the educational process, which have the opportunity to carry out feedback (Fig. 1).

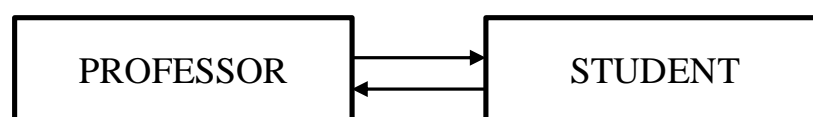


Figure 1: Information interaction between subjects of educational process in the traditional system

An important difference from the usual logic of the educational process (where learning goes from theory to practice) in interactive learning is the logic of the educational process from the acquired new experience in the process of activity to the theoretical understanding during the application [10].

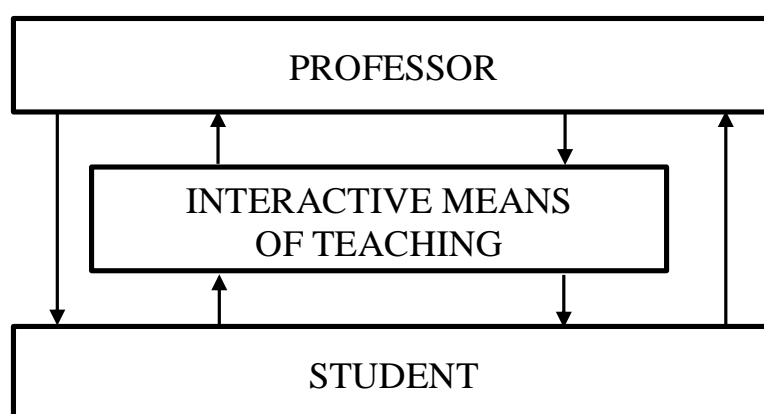


Figure 2: Information interaction between subjects of educational process using interactive means of teaching

Feedback used in IMT tools (Fig. 2), allows:

- to manage the learning process,
- to control and correct it,
- to ensure the achievement of the goals set by the professor,
- to help students with independent work with IMT to make the right choice from a variety of proposed actions,
- to manipulate information,
- to organize more effective self-learning and self-organization of students, to form their self-appraisal,
- to create situations for the successful execution of the proposed tasks (for example, to use a system of prompts for various options for user actions with the training program) , etc.

It should be noted that the use of information and communication technologies at lectures, seminars, leads to the emergence of new channels and levels of information transmission, which complicates feedback, leads to changes in the communicative impact [7]. For example, software designed for training (training programs, multimedia textbooks, electronic educational resources, etc.), imply the interaction of the program with students. Therefore, they contain such opportunities as a response, for example, tips, instructions, etc., which appear in specific actions of the student with the program, all this is associated with the processing of information received as a result of feedback [14].

Three forms of interactivity in electronic educational resources were identified, the types of activities of students with them and variants for their use were specified: reactive interactivity, when students consistently answer the questions proposed by the program, and this sequence is strictly set, which is convenient for

demonstrating, explaining new material, at the initial acquaintance with it; effective interaction, when learners are unable to manage the program, choose the trajectory of learning within e-learning resources (e.g., materials from the anthologies designed for self-review) and to choose the execution order of tasks, and is especially effective for distance learning; - mutual interaction, when students and the program can adapt to each other, which enables students to achieve the effect of virtual reality, to undertake independent studies, to solve problems of different complexity. The ability to control the operation of the program by students is greatly enhanced, which is useful in simulators, workshops, training programs (for example, if a student correctly answered several questions on the test that comes immediately after acquaintance with a topic, in the final test, the proportion of questions from the unit is maximally reduced).

S.B. Stupina [18] notes that the main principles of interactive learning are: interaction on the basis of a dialogue between a student and a professor; students' work in small groups, which is based on equal cooperation, active role-playing (game) activities, training forms and methods of training (including heuristic conversations, presentations, discussions, "brainstorming", discussion of collective solutions to creative tasks, practical works on a competitive basis, case-method, etc.).

Using the ideas of interactive learning requires a high level of professionalism from the professor, his experience and willingness to innovate, improvise, use interactive tools and teaching methods, as the structure of interactive classes is very different from the usual [20]. The structure of an interactive lecture contains elements of an interactive learning model, called interactive technologies, which are understood as technologies that use techniques and methods for specially organized activities, including "feedback" between all its participants to correct the educational process on the basis of reflective analysis.

IMT help professors to solve a number of pedagogical tasks:

- ✓ increasing the level of perception of educational material,
- ✓ visualization of information,
- ✓ explanation of abstract material,
- ✓ organization of independent cognitive activity,
- ✓ the task of managing the activities of students in explaining, illustrating educational material, its consolidation, as well as in carrying out qualitative and operational diagnostics of students' knowledge [8].

These tasks are usually solved by professors with the help of licensed educational resources, as well as with the help of self-developed and created resources in the form of educational presentations or flash animations (Fig. 3).



Figure 3: An example of an interactive task, when the names of states from right should be moved and connected to the type of state to left

Interactive models also allow to solve the problem of organization of independent cognitive activity of students. With their help, the teacher can organize the activities of students in such a way that they independently study the lecture material, prepare for workshops, seminars, colloquiums, laboratory work, perform homework, conduct educational research and scientific work. There are several important principles of the organization of independent work of students with the help of interactive learning tools: systematic, availability of control and evaluation of tasks for independent work.

Based on the research of A.V. Osin [6] and T. K. Smykovskaya [17], the analysis of their own experience, four forms of user interaction with the interactive whiteboard were identified as the most common interactive learning tool in the University:

1. Passive form, characterized by the absence of explicit interaction. In these forms, professors use an interactive whiteboard as a normal screen to show students in multimedia form the information that the professor possesses [13].
2. An active form in which there are elements of user interaction with the interactive whiteboard at the level of operations with its specialized tools, or with elements of electronic educational resources, or interaction with objects of the information system, objects of Internet services, demonstration to students of the principles of the software, etc. [19]
3. Activity form, characterized by large degrees of freedom in the constructive interaction of the user with the interactive whiteboard, with the choice of the sequence of actions that leads to the qualitative achievement of goals, with the analysis of their actions and steps. For example, when performing actions to move and delete objects on the screen when performing creative tasks, correlating elements and their names, making certain compositions, etc.

II. METHOD

Research base is K.G. Razumovsky Moscow State University of technologies and management (the First Cossack University). The sample consisted of 95 students.

The experimental work was carried out in 3 stages.

The first stage is the preliminary research. The tasks of the pre-test: analysis of the interactive teaching tools available at the Institute and the state of their use in pedagogical practice, diagnosis of the levels of basic knowledge in political science, as well as readiness for interactive training of students of experimental (48 students) and control (47 students) groups by means of a questionnaire.

The second stage is the prototyping stage of the study. The purpose of this stage of the study: conducting classes in political science with students of the experimental group, during which the amount of basic political science knowledge increased. Classes in political science for the experimental group were conducted with the help of interactive learning tools, for the control group-with the help of traditional methods, without the use of interactive learning tools.

The third stage is the assessment stage of the study. The purpose of this stage of the study: analysis of the effectiveness of classes in political science with the help of interactive learning tools through the final diagnosis of the results of both groups.

III. RESULTS AND DISCUSSION

At this stage of the ascertaining experiment in 2017-2018, a survey was conducted with students of the 2nd year, a survey and analysis of their lessons in order to diagnose basic knowledge in political science. During the survey of students it was revealed that the vast majority of students, despite the positive results of school and internal entrance exams in social science are not ready to master the sum of basic political science knowledge.

73% of students in the experimental and 75% of the students in the control groups showed low levels of political knowledge (have a fragmented view of science; able to use them only at the level of primitive “broadcast” of information; it is not able to justify the feasibility of using existing collections of samples and templates of interactive electronic educational resources, etc.), 27% of students in the experimental and 25% of the students in the control groups showed average level of political knowledge (have a General idea of science; they are able to use them at the level, but occasionally, not in the system; they are able to experience the events of their professional activity on the use of interactive learning tools for the purpose of its improvement, correction, etc.) (see Fig. 4). High level of political science knowledge (having system knowledge on political science; capable to the analysis of adequacy of the actions on use of interactive means of training and the critical relation to them) was not revealed at all.

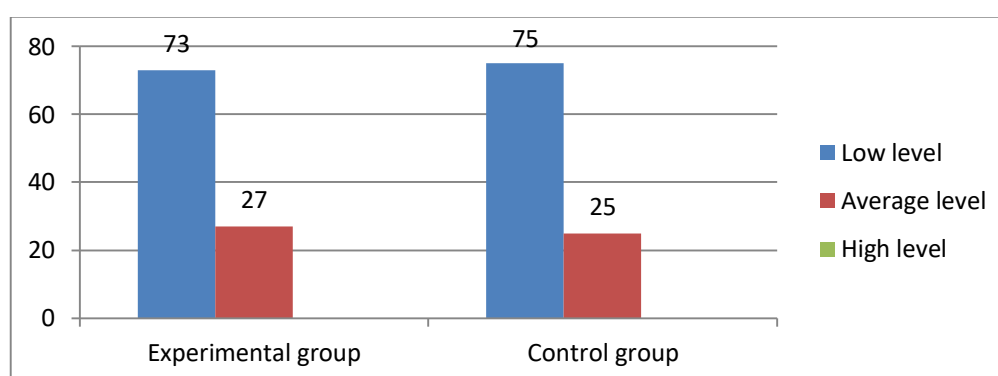


Figure 4: Pre-test Values of Control and Experimental Group

Based on the results obtained, the current system of training of future technologists is characterized by a priority focus on the study of specialized subjects, while not enough attention is paid to General education disciplines. As a result, future specialists cannot consciously and rationally act in the political life of society.

During the formative stage of the experimental work, 17 classes were conducted using interactive teaching methods (electronic visual AIDS; electronic textbooks; tools in the educational process; simulators; automated control of knowledge; reference electronic educational resources). Intermediate and final control was also carried out using these methods.

Even before the experiment, an interactive multimedia textbook on political science was developed, which gives the necessary theoretical knowledge in political science, can be used both for joint work in the classroom using an interactive whiteboard, and for independent work of students at the PC [16]. The developed textbook

meets the basic requirements for multimedia textbooks: structuring, ease of use, visibility of the material; it has the level of presentation of the material that will be understandable and accessible to the student and meets the generally accepted requirements that must meet modern electronic learning materials and allows you to use almost all types of interactivity. The structure of the multimedia textbook consists of three main sections: “read the theoretical material”; “check yourself”; “pass the test”.

The interactive textbook contains a large number of: demonstration educational material, allowing in the form of an interactive dialogue to present it to students; animated demonstrations; practical interactive training and monitoring tasks, etc.

The section “Theoretical Material” consists of 8 topics for study (see Fig. 5).



Figure 5: Example of a list of topics of theoretical material

Examples for interactive support of the professor's explanation of the abstract content of the educational material, where the information on the screen appears gradually (on click), in the course of the professor's explanation and dialogue with the student (Fig. 6).

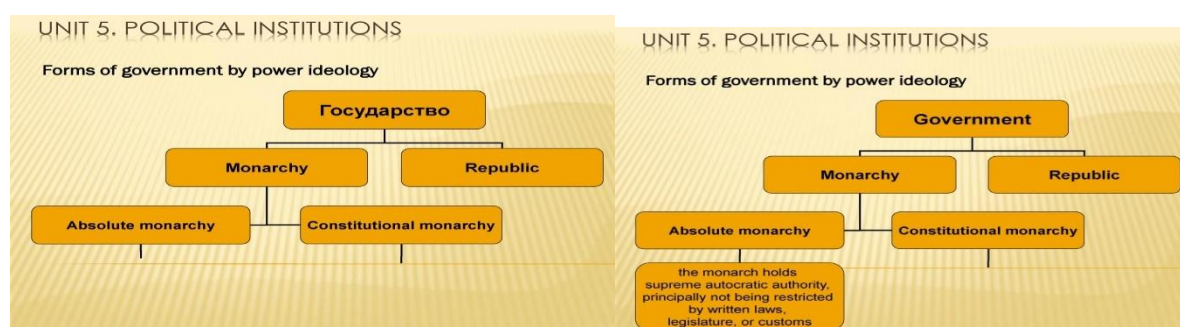


Figure 6: An example of interactive sequential presentation of information on the screen in the course of interaction with IMT.

An example of the use of sequential presentation on the screen (by mouse click) during the professor's explanation of new material of various types of information (text, figure, table, sound, video, animation) is presented (Fig. 7).

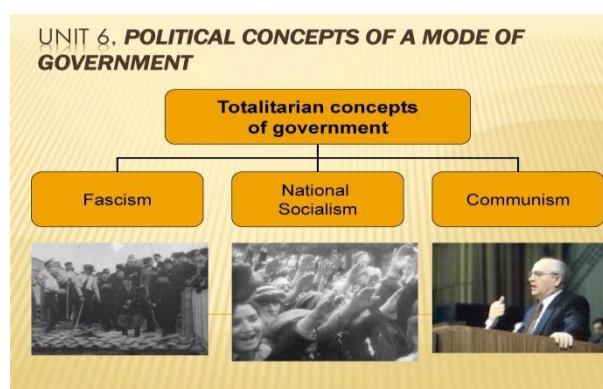


Figure 7: Example of using sequential presentation on the screen of video information

The section “Test yourself” contains tasks on all passed topics. The following are examples of interactive training tasks that allow you to use the ability to: move objects on the screen (in this case, the wrong answers are returned to their place), use the keyboard to enter answers, use the controls to get tips, repeat the theoretical material, etc. It should be noted that the tutorial presents: 1. Tests like those created using triggers and hyperlinks (with no ability; statistics maintenance). 2. Tests created using macros in MS PowerPoint and the built-in VBA (Visual Basic for Applications) programming environment.

Figure 8: Example of a test job created in MS PowerPoint and a final slide with the results

Note that MS PowerPoint has another opportunity-to use ready-made templates, test designers, which are easy to find on various educational portals. Using ready-made templates, a professor who does not know programming and has even a little experience in PowerPoint, will be able to prepare his own selection of tests. It is enough to fill in the slides with the necessary questions, answers, appropriate visibility. For the implementation of training activities, a simulator is presented, when working with which the student has the opportunity to receive tips, and the tips do not appear immediately, but as the student answers. The first time choosing the wrong answer, he gets to the page with the first hint, and clicking on the link that appears on the hint, viewing it, has the opportunity to go back and answer again or choose the second hint that appears on the screen (revealing not only one wrong answer, but also other incorrect options). Further, continuing the work, the student has the opportunity to either re-answer the question, or get a third clue containing the correct answer (Fig. 9). If the student has chosen the correct answer, then he gets on the slide with the words: “Right! Well done!” and can either to the next task, or to the content of the textbook, or to the theoretical material to be re-trained.

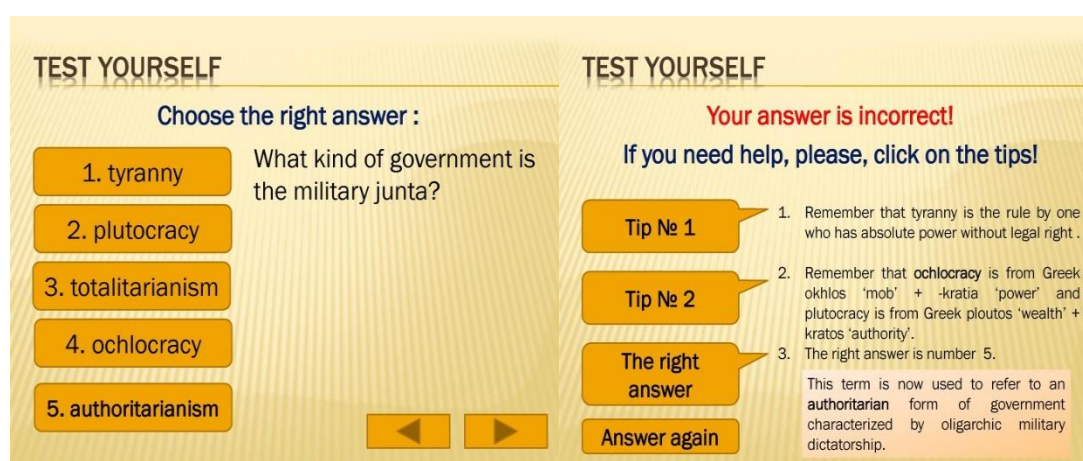


Figure 9: The task of the simulator and the options that appear if the student chose the wrong answer for the first and second time

At the control stage, repeated questioning of students of the experimental and control groups was conducted.

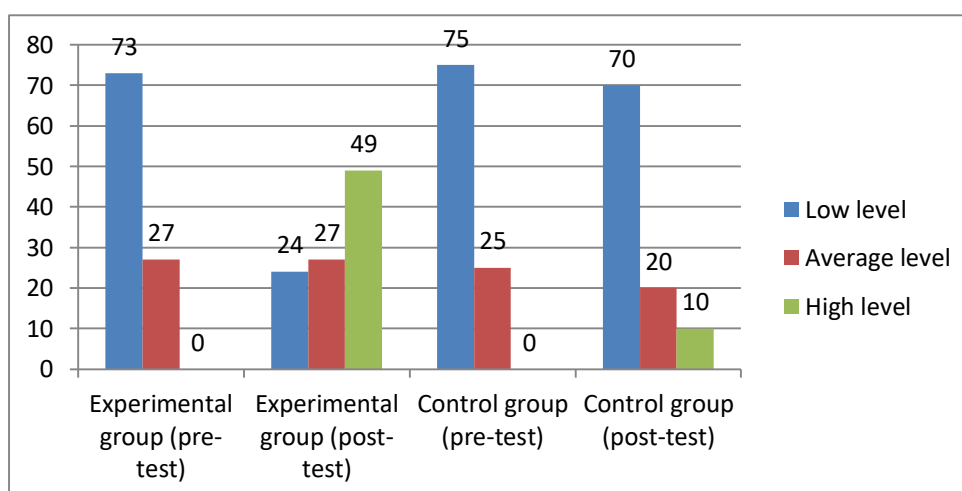


Figure 10: Pre-test and Post-Test Values of Control and Experimental Group

During the comparing of the survey results on ascertaining and control stages it was revealed that after training in the science of using IMT were able to significantly improve the high level (49%) and simultaneously reduce the incidence of low level 3 times. While in the control group to achieve similar results failed. The low - and mid - level indicators were down only 5 %, while the high-level indicators rose only 10 %.

IV. CONCLUSION

The search for innovative learning tools to improve the quality and effectiveness of political science education in a technological University, led to the understanding of the significant potential of IMT to enhance the educational and cognitive activities of students.

The potential of IMT for political science training has been identified:- dynamics of presentation of information objects on the screen in IMT and imagery of media used in them allow to improve perception of difficult to understand processes or abstract concepts studied in political science- interactive opportunities of IMT together with methods of pedagogical facilitation allow to intensify educational and cognitive activity of students in the study of political science;- the ability of IMT to break the training material into steps and create conditions for consistent work on each of these steps in the area of immediate development of students with a gradual decrease in the degree of support to self-use of acquired knowledge in the process of working with them;
- conducting an interactive dialogue based on IMT allows you to flexibly manage the learning process both directly in direct contact with the professor in the classroom and in virtual distance learning, as well as to organize interaction between students or completely independent for one student;- mobility and ease of transition to different types of clarity when explaining new material, the complexity in the use of various learning tools through the integration of electronic multimedia educational materials allow you to master the content of political science in various didactic situations.

The system of diagnostics of level of knowledge on political science on quantitative and qualitative indicators is developed. Stages of pedagogical experiment — ascertaining, forming and estimated were defined, for each of which the purposes are formulated, the empirical base and participants of experiment are defined.

The results of the control and experimental groups of students differ, despite the fact that in the control and experimental groups the teaching of political science was carried out within the same content according to the state standard. At the same time, quantitative indicators confirmed the greater efficiency of the use of IMT in students of the experimental group in comparison with the control group. In General, quantitative and qualitative analysis of the data allows us to conclude about the positive dynamics of the use of IMT in the experimental group of students, which indicates the effectiveness of the developed methodology.

Thus, the obtained results confirmed hypothesis of the study, and also showed the possibility of practical application of the study methods of using the IMT in the teaching of science.

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