JOURNAL OF UNIVERSAL SCIENCE RESEARCH

ISSN (E): 2181-4570 ResearchBib Impact Factor: 6,4 / 2024 SJIF 2024 = 5.073/Volume-3, Issue-6

METHODS OF TEACHING THE "OPERATORS" SECTION IN TEACHING THE PASCAL PROGRAMMING LANGUAGE BASED ON THE LOGIC SCHEME OF CONCEPTS IN THE ENVIRONMENT OF DIGITAL TECHNOLOGIES

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Annotation: *The article presents the modern achievements of information technology in the education system, the analysis of existing scientific publications on the application of software in the educational process, the problems in this area, the relevance of the proposed idea, the purpose. Pascal programming language in the acquisition of basic knowledge and skills in programming in the teaching of "Computer Science and Information Technology", in which there are some difficulties in mastering the topic of operators, as a solution it is recommended to use a logical scheme of concepts. Concepts of the operator section of the Pascal programming language were selected, a logical scheme of concepts was created, and a computer simulation model was created, which provides information about each concept. The methodology of organizing lectures on the basis of the created computer simulation model is described. In this methodology, the process of working with a computer simulation model and the mechanism of explaining the lecture lesson using it are described in the description of the content of the selected topic. On the basis of theoretical research and practical developments, pedagogical experiments were organized to confirm the use of teaching methods, the results were presented and the effectiveness of students' learning was presented. The concluding section states that conveying the concepts of the operator to students using a computer simulation model provides a great opportunity to reveal their content, that is, students can re-read the learning material, change its presentation speed, ie choose the desired mode*

ISSN (E): 2181-4570 ResearchBib Impact Factor: 6,4 / 2024 SJIF 2024 = 5.073/Volume-3, Issue-6

based on their perceptual abilities.

Keywords: *"Informatics and information technology", computer simulation model, methodology, education system, information technology, logical scheme of concepts, operator, operator-related concepts, Pascal programming language.*

Introduction.

The world today is undergoing a truly revolutionary process of information. It should be noted that the development of the economy in society is currently carried out not by the movement of goods, resources, materials, but by the power of ideas and knowledge.

The use of information technology in education has led to the emergence of new educational technologies based on the transmission of information and electronic means, as well as their specific forms. Interactive computer programs and high-capacity multimedia systems are good examples.

Although the technical means and technologies used in the learning process are different, the quality of teaching can be high or satisfactory depending on the form and means of presenting the learning material.

When analyzing the software tools created in the field of application of information technologies in the education system, we see that many authors who create computer programs are creating original methods of presenting educational and scientific materials on the basis of information technology in parallel, independently of each other [1] .

An analysis of the existing scientific publications on the application of software in the educational process shows that the issue of using software in the educational process has received a lot of attention around the world. M.V.Sosedko, a Russian scientist, conducted research on the activity of students in educational activities on the basis of new information technologies, L.S.Sauer identified the didactic conditions for the introduction of information technology. In the dissertations of A.N.Burov, M.N.Maryukov, M.I.Ragulina, O.P.Solobuto, A.V.Yudakov and others the issues of using new information technologies in teaching mathematics were considered [2].

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In the works of Uzbek scientists S.S.Gulomov, A.Kh.Abdullayev [3] and M.Kh.Lutfillaev [1] it is shown that the creation of a virtual stand and their application in the educational process is one of the most pressing issues today. A.M.Pulotov [4] conducted research on the simulation model and methods of using it, predicting the level of knowledge that students will acquire in the future on the basis of knowledge acquired in the subject "Informatics and Information Technology".

In recent times, so many publications on computer-based teaching aids have begun to appear that in most of these publications the authors focus mainly on the methodological and didactic features of the issue and pay almost no attention to its analysis of e-learning tools.

This article presents the problem of creating and experimenting with a computer simulation model (animation) that can reveal the essence of the content of each concept on the basis of a logical scheme of concepts in the discipline of "Computer Science and Information Technology".

The aim is to develop a logical scheme of concepts in the study of "Computer Science and Information Technology" on the basis of modern information technology as a methodological problem of implementation using a computer simulation model.

Method of research.

Pascal programming language is taught to gain basic knowledge and skills in programming in the teaching of "Computer Science and Information Technology". In the study of the Pascal programming language, the main focus is on the topic of operators. Mastering the topic of operators is a bit more complicated than other topics. This is because operators perform tasks that are related to the execution of a specific process in the program. Due to the fact that these processes are usually performed dynamically, students do not always understand their content correctly.

Many years of experience have shown that the semantic content of the learning material presented to students through concepts is very effective in showing that the meaning of the concepts is interrelated with other concepts in addition to listing the symbols of concepts and leads to the emergence of a logical scheme of concepts. The interdependence of concepts in this form is called the logic scheme of concepts (LSC)

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[5].

Therefore, the urgency of developing a logical scheme of concepts related to the section of operators of the Pascal programming language and the creation of a computer simulation model to convey their content to students is urgent.

We have selected the concepts of the operator section of the Pascal programming language, created a logical scheme of concepts, and created a computer simulation model that shows information about each concept (Figure 1) [6].

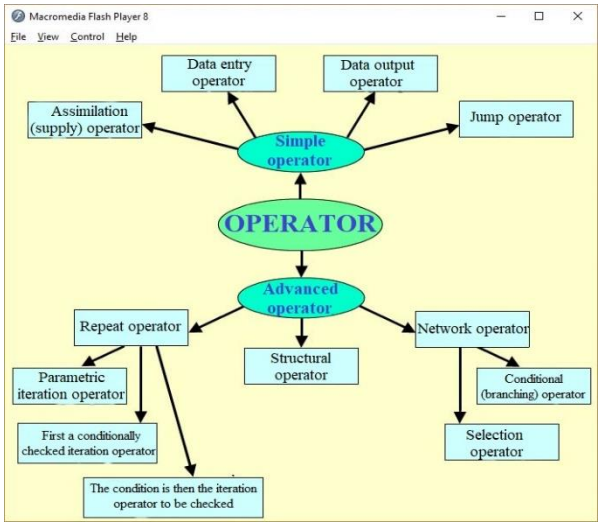

Figure 1. Logical scheme of operator concepts.

In this logic diagram, operator-related concepts are given, and a computer simulation model is created for each concept. For example, the "Advanced Operator" section contains "Network Operator" and "Conditional Operator" and "Selection Operator". The "conditional operator" itself is divided into "Full conditional operator" and "Incomplete conditional operator".

To explain to students the working principle of a full conditional operator, we show in the examples the process of execution of each item using a computer simulation model (Figure 2).

For example.

$y = \begin{cases} ax+b & \text{if} \quad x > 0 \\ cx+d & \text{if} \quad x \le 0 \end{cases}$ create a program to calculate the value of a function. Here, a=1.5,

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b=4, c=3.7, d=-4.2

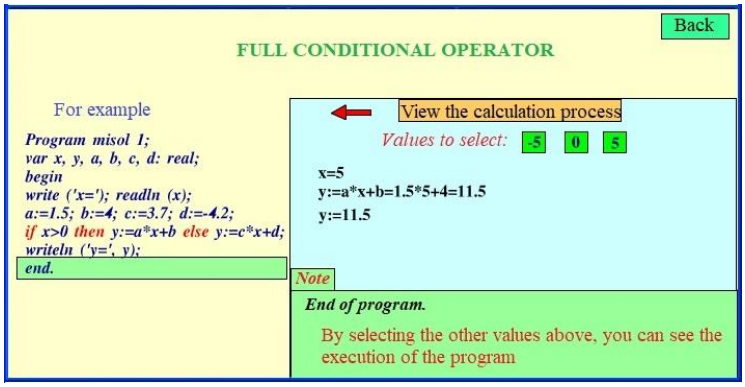

Figure 2. The process of executing a complete conditional operator simulation model.

In the example above, the working principle of a full conditional operator is demonstrated using an simulation model. This process is illustrated on the right side of Figure 2. As can be seen from the figure, in a clearly given example, the performance of a complete conditional operator is shown for each item. Explaining the full conditional operator to students in this way will be the basis for a complete mastery of the working principle of this operator.

Explaining the incomplete conditional operator to students is done in concrete examples using its simulation model (Figure 3).

For example.

$y = \begin{cases} ax+b & \text{if} \quad x > 0 \\ cx+d & \text{if} \quad x \le 0 \end{cases}$ create a program to calculate the value of a function. Here, a=1.5, b=4, c=3.7, d=-4.2

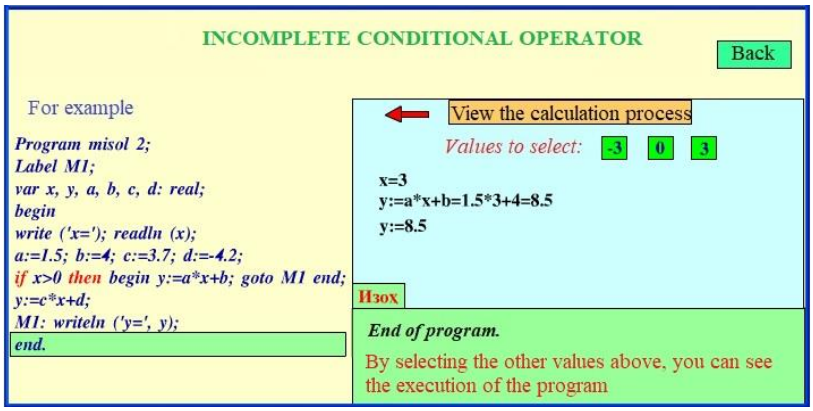

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Figure 3. The process of executing an imitation model of an incomplete conditional operator.

Here, too, the working principle of the incomplete conditional operator is shown using an imitation model. This process is illustrated on the right side of Figure 3.

Similarly, in the logical scheme of concepts related to the operator section, a computer simulation model is created that teaches each concept.

The method of organization of lectures on the basis of the computer simulation model created according to the logical scheme of concepts on the operator's part of discipline "Informatics and Information Technologies" is described. In this methodology, the process of working with a computer simulation model and the mechanism of explaining the lecture lesson using it are described in the description of the content of the selected topic.

Research results.

On the basis of theoretical research and practical developments, a pedagogical experiment was organized to confirm the use of teaching methods.

An experiment was organized at the Faculty of Biology of Samarkand State University. Experimental and control groups (groups 105, 106) were selected at the Faculty of Biology (groups 101, 102). Classes in the experimental groups were based on a computer simulation model, and in the control groups with traditional methods.

Table 1.

Controls on the subject of the operator in the theoretical and practical classes on the subject "Informatics and Information Technology" gave the following results.

Fan name	Hour	Experimental group	Hour	Control group

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	Lecture	Practical, laboratory	Course, group	Number of students	The result	Lecture	Practical, laboratory	Course, group	Number of students	The result
Informatics and information technologies	8	22	101	35	80	8	22	105	23	67
	8	22	102	35	79	8	22	106	23	65

The analysis of the results of pedagogical experiments was based on the Regulation of the rating of control over student knowledge of the Ministry of Higher and Secondary Special Education of the Republic of Uzbekistan [7].

$$Z_{яб} = \sum_{i=1}^{M} K_i / M$$

where M is the number of students, K_i – i-th student's control score, $i = \overline{1, M}$; Z – average score on control.

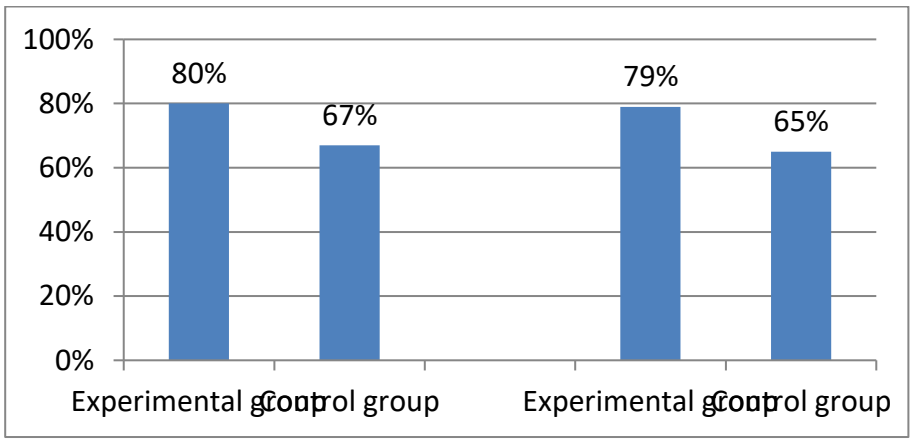

Figure 4. Experimental results on the subject "Informatics and Information Technology".

The results show that the control of the subject "Computer Science and Information Technology" on the subject of the operator led to an increase in student mastery by 11-14%.

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Conclusions.

The active participation of students in teaching was observed by applying the computer simulation model in the educational process. This was evident in the lectures and practical and laboratory classes on the computer simulation model. In addition, students had the opportunity to practice independently on a computer simulation model in computer classrooms. This provided an opportunity for them to prepare for lectures and practical lessons. As a result, it seemed that students were always trying to ask and answer questions with teachers on the topic covered.

The results of the experiment showed that in teaching on the basis of computer simulation model, not only the mastery of teaching materials, but also the desire of students who are not able to master well to acquire new knowledge has increased. Teaching based on the computer simulation model has increased the activity of students, the quality of their mastery.

In short, conveying the concepts of the operator to students using a computer simulation model provides a great opportunity to reveal their content, essence. When using this computer simulation model, students can re-read the learning material they are learning, change the speed of its presentation, i.e. select the desired mode based on their perceptual abilities.

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