

METHODOLOGY OF DIGITAL TECHNOLOGY FORMATION OF STUDENTS'PROGRAMMING COMPETENCIES

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Abstract: *Teaching the basics of programming requires high pedagogical skills as well as the ability to apply modern digital technologies. Technology is evolving in every area of life, and in today's world of virtual worlds, remote offices, cloud technologies, online applications, ultra-sensitive devices and artificial intelligence technologies, one of the most important tasks is to develop specialists who can improve them, discover new innovative technologies, fully understand the world experience, be loyal to their country through the development of this field, contribute to various stages of the country's development through their knowledge and skills.*

Key words: *programming, competence, methodology, digital technology, modern tool, programming training, python.*

I. Introduction

The science of computer science and information technology has a special place among a number of subjects in secondary schools. In the information age, the preparation of young people for information and related issues: their reception, transmission, storage, protection, information security, prevention of information attacks, etc., is considered to be an important foundation of modern human resources.

At a time when digital technologies are becoming an integral part of our lives, attracting students to programming, teaching them programming knowledge is one of the most important tasks facing everyone working in this field. Teaching the basics of programming to the younger generation begins at the school stage of education. At this stage, the process of teaching students the basics of programming is done through a variety of tools. Examples of board and presentation materials are the basic teaching aids used in the teaching of computer science and information technology in general secondary schools. However, it is difficult to fully control the knowledge of programming through these educational tools. Because these learning tools are tailored to deliver one-way information.

II. Literature review

The use of modern digital technologies in the teaching of computer science and information technology, in particular, in the teaching of "Fundamentals of Programming" is highly effective. These technologies increase students' interest in science, saving the teacher time.

At present, professional pedagogy and education are at an important stage in the digitization of the entire education system, the introduction of innovative methods, techniques and forms of working with students in pedagogy. The introduction of digital technologies in the theory and practice of pedagogy helps to increase the effectiveness of students' learning, but there is a problem of competent combination of teaching methods with information and communication technologies and digital educational technologies.

III. Analysis

Nowadays, people encounter and use information technology at every step. The value of information in the world is growing at an unimaginable rate. This means an increasing need for people who can interact with rapidly evolving information.

Explaining information technology, training personnel who can process information, created the need to introduce it as a science. In this regard, the sciences of cybernetics, computer science, computer science, and then computer science and information technology have been formed in Uzbekistan.

At present, computer science and information technology are taught from the 5th grade of general secondary schools.

There are a number of problems in teaching computer science and information technology:

1. Lack of introduction of computer science and information technology in primary school
2. Insufficient supply of classrooms and material and technical support in the field of informatics and information technology in general secondary schools.
3. Low allocation of training hours for weekly and annual workload. Informatics and information technology are taught in the following order for each class (see Table 1.1).

Table 1.1.

Classes	5	6	7	8	9	10	11
Weekly training download	1	1	1	1	2	2	2
Annual training load	34	34	34	34	68	68	68

As you can see, the weekly workload of computer science and information technology is 4-8% of the total weekly workload for this class.

4. The fact that the relevant disciplines of computer science and information technology in higher education institutions are not included in the entrance exams.

5. Inability of teachers to adapt to the constantly updated textbook and program "Informatics and Information Technology".

6. Ineffective use of digital technologies in the lessons of computer science and information technology.

From the above, it is necessary to reconsider some approaches and principles in the teaching of computer science and information technology in schools, to adapt them to modern requirements.

The Department of Fundamentals of Programming in the teaching of computer science and information technology at school is distributed as follows (see Table 1.2):

Table 1.2.

Classes	Teaching programming language	Annual download	Download dedicated to programming topics
5 th grade	Scratch	34	9
6 th grade	Scratch	34	9
7 th grade	Web technology	34	9
8 th grade		34	0
9 th grade	Python	68	38
10 th grade	Python, Web Design	68	36
11 th grade	Artificial intelligence in Python	68	5

As we can see from this table, the new edition of computer science and information technology textbooks focuses more on teaching programming for the upper grades.

In teaching programming to students, it is important that the topics are structured, that the new topics are a logical continuation of the topics covered in the transition from class to class. Systematic teaching of the basics of programming to students from an early age makes them a person who can apply information technology to their field, regardless of their future profession.

Basics of programming are taught mainly in the computer room. The following tools will be needed to teach the basics of programming:

1. Computer
2. Class board
3. Video projector or electronic board
4. Necessary software
5. Pedagogical software

The student faces some difficulties in the process of learning the basics of programming section. In many cases, the essence, purpose, and why the topics covered are not explained. For example, when entering the Python programming language, the reader will have a strong sense of interest and it will be easier to learn if he is shown what he needs, what kind of programs he can create, and what this programming language is capable of.

In the 9th grade of general secondary schools, the basic concepts of Python, general programming terms, and the standard Python IDLE environment are introduced. According to the basics of programming in the science of computer science and information technology, each student is required to have competencies such as algorithms, their design, types, their construction depending on the problem, obtaining the desired results based on the algorithm. Based on this, a survey was conducted among 9th grade students to determine their interest in science and their level of knowledge (Appendix 1). The results of the survey show that although students are learning the basics of programming, they do not have enough understanding of the program, the essence of programming, its stages. Students develop a program within the science, but in many cases do not fully understand why it is needed, and for exactly what purpose each code is written.

IV. Discussion

Programming competencies in general secondary school students are described differently in the work of different scholars. According to V.V. Kraevsky and A.V. Khutorsky, competence should be understood as "a set of issues that a person has the knowledge and experience, enough information about them."

Based on the analysis of the place and role of competence in education, the following key functions should be highlighted:

- reflect the social needs of young citizens who are ready to participate in everyday life;
- a condition for the realization of the student's personal meaning in education, to be a means of overcoming his alienation from education;
- identification of real objects of the surrounding reality for the purposeful complex application of knowledge, skills and methods of activity;
- to determine the subjective experience of the student, necessary for the formation of his abilities and practical training in relation to real objects of reality;
- the content of education as part of the meta-science (for all disciplines) as part of the content of various disciplines and areas of study;
- combining theoretical knowledge with practical application in solving specific problems;
- represents the integral features of the quality of student training and serves as a tool for the organization of educational control, which has a comprehensive personal and social significance.

There are different types of competencies. A.V. Khutorskoy defines the following basic educational competencies of students: educational and cognitive, communicative, informational, value-semantic, general cultural, social and labor and personal self-improvement competencies.

Learning-Cognitive Competence (LCC) plays a key role in students' core learning competencies. It is a set of competencies of students in the field of independent cognitive activity, including elements of logical, methodological, general educational activity, related to real objects of knowledge. This includes ways to set goals, plan, analyze, think, and organize self-assessments. The student acquires creative skills in relation to the studied objects: direct knowledge of the surrounding reality, mastering the techniques of learning and cognitive problems, actions in non-standard situations. Within this competence, functional literacy requirements are defined: distinguishing facts from assumptions, having measurement skills, using probability, statistics, and other cognitive methods [3]. The degree of formation of LCC sometimes determines mainly the quality of the student's learning outcome. In this process, computer science plays an important role as a science and a subject, because the competencies formed in computer science classes can be transferred to the study of other disciplines in order to create an integrated information space of students' knowledge. Education and cognitive competence are inextricably linked to a student's motivation, and the degree to which a student understands why and why they are learning a particular subject.

In computer science, LCC means:

- Ability to plan, analyze, reflect, self-assess their activities;
- Ability to make hypotheses, ask questions about observed facts and events, evaluate preliminary data and planned results (modeling and formalization, digital methods of problem solving and computer experience);
- have the skills to use measuring instruments, special instruments, statistics and probability theory;
- the ability to compile the results of their activities, to present them at a modern level (construction diagrams and graphs, presentation tools), etc.

One of the main goals of educators is to increase the level of learning and cognitive competence of students who are able to adapt to a rapidly changing world.

For most students, the computer actually becomes a home appliance, and with it, it loses its motivational power. The emergence of a large number of software products has reduced students' enthusiasm for mastering programming. Given that students' motivations are shaped by their needs and interests, we should focus all efforts on developing students' cognitive programming interests, primarily through the use of this e-course.

This in turn leads to the formation of learning and cognitive competencies of high school students. On this basis, the Department of Fundamentals of Programming in the school is not sufficiently taught, so it is important for senior students to understand and study these topics in depth. By using reasonable teaching methods with limited class hours, it will be possible to achieve a good level of programming among high school students:

- selection of elementary operations in the construction of algorithms and programs;
- determine the structure of the algorithm and the forms of its recording in the algorithmic language;
- the same form of writing a problem-solving algorithm with the same structure of the initial data.

The use of online programming platforms, sandboxes, virtual stands and laboratories, interactive programming environments in programming teaching facilitates the acquisition of new knowledge by students.

According to a survey conducted in 2021, the TOP 10 resources for learning programming have been compiled. According to Internet users, the best projects for learning programming are: Codecademy, Javascript.ru, Coursera, HTML Academy, Stepik, Codewars, ITVDN, JavaRush, Hetlet and LiveEduTV.

The course workflow in the Codecademy system is convenient and includes a minimum sufficient to learn programming. The system workspace consists of a set of materials, instructions on the task Task Codecademy - an interactive online platform for learning Python, Java, JS, Ruby and other programming languages, as well as markup language (HTML and CSS) in the design of web pages. Users have profiles to record their learning achievements, there is a forum for communication, and you can also publish your own courses through the course creator.

A distinctive feature of some of the courses within the platform is the presence of a "Sandbox" where you can test your code. completion (Figure 1). Such a structure is optimal, at least in terms of the fact that the user can see all the necessary modules at once and do not have time to look for additional materials to solve the problem, while the correctness of the solution can be checked immediately by code.

V. Conclusion

Improving the quality and effectiveness of education through the use of digital technologies, such as the above, facilitates students' access to programming, allows them to quickly master programming languages. The enumerated technologies play a leading role in shaping students' programming competencies. This, in turn, will pave the way for the future development of mature programmers, founders of IT companies.

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