E CONF SERIES

International Educators Conference
Hosted online from Toronto, Canada
Website: econfseries.com 7th August, 2025

PEDAGOGICAL AND PSYCHOLOGICAL ASPECTS OF DEVELOPING STUDENTS' ALGORITHMIC THINKING IN THE CONTEXT OF PROGRAMMING

Mirsanov Jurabek Mukhammadiyevich,
Teacher of the Samarkand Academic Lyceum

Annotation
This article analyzes the works of scholars on developing algorithmic thinking in general secondary school students and examines the pedagogical and psychological aspects of fostering students' algorithmic thinking in the field of programming.

Keywords: algorithmic thinking, algorithmic thinking in programming, operator, web-oriented, electronic educational resource.

The formation of algorithmic thinking in school students offers tremendous opportunities for developing numerous thinking qualities, as well as moral and aesthetic attributes of an individual, which serve as the foundation for choosing one's life position and social behavior. Algorithmic thinking significantly influences the formation and development of logical, abstract, creative, linguistic, and operational thinking aimed at selecting optimal solutions [1]. In this context, the subject of informatics and information technologies, including algorithmization and programming, taught in general education schools, plays a crucial role.

One of the main problems of mastering the school course of computer science and information technology, and primarily programming, is that the study of the content of this subject is mainly theoretical in nature, which is in fact closely related to our daily life. Giving the educational process an interactive character, linking the studied material with the solution of practical problems, and thereby creating an educational environment in which students can be motivated, allows for a significant increase in the effectiveness of the educational process and the continuous development of algorithmic thinking in students [2].

According to A.V. Kopayev, "Algorithmic thinking is methods aimed at solving theoretical and practical problems in programming practice, the systematic application

of corresponding mental strategies to various problems" [3]. According to N.O. Kuznetsov, "Algorithmic thinking is the process of developing the skills of creating and writing algorithms necessary for a specific executor in professional activity in modern society, forming knowledge about algorithmic structures, logical values, and operations, as well as familiarization with algorithmic structures (linear, conditional, iterative) from programming languages" [4]. According to A.P. Yershov, "Algorithmic thinking is the ability to plan the structure of actions necessary to achieve a goal using a set of defined means" [5].

At the same time, G.A. Zvenigorodsky defined algorithmic thinking as the ability to create information models for describing objects and systems, while Y.A. Pervin expressed the opinion that it is the ability to organize the search for information necessary for solving a task on a computer [5]. According to A.G. Kushnirenko, algorithmic thinking is a specific type of problem-solving, in which the user cannot find only one answer, but can find a solution in the form of steps that the user can follow and receive a response [6].

Based on the analysis of the scientific and methodological works of the above-mentioned researchers, the following definition of algorithmic thinking in programming was given.

Algorithmic thinking in programming is the ability to plan the sequence of actions necessary to achieve the goal using algorithmic structures, analyze the problem, divide it into parts, formalize and automate actions, and find optimal solutions to the performed actions in a particular programming language.

It is known that programming is arduous mental work and plays an important role in determining a person's place in society in the context of our rapidly developing world. Because with the help of programming languages, the user has the opportunity to create their own software products and solve non-standard tasks that cannot be performed in standard user programs. It also implements the following in students: develops logical thinking; increases accuracy and attentiveness; forms the qualities of resourcefulness and ingenuity; develops imagination, creativity, and algorithmic thinking.

Algorithmic thinking is an important part of human intellectual activity, carried out using modern information technologies. Algorithmic thinking is becoming one of

the most important features of human culture in the modern world. The method of algorithmic thinking allows making optimal decisions in various spheres of human activity and is associated with self-programming and computer technologies.

Thus, it is necessary for students to acquire knowledge about the concept of an algorithm, its properties, types, methods of representation, branching, iterative, and mixed algorithms, programming languages and programming languages, to establish programming languages, to describe variables in it, to work with errors, types of data, perform arithmetic operations, to work with rows, operators (if, else, elif, for, while, sontinue, break) and expressions, as well as to develop knowledge, skills, and abilities in programming linear, branching, iterative, logical problems, working with subprograms (functions and procedures) and the library of languages, its graphic capabilities, through the creation and testing of various didactic electronic educational resources intended for the web. In this case, it helps to organize students' extracurricular learning activities, analyze their own activities, summarize, collect information, organize it, and store educational information in memory.

A student who does not have the ability to think algorithmically about programming will have difficulty giving clear and understandable instructions for instructions when solving problems individually and preparing various projects. Therefore, the algorithmic approach is important not only in teaching algorithms and programming, but also in the study of subjects related to computer science in general.

At the same time, a characteristic feature of algorithmic thinking in programming is the ability to determine the sequence of actions necessary for solving a problem in programming practice. It can be said that until recently there was no need to study algorithmic thinking in programming as a separate type of thinking. Algorithmic thinking related to programming relatively recently emerged as a separate type of thinking. This was prompted by the development of digital technologies.

In conclusion, by developing students' algorithmic thinking about programming, they develop skills such as setting goals, achieving goals in their activities, and solving various problems in programming practice.

References:

1.Levchenko I. V. Methodological issues of computer science teaching methodology in secondary general education schools // textbook. - M.: MGPU, 2012. - 124 p.

2. Abdurazakov M.M., Aziyeva J.H., Romanov P.Yu., Sadykova A.R. Teachers it competence structure and content in 5the field of cloud computing // The European Proceedings of Social & Behavioural Sciences (EpSBS). 2017. P. 1–8.

3. Kopayev A.V. On the Practical Significance of the Algorithmic Thinking Style / A.V. Kopayev // Information Technologies in General Education School. 2003. - No 4. - P. 6-11

4. Kuznetsov N.O. Designing and implementing individual trajectories of teaching programming to schoolchildren at the basic level // Dissertation for the degree of Candidate of Pedagogical Sciences. Nijniy Novgorod, 2012. - 208 p.

5. Yershov A.P. Methodological letter "On teaching the course "Fundamentals of Informatics and Computing Technology" [Electronic resource] / Archive of Academician A. P. Yershov. - Access mode: http://ershov-ars.iis.nsk.su/arshiye/yeeimagye.asr?lang=1&did=8976&fileid=106681

6. Kushnirenko A.G. 12 lectures on what a school computer science course is needed for and how to teach it [Text] / A.G. Kushnirenko, G.V. Lebedev. - Informatics. - 1999. - No1. - P.2-15.