



REQUIREMENTS FOR DEVELOPING A WEB PLATFORM AIMED AT FORMING STUDENTS' ALGORITHMIC THINKING IN PROGRAMMING

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***Annotation.** This article analyzes researchers' studies on the creation of digital educational tools. Additionally, it presents the requirements for developing a web platform designed to foster algorithmic thinking related to programming among secondary school students.*

***Keywords:** electronic educational resource, web-platform, algorithmic thinking, educational resource.*

For the creation of a web-platform designed to form algorithmic thinking in the field of programming in students of general education schools, it is necessary to clarify the initial requirements for creation, and if necessary, to improve it. For this, it is first necessary to study the research of scientists in this field.

Research on these issues was conducted by such scientists as S.Tursunov [1], M.Lutfillaev [2], A.K.Zhamolov [3], A.V.Mukhamedshina [4], A.O.Norbekov [5], V.A.Krasilnikova [6]. In their work, they developed electronic educational resources, virtual educational technologies, and conditions for students to create information and educational environments.

In particular, S. Tursunov developed requirements related to psychophysiological and didactic aspects, content and structure, sounds, images and colors, continuity of program operation, and interface when creating electronic educational resources [1]. In M. Lutfillaev's research,

a brief opinion was expressed regarding the requirements for creating electronic educational resources. He emphasized that one of the challenges in developing an electronic guide is determining the appropriate amount of information to provide to the user. To address these issues, it is necessary for electronic educational resources to have capabilities that improve the quality of educational information provided, such as the ability to modify parameters like muting, lowering, or raising volume, and changing colors [2]. A.K. Dzhamolov recommended that the following basic psychological and pedagogical requirements be taken into account when designing electronic educational resources [3]: ensuring the formation of the content of educational activity, adhering to the basic principles of pedagogy, psychology, cybernetics, and systems design theory; providing the learner with the goals of education and upbringing, as well as information for achieving the goal; motivation should not be motivated solely by the computer; it should correspond to the level of difficulty of educational tasks related to the subject and the psychophysiological capabilities of students.

According to A.V. Mukhamedshina, the technology of creating electronic educational resources related to subjects is considered a rather complex process, and for the processing, design, and implementation of pedagogical scenarios, it is recommended to implement them in the following stages [4]: defining didactic goals; developing the structural composition of the educational tool; performing technical work; identifying shortcomings through testing in educational institutions and correcting them; developing methodological proposals and recommendations for use in the educational process.

In the works of these scientists, requirements for the creation of electronic educational resources are presented. However, there are some differences in the requirements for creating web platforms. That is, due to the creation of web platforms at the addresses of the global network, students change fundamentally. In this case, the use of the web platform must meet such requirements as having a simple structure, ensuring information security, and having logical connections between hyperlinked applications. Therefore, it is necessary to study the research of scientists on the creation of educational environments located at the locations of the global network.

In this regard, A.O. Norbekov's dissertation "Methodology for Increasing the Effectiveness of Teaching the Subject "Computer Support" in Pedagogical Higher Educational Institutions" provides his proposals and recommendations for creating an information and educational environment for teaching the subject "Computer Support" in pedagogical higher educational institutions. According to him, when creating an information-educational environment, he emphasized adherence to the following principles and students: design of the information-educational environment; educational tools of the information-educational environment; hierarchical structure; adaptation to the individual characteristics of the student; distribution of educational material; interactivity; variability; continuity and integration; objectivity in assessing the results of educational achievements; expediency; ergonomic [5].

V.A. Krasilnikova also made proposals on these issues. In his methodological guide, he took a different approach to creating an educational portrait. He noted that when creating an educational portal,

the following requirements should be observed [6]: the presence of a software package that allows adding subsystems of different levels to serve external and internal users; free access to open data for all users; equal participation of all educational institutions: a) formation of requirements reflecting the functionality of the educational portal and supplementing its content; b) development, discussion, and application of software products and methodological materials developed to meet the requirements of various categories of users and modernize the educational process; c) conducting forums and seminars at various levels on the issues discussed, modernizing pedagogical activity based on Internet technologies.

Although V.A.Krasilnikova's methodological guide includes students in creating an information and educational environment, her guide does not fully cover students in creating an information and educational environment.

We were particularly interested in the dissertation of J.A. Elmurodov "Improving the Methodology for Creating and Implementing an Open Information and Educational Environment for General Secondary Educational Institutions"⁷, in which students are presented on the creation of an open information and educational environment. In his research, students on the creation of an open information and educational environment in teaching geometry in general education schools are described in detail.

Although the works of these scientists include students on the creation of electronic educational resources, information and educational environments, and educational portals, the requirements for creating web platforms designed for teaching programming languages differ

somewhat. That is, a web platform for programming cannot be limited only to electronic educational resources, assessment and control systems. This requires students to have software tools designed for logical, algorithmic thinking in programming, functions for preparing projects in a team, software for analyzing program codes of problems, etc.

Therefore, during the study, based on the analysis of the works of the above-mentioned scientists, the requirements for creating a web platform for the formation of students' algorithmic thinking in the field of programming were improved:

Scientific and pedagogical requirements. The web-platform, created for the formation of students' algorithmic thinking in the field of programming, should consist of problematic examples and problems related to programming, based on scientific facts, as well as encouraging and stimulating interest in programming, the student should be able to intuitively perceive the methods and sequence of algorithmization and programming of examples and problems, as well as take into account the possibility of observation, in order to firmly master the educational material related to the subject, it should consist of forming such abilities as deep thinking, long-term retention in memory.

Requirements for the design of a web platform. This requirement is recommended for the effective and correct use of colors when creating a web platform designed to form students' algorithmic thinking about programming at the address of the global network. In this case, the design must comply with the laws of color composition, as it creates a certain mood. Also, special attention should be paid to the validity and systematicity of the approach to the use of images by the creators of the web platform. In places where it is difficult to understand the content of

the subject, requiring additional visual explanation, it is recommended to use one or another image, i.e., to generalize and systematize thematic semantic blocks. At the same time, when creating an interface for a web platform, it is recommended to choose colors in accordance with a person's psychological reaction.

Student requirements for the educational tools of the web platform.

Educational resources developed for a web platform for programming should consist of the following: increasing motivation; forming logical thinking; forming algorithmic thinking.

A requirement for a web platform to have a hierarchical structure.

The developed web-platform for the formation of students' algorithmic thinking in the field of programming provides for the implementation of the content of the studied material and actions in its study in a hierarchical order.

Psychological requirements. When creating a web-platform for the formation of students' algorithmic thinking about programming, it is necessary to take into account such characteristics of students as thinking, imagination, and memory for programming examples and problems.

Requirement for adaptation to the individual characteristics of the student. The creation of a web-platform, designed to form students' algorithmic thinking about programming, requires not only the presentation of educational material at different levels of complexity at the content level, but also taking into account the individual characteristics of students.

Psychophysiological requirement. When creating a web-platform designed to form students' algorithmic thinking about programming, it

is necessary to use colors, images, and animation effects that do not strain the eye, as well as words that lift the student's spirits when completing tasks.

Requirements for the distribution of educational materials.

Educational materials in traditional teaching technology are usually collected in textbooks and some supplementary sources. The use of web platforms in teaching allows the student to learn and transition to different educational environments not only from one source, but also through a well-thought-out thematic database with hyperlinks. The technical and technological capabilities of almost any educational institution, specially organized web platforms, and educational websites for integrating electronic resources into educational materials will be significantly enriched.

Interactivity requirement. This requirement consists of ensuring the interactivity of teaching algorithmization and programming using special tools and the formation of students' algorithmic thinking, as well as providing operational feedback: processing student actions through a computer learning system; the reaction of the learning system on the web platform to the actions of other subjects of the educational process (teacher, students themselves, and other students); ensuring teamwork on the web platform; the need to ensure the direct participation of the teacher in the system; joint discussion by the subjects of the educational process of the results of work that must be submitted for consideration at the request of the teacher and students on the web platform.

Variability requirement. This requirement consists in the preparation, periodic updating, and design of educational materials on algorithmization and programming, providing for the creation of an

environment that constantly updates educational information, recommendations for completing educational tasks, etc.

Requirements for continuity and integration. This required web platform should ensure the further implementation and improvement of effectively used developments, state standards, and innovative technologies [8]. This is based on a rational combination of modern information technologies and traditional approaches to personnel training in the educational process of algorithmization and programming.

Students allowed to evaluate the results of educational achievements. This student provides for the possibility of obtaining quantitative characteristics for assessing the level of activity and achievements of teachers and students based on a systematic approach to the creation of a web platform designed to form students' algorithmic thinking in the field of programming. At the same time, it allows achieving the accuracy, compactness, and technology of presenting tasks for managing the development of methods for formalizing and presenting educational material on algorithmization and programming using a web platform.

Requirement for compliance with regulatory documents. This student assumes that the developed web platform and the educational tools placed on it will be aimed at increasing the effectiveness of the educational process. Therefore, the part of the subject that meets the standards should be placed on the web platform. To form students' algorithmic thinking about programming, the current curriculum and the level of requirements for the development of a web platform should be taken into account as much as possible. Unfortunately, in many cases,

software developers do not follow these requirements sufficiently in some cases. That is, the proposed web platforms do not fully correspond to the content of the State Educational Standards of general secondary educational institutions [8]. As a result, it leads to a decrease in the effectiveness of teaching the subject. Therefore, the web-platform and the electronic educational resources placed on it, designed to form students' algorithmic thinking in the field of programming, should be fully adapted to the content of the State Educational Standard.

Ergonomic requirements (Health requirements). The main ergonomic requirement is the task of ensuring a high level of human interaction with the student, therefore, the organization of a user-friendly interface requires ensuring the ability of the student to use the necessary methodological instructions in the process of interaction with the system interface. Here we can also include the correspondence of the color scheme, the orderliness and expressiveness of the interface elements. In this regard, according to Y.A.Vinnitsky, the created web platform and the training tools contained in it should consist of colors, fonts, and animation effects that do not provoke the user's anger. This requirement assumes that it does not affect the health of the student [8].

Technical requirements. The web platform and educational tools placed on it, designed to form students' algorithmic thinking about programming, should be easily opened in browsers and be dynamic variables.

In conclusion, in order to develop a web-platform designed to form algorithmic thinking in the field of programming in students of general education schools, it is necessary to follow the students proposed within the framework of the study. Based on the proposed students, they will

have the opportunity to develop a web platform that meets modern requirements.

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