

## DEVELOPMENT OF STUDENTS' COMPETENCE IN THE ARDUINO PLATFORM AS A PEDAGOGICAL PROBLEM.

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**Abstract.** *In this thesis, the pedagogical problems of developing students' competence in the ARDUINO platform, the opinions of scientists, and the areas of study are presented. The Arduino platform primarily provides a user-friendly interface for creating simple electronic projects. Arduino - a platform for the rapid development of electronic devices for beginners and professionals.*

**Keywords:** *Robotics, electronics, Arduino, educational platform, information technology, continuing education, competence.*

Today, due to the rapid digitalization of all spheres of society, there is a need to train and improve the qualifications of highly qualified personnel in the field of information technology, as well as to develop new approaches to teaching disciplines related to this field.

In this regard, the Decree of the President of the Republic of Uzbekistan dated October 8, 2019 No. UP-5847 "On Approving the Concept for the Development of the Higher Education System of the Republic of Uzbekistan until 2030" defines such priority areas as "introducing digital technologies and modern methods into the educational process, organizing a system for training highly qualified engineering and technical personnel for the digital economy, ensuring the solid integration of modern information and communication technologies and educational technologies, creating additional conditions for the continuous development of the professional skills of pedagogical personnel in this area."

The implementation of the tasks set forth in the Decree requires the introduction of digital technologies, distance learning systems into the educational process, as well as the improvement of the methodology for teaching subjects related to computer science in higher educational institutions, as well as the development of students' creative abilities, algorithmic and creative competence in the field of information technology, including robotics and electronic programming.

Scientific research on this issue, namely the methodology of introducing digital technologies into the educational process and the problems of distance learning, the technologies of creating electronic educational resources in disciplines, was conducted in our country by N.N.Poyarkova [1], S.S.Mironseva [2], O.V.Danilova [3], V.V.Gura [4], E.K.Vasin [5], I.V.Morozova [6], L.N.Bobrovskaya [7], M.A.Sorochinsky [8] and abroad by Henderson Steven [9].

In the research of the above-mentioned scientists, research was conducted on the theory and practice of introducing digital technologies and distance learning systems into the system of continuous education, the use of advanced pedagogical technologies in improving the methodology of teaching such subjects as "Computer Science and Information Technologies," computer graphics, network technologies, databases, the creation of didactic

electronic educational resources in subjects related to computer science and the mechanisms of their implementation, and the methodology of organizing independent educational activities of future computer science specialists. However, their research did not focus on improving the methodology of teaching programming technologies in the field of robotics and developing students' algorithmic thinking in the field of programming.

Research on the problems and solutions of developing students' competence in the Arduino microcontroller programming language in higher educational institutions was conducted by such scientists as T.P.Pushkareva [11], T.A.Stepanova [12], V.V.Kalitina [11,12], Osztian Erika [10], Tauno Palts [12].

Also, P.Bovi, T.P.Pushkareva, T.A.Stepanov, V.V.Kalitina conducted research on the methodology of developing students' thinking in robotics and electronic programming [10,11,12]. Also, P.Bovi, T.P.Pushkareva, T.A.Stepanov, V.V.Kalitina conducted research on the methodology of developing students' thinking in programming [10,11,12]. The educational can be considered as a specially organized process for developing the ability to independently solve problems of personal and social significance. Such an understanding of the educational goal, in turn, creates the basis for the implementation of a competency-based approach.

If we look at the research of various scientists mentioned above, they have conducted their research in the field of programming, in particular, robotics. However, they did not pay sufficient attention to the new directions of methods for developing students' competence in the Arduino programming language [13].

Therefore, the proposed research, that is, the methodology for developing students' competence in the Arduino programming language, is one of the problems. Solving this problem requires first defining the concepts of competence and competence related to the Arduino programming language.

In the sources, the terms "competence" and "competency" are used to express such qualities of a person as knowledge, skills, abilities, diligence, professional skills. In this work, we use the term "competence".

"Competentia" is a Latin word, and its lexical meaning in the Uzbek language means "one who knows well," "having experience." Consequently, a competent person in any field has the appropriate knowledge and abilities to reason reasonably about this field and carry out effective activities in it.

In scientific sources, one can find the following definitions of competence and competency: motivated ability; personality traits and qualities, personal characteristics; criteria for readiness for activity; ability necessary for solving a problem and obtaining its results; knowledge, skills, abilities and experience related to activity (solving a problem mastered by a person, combining methods and ways into one whole), as well as the motivated and emotional, volitional sphere of the personality .

A.A.Verbitsky and M.D.Ilyazova defined these concepts as follows: competence is a system of goals, values, motives, personal qualities, knowledge, skills, abilities, and experiences that ensure the implementation of a certain activity by a person; competence is a

competence characterized by the level of mastery of practical activity technologies and the development of socio-moral qualities of a person, manifested and realized in practice .

Based on the definitions of competence of the above-mentioned scientists, we present the definition of competence of students in the Arduino programming language.

The competence of students in the Arduino programming language implies the formation of certain skills in writing program code for robotic devices, in particular, micro controllers, and effective device management using modern programming languages.

Based on the given definition, it can be said that today the development of students' competence in the Arduino programming language is of current importance.

Because currently, the most popular fields are robotics, electronics, and artificial intelligence. Programming languages are of great importance in the field of robotics, since we write program code through programming languages to perform tasks in a certain field of robotics, in general, all robotic electronic devices. The Arduino programming language, belonging to the field of robotics, is mainly based on C and C++, which is used for programming microcontrollers and Arduino boards. The Arduino platform primarily provides a user-friendly interface for creating simple electronic projects. Arduino is a convenient platform for the rapid development of electronic devices for beginners and professionals.

In conclusion the choice of the Arduino platform as the basis is due to its clarity and simplicity, which allows a very wide range of people to assemble various devices. It is possible to develop robotic mechanisms by connecting the Arduino board with various components and installing new programs on it.

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