

POSSIBILITIES OF DIGITAL EDUCATIONAL TECHNOLOGIES IN THE DEVELOPMENT OF STUDENTS' COMPETENCE IN THE ARDUINO PROGRAMMING LANGUAGE

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Abstract: In this thesis, based on theoretical research, the need to use digital technologies in the development of students' competence in the Arduino language was analyzed, and the need to use modern educational technologies in teaching students programming in the Arduino environment was determined.

Keywords: Educational technology, digital technology, interactive whiteboards, simulation programs.

One of the priority areas for improving the system of organizing the educational process in higher educational institutions is the improvement of the structure of the use of digital technologies in the educational process. Today, the use of digital technologies in higher education is becoming a real practice. That is, in higher educational institutions, classrooms are equipped with interactive whiteboards, tablets, modern computers, robotics equipment, virtual reality glasses, and similar tools.

“Digital educational technologies are now not only a tool, but also a new environment for humanity, providing, in principle, the following opportunities: to receive education anywhere and at any time; to meet the educational needs of the student's personality by designing an individual educational direction; self-assessment; it forms the competencies of students not only to become active consumers of e-learning resources, but also to become creators of new resources”[1]. Therefore, the development of new approaches to the use of digital technologies in teaching subjects in general education schools, including in increasing the effectiveness of teaching the subject "Computer Science and Information Technologies," remains one of the important issues.

Today, to teach programming, it is necessary to abandon to a certain extent a focused approach to providing students with ready-made educational information, to achieve their ability to apply programming knowledge in everyday life, and to focus on the formation of independent thinking skills.

"The main goal of teaching programming in general education schools, in particular robotic programming, is the formation of students' knowledge, skills, and abilities in this subject, the upbringing of a person capable of positive activity, critical and logical thinking in a rapidly developing society. The main task of teaching students programming given problems is to create conditions for acquiring knowledge, skills, and abilities related to this subject, to understand the importance of programming in the development of society, to teach them to successfully apply programming knowledge in everyday life, and to develop their individual characteristics" [2,3]. In the implementation of such tasks, digital technologies serve as an important pedagogical tool.

In this regard, research on the theory and practice of designing, developing, and implementing digital technologies is presented in the works of such scientists as L.A.Aleksandrova [4], A.V.Bobilev [5], N.A.Bogdanova [6], A.I.Vasiliev [7], N.V.Dnepr [8], K.V.Kiuru [9], T.V.Malkova [10].

In particular, S.V. Lapteva studied the possibilities of digital educational resources [15], O.O. Chertovskikh - issues of using artificial intelligence in the modern education system [11], O.O. Djioeva, O.M. Tandelova, D.V. Chochiti - classification of digital technologies [12], O.M. Shadrina - methods of using digital educational resources in organizing independent work of students [13], L.R. Gabdrakipova and O.V. Shatunova - advantages of Quizizz, Kahoot!, Padlet, Mind Meister platforms in the implementation of digital tools to improve the quality of education [14], N.V. Chiganova - possibilities of digital technologies in teaching students algorithmization and programming theoretically and practically substantiated.

They emphasize that the introduction of digital technologies into the educational process allows the teacher to systematize, optimize, and present educational information in a form that is easy to assimilate, to design lessons in an interesting form, and to monitor and evaluate the student's educational activity. And by providing the student with independent learning in a visual form, self-assessment, it creates an opportunity to increase their motivation in science, develop creative thinking, and form competencies.

According to the presented analyses, it is necessary to use digital tools in teaching subjects, including programming languages, in general education schools.

- online whiteboards such as Miro, AMW board, WhiteboardFox, Webwhiteboard for visualization and explanation of educational material;
- Wizer.me, Liveworksheets, Core.Tinkercard, Hackster.io, Udemy, Instructables, interactive tasks to increase students' independent learning activity;
- "software for creating electronic educational resources, such as Canva, OBS Studio, Socrative, LearningApps, Mentimeter, Timegraphics, Mindmeister, iSpring, etc.)";
- "GoogleMeuet, Trello, Dissord, Miro, Videomost, Teams Radlet, Zoom, Mentimeter, BigBlueButton, Microsoft Teams, Webinar.ru, Twiddla. Programs such as Project2Manage, ProjectPier, Discord";
- systems such as Google Forms, Kahoot, Online Test Pad, Mastertest for assessing and monitoring acquired knowledge, skills, and abilities.

Therefore, the teacher should design lessons using distance learning platforms when teaching students. Today, with the help of distance learning platforms, it is possible to create various educational resources with presentations, virtual laboratories, animation effects, control and management systems. As an example of this, one can cite the following offline and online operating applications and platforms recommended by T.V. Richter and I.V. Abramova:

- online whiteboards such as Miro, AMW board, WhiteboardFox, Webwhiteboard for visualization and explanation of educational material;
- Wizer.me, Liveworksheets, Core.Tinkercard, Hackster.io, Udemy, Instructables, interactive tasks to increase students' independent learning activity;
- "software for creating electronic educational resources, such as Canva, OBS Studio, Socrative, LearningApps, Mentimeter, Timegraphics, Mindmeister, iSpring, etc.)";
- "GoogleMeuet, Trello, Dissord, Miro, Videomost, Teams Radlet, Zoom, Mentimeter, BigBlueButton, Microsoft Teams, Webinar.ru, Twiddla. Programs such as Project2Manage, ProjectPier, Discord";
- systems such as Google Forms, Kahoot, Online Test Pad, Mastertest for assessing and monitoring acquired knowledge, skills, and abilities.

"With the help of the presented digital tools, effective results can be achieved by applying the teaching of the subject "Computer Science and Information Technologies," including the section "Fundamentals of Programming," in general education schools."

In conclusion, theoretical research was conducted on the need to use digital technologies in the development of Arduino language competence. Students were shown the need to use digital technologies in the development of project development competence in the Arduino environment. The effectiveness of using web-quest educational technology in the development of students' competence in the Arduino language is highlighted in the process of writing a thesis.

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