GALAXY INTERNATIONAL INTERDISCIPLINARY RESEARCH JOURNAL (GIIRJ)
ISSN (E): 2347-6915
Vol. 12, Issue 3, March (2024)

FORMATION OF TECHNICAL THINKING OF STUDENTS BY MEANS OF EDUCATIONAL ROBOTICS

Mamajanova Svetlana Valentinovna
Senior Lecturer at Kokand State Pedagogical Institute

Lyubimova Elena Mikhailovna
Senior Lecturer at Yelabuga Institute of KFU

ABSTRACT

The article discusses the importance of using educational robotics to develop technical thinking among students. The main purpose of the study is to evaluate the effectiveness of educational robotics as a tool for developing key skills required in the modern world of technology. The study identified the basic principles and methods of teaching using robotics, and also assessed the skills and level of technical thinking among students. The results showed the positive impact of robotics on the development of creativity, logical thinking and the ability to solve complex technical problems.

Keywords: educational robotics, technical thinking, learning, programming, robots in education, learning efficiency, creativity

INTRODUCTION

The current stage of human development is characterized by the tendency to create an information society aimed at creating conditions for the development of human technical abilities. Technical thinking is one of the key components of technical abilities, focused on the engineering and technical perception of the world. The leading role in this problem is given to education, focused on the formation of personal qualities that meet the requirements of the information society.

Educational robotics is a powerful tool for developing students' technical thinking. It helps develop the analytical, logical thinking and decision-making skills needed in today's technological world.

Students, working with robots, learn programming, solving engineering problems, developing algorithms and testing their solutions in practice. This promotes the development of creativity, the ability to work in a team and independence in finding solutions.

Educational robotics also stimulates interest in science and technology, which may influence future career choices. Suitable educational programs using robotics help students learn not only technical skills, but also develop critical thinking and the ability to adapt to the changing technological demands of modern society.

MATERIAL AND RESEARCH METHODS

Foreign scientists J. Beran, B. D. Broll, K. C. Fernandez, D. P. Figueiredo, Ch. Giang, H. T. Hinton, S. Sh. Marshall, R.J. Morris, N. Poner, E.D. Restpero, S. Papert, E. Senft, D. Scaradozzia, Ch. Swanwick and others conducted scientific research on teaching robotics as a

science in secondary schools, theoretically -practical problems of effective use of robotics designers in the educational process.

The Republic of Uzbekistan partially has domestic developments in the field of educational robotics. As follows from the analysis of sources, at the republican level, the research work of O.A. Tuychiev examines the use of robotics elements as teaching aids in physics lessons. Based on the above, it follows that there is a need to conduct research on educational robotics.

The study was conducted at the university robotics laboratory at the Kokand State Pedagogical Institute with the participation of 2nd year students in mathematics and computer science. Observation sessions were conducted with students while working with robots to assess their activity and participation in tasks in the subject "Algorithmization and modern programming languages." Students completed questionnaires asking about their experiences with robotics and perceptions of the learning process. After completing the training sessions, students were offered tests to assess their level of mastery of the material. To program the robots, specialized software TRIK Studio and Arduino IDE were used, which allows you to create and test control algorithms. The obtained data were analyzed using statistical methods in order to identify patterns and assess the effectiveness of educational robotics in the formation of technical thinking among students.

RESEARCH RESULTS AND DISCUSSION

The learning process using educational robotics is built on several basic principles. The first of them is the practical application of knowledge. Students get the opportunity not only to learn theory, but also to apply it in practice through programming and controlling robots.

The second principle is interactive learning. Robots create keen interest and motivation among students through their unique form of learning. Students actively participate in the learning process, experiment, find innovative solutions and develop creative thinking.

Training methods include hands-on training with real robots, laboratory work, project creation and robotics competitions. These methods contribute not only to the acquisition of specific skills, but also to the development of general competencies such as teamwork, problem solving, and communication skills.

One of the key aspects of developing technical thinking using educational robotics is practical training. Students have the opportunity to work with real robots and models, allowing them to not only understand theoretical concepts but also apply them in practice.

Hands-on activities include programming robots, creating algorithms, testing and optimizing solutions. Students also participate in creative projects and research in the field of robotics, which develops their analytical and problem-oriented skills.

An important aspect is also the opportunity to stimulate creative thinking and independence of students through solving various problems and creating their own projects in the field of robotics. This develops their technical thinking and prepares them for real-life professional challenges in technology.

Examples of successful practices include the use of robots to teach children the basics of logic and algorithmic thinking, and the use of robotics in higher education institutions for research projects and the development of effective solutions [2].

To effectively teach programming through robotics, a variety of methods and approaches are used that take into account the characteristics of the educational process and the needs of students, these include:

1. Interactive learning platforms
2. Project-oriented approach

To teach programming through robotics, there are many tools and technologies that can be effectively used in the educational process.

One of the popular tools is software environments for working with robots, such as LEGO Mindstorms, Arduino IDE, Robot Operating System (ROS) and others. These environments provide students with the opportunity to create programs to control robots using various programming languages such as Python, C++, Java and others.

Online platforms and programs are also widely used, for example, Code.org, Scratch, Tinkercad, TRIK Studio and many others. They offer interactive lessons, assignments and projects that help students learn the basics of programming and put them into practice by working with virtual or real robots [3].

An example of programmatic learning through robotics could be as follows: students are asked to develop a program algorithm in TRIK Studio for a LEGO EV3 robot, which must complete a series of tasks, such as completing a maze or collecting objects. Students use the TRIK Studio software environment to write code in the Python programming language, download the program to the robot, and test its execution.

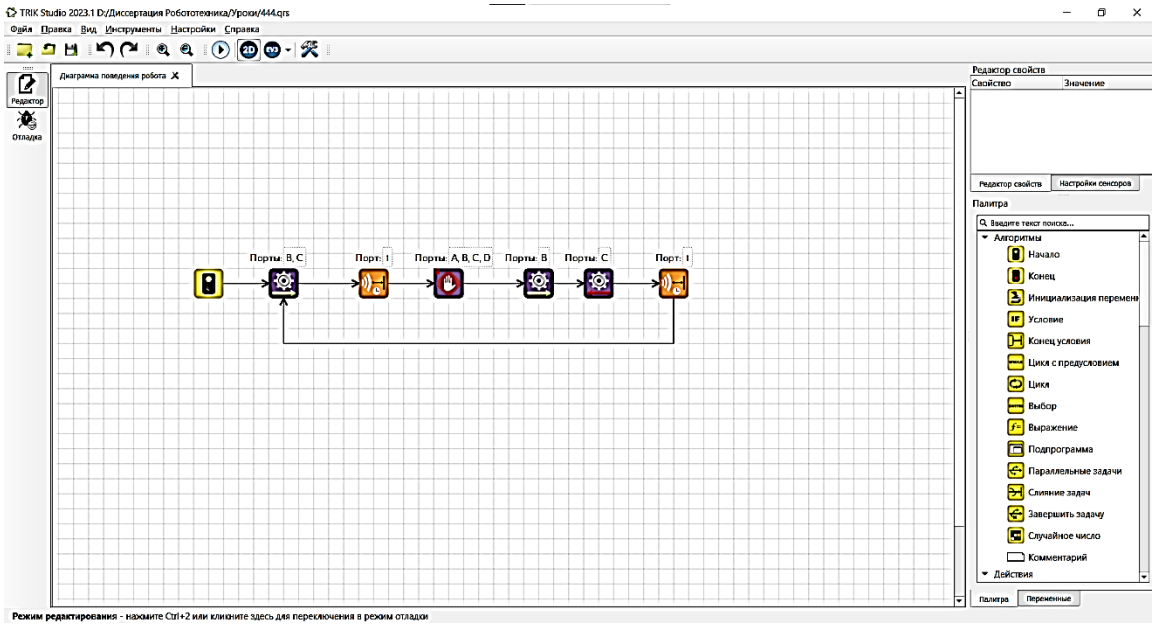

Fig 1. An example of using the TRIK Studio program to write program code for the LEGO EV3 robot

This approach allows students not only to master programming skills, but also to learn how to apply them to solve specific problems using robotics.

Evaluation of the effectiveness of the methodology for teaching programming through robotics shows positive results in the development of critical thinking, logical thinking, algorithmic thinking and problem thinking in students. The use of robotics in the educational process stimulates interest in the material being studied, improves knowledge acquisition and promotes the development of a creative approach to problem solving.

Various methods were used to assess the level of development of students' technical thinking. One of them is the analysis of the results of completed tasks and projects in the field of robotics. Students also took tests and examinations that assessed their ability to solve technical problems and apply the acquired knowledge in practice.

To develop technical thinking skills, specialized training and master classes were held, where students deepened their knowledge and skills in working with robots. Evaluation of results and analysis of errors helped to identify weaknesses and develop individual development programs for each student.

This approach to assessing and developing technical thinking skills has resulted in significant gains and improvements in student learning, making them more prepared to solve complex technical and robotics problems.

CONCLUSION

Educational robotics is an effective tool for developing technical thinking in students. It allows you not only to deepen your knowledge in the field of programming and engineering, but also to develop creative and logical thinking, the ability to solve complex problems and work in a team.

Students, mastering skills through hands-on training with real robots, gain valuable experience that will be useful to them in their future professional activities. Robotics stimulates interest in science and technology, develops the skills of independent work and finding non-standard solutions.

Thus, the use of educational robotics contributes to the full development of students as specialists in the field of technology, ready to solve modern challenges and problems in an innovative environment.

REFERENCES

1. Rodionov M.A. Kochetkova O.A., Pudovkina Yu.N. Teaching students the basics of programming within the framework of the elective educational course “Robotics” // School technologies. 2019. No. 2. P. 86-93.
2. Mamadjanova S.V, . (2022). DESIGN FEATURES OF VIRTUAL LEARNING ENVIRONMENTS. European International Journal of Multidisciplinary Research and Management Studies, 2(06), 1–5. Retrieved from https://inlibrary.uz/index.php/eijmrms/article/view/23533
3. Andrianov P.N. Technical creativity of students: A manual for teachers and circle leaders: From work experience. M.: Education, 2018. 128 p.
4. Muydinovich, Rasulov Inom, Mamadjanova Svetlana Valentinovna, and Maxkamova Dilshoda Xabibjonqizi. "THE ROLE OF INFORMATION TECHNOLOGY IN MODERN METHODS IN THE SYSTEM OF HIGHER EDUCATION." International Journal of Early Childhood Special Education 14.7 (2022).
5. Xakimova, Yo T., I. I. Djurayev, and S. V. Mamadjonova. "INFORMATICS AND INFORMATION IN PRESCHOOL INSTITUTIONS METHODOLOGICAL SYSTEM OF INTRODUCTION OF SCIENCE “TECHNOLOGY”." Oriental renaissance: Innovative, educational, natural and social sciences 1.3 (2021): 105-110.

6. Mamadjanova, S. V. "Design Features of Virtual Learning Environments." European International Journal of Multidisciplinary Research and Management Studies 2.06 (2022): 1-5.
7. Мамаджанова, С. В., И. И. Джураев, and М. М. Ботиров. "Технология веб-квест на уроках информатики." Теория и практика современной науки 6 (60) (2020): 213-220.
8. Valentinovna, Mamadjanova Svetlana, and Urinbaeva Azada Baxadirovna. "The Role Of Mobile Applications In The Education System." Onomázein 62 (2023): December (2023): 2088-2093.
9. Мамаджанова, С. В. "Влияние виртуальной образовательной среды на эффективность обучения." Евразийский журнал академических исследований 2.3 (2022): 531-535.
10. Mamadzhanova, S. V. "Teacher's Choice of Organizational Forms of Learning in a Virtual Educational Environment as a Pedagogical Problem." Open Access Repository 9.12 (2022): 109-112.