Robotic Engineering as an Innovative Direction of Developing the Design Culture of Students

Abduganiyev Bekzod Burkhon ugli

Teacher, Jizzakh State Pedagogical University
abduganiyev-bekzod@mail.ru

ABSTRACT

This article talks about the role of robotics and its use in developing the design culture of schoolchildren. Also, information about the necessary conditions for the use and application of robotics was mentioned in the educational process.

Keywords: Robotics, design culture, LEGO, project, school, Arduino

In connection with the active use of modern technologies in working with students, interest in using the opportunities offered by educational robotics is spreading. Robotics is one of the well-known and widespread systems today, which uses three-dimensional models of the real world and a themed game environment for teaching and developing students [1].

The state policy of leading countries in the field of robotics shows that educational programs on robotics are relevant at the current stage of society's development. Developed countries such as Great Britain, France, the USA, Japan, and South Korea are drawn up in the form of "roadmaps" to solve specific problems with given performance indicators. The state acts as a coordinator and the main funding comes from business. In 1971, the first national association of robotics manufacturers (Japan Robot Association) was established in Japan. The association develops programs for the development of robotics, as well as the concept of industrial development based on the use of robots, and participates in the development of Japanese industrial standards for robotics and the organization of international robotics exhibitions.

In today's developed and developing countries, robotics is one of the innovative directions for the development of students. Students get acquainted with the basics of robotics as part of additional education in the form of clubs, classes, sections, and optional courses.

Active implementation of the robotics project has begun in general secondary schools.

Psychologists and pedagogues say that the project has an effective impact on the comprehensive development of the student's personality. According to N.N.Shiryaeva, the use of the design process in the education of students is of great importance for the formation of mental activity, that is, the ability to think, draw logical conclusions, design culture and justify one's decision.

Based on the definition of "Educational technology" in the pedagogical encyclopedic dictionary, it can be noted that if the project in the educational process is systematic and systematic, the activities of the teacher and the student during the design process will contribute to the formation of speech culture, creative if it is aimed at developing skills and forming technical thinking, it can be called education.

The E.V. Volkova educational kit is a set of interconnected elements and assembly instructions designed for self-production of any

device that meets educational design goals. considers it to be plami. Its use helps to form and develop creative abilities, technical thinking, and is suitable for the age characteristics of students, and most importantly, it includes systematic, organized activity of the student with the participation of the teacher.

Today, robotics is one of the fastest growing industries. Is it possible to imagine life in the modern world without mechanical machines? Hardly! In fact, many human tasks have become much easier, more accurate, faster, and of better quality thanks to robots. In the near future, robots will become an integral part of everyday life. At every step we encounter robots. Robots will be everywhere.

Robotics is one of the most important areas of scientific and technical development, in which the problems of mechanics and new technologies come into contact with the problems of artificial intelligence [2]. At the current stage, there is a need to organize educational activities aimed at meeting the needs of students and existing requirements in the areas that help to realize the main tasks of scientific and technical development of society in additional educational institutions.

Currently, there are many robotics kits that allow you to solve educational problems: Arduino-like, DaNi, DARwin, Engino, Fischertechnik (a number of programming-related kits), Hunarobo (both series of kits: design and programming and programming), K'nex, Lego (design), Marbutopia, Meccano, Megabloks, OLLO, Robopica, Scratchduino, Tetrix, Vex, Zometool, Igroteco, Konstruktor, Technolab, TRIK.

Based on E.V. Volkova's definition, if robotics meets certain criteria, we can use it as an educational technology.

First, the designer should strive for infinity, that is, he should offer design options that the teacher and student can think about, he should not limit the imagination.

Secondly, the constructor must include the idea of complexity, which, as a rule, is provided by the structural elements of the constructor, details, which will make the project colorful and complex in the future.

Thirdly, a construction set should be included among the construction sets that provide the ability to work consistently with each set, depending on the age of the students and the design tasks.

Fourth, to fully raise the semantic load and knowledge expressed by students in the meaningful creation and reproduction of models of objects of reality from the details of the designer. As a result, students demonstrate mastery of knowledge and subject-sensory experience.

A designer who meets these criteria will be able to perform a serious task related to the full development of the student.

Educational robotics is a new, relevant pedagogical technology, located at the intersection of promising areas of knowledge: mechanics, electronics, automation, construction, programming and technical design.

The use of LEGO projects in educational activities increases the student's enthusiasm for learning, because it requires knowledge from almost all educational areas. Different LEGO designers allow working with students of different ages and in different fields (design, programming, modeling).

If a student is interested in this field from a young age, he can discover many interesting things and, most importantly, develop the skills necessary for his future profession.

In addition, teaching students with the help of robotics serves both to learn by playing and to develop the culture of designing in students at the same time.

Robotics is rapidly developing in the USA, Japan, Korea, China, and a number of European countries. From a young age, students have the opportunity to attend robotics clubs and innovation centers. Japan is an advanced country with developed robotics. That is why we are seeing high-speed technological growth in the country. In Uzbekistan, the use of robotics for students is very small.

Robotics is one of the most advanced fields of science and technology, and educational robotics is a new interdisciplinary field of student education that integrates knowledge in physics, mechatronics,

technology, mathematics, cybernetics and ICT. allows to attract students of different ages in an integrated way.

Educational robotics is becoming increasingly important and relevant in the modern world. In joint training on robotics, students get acquainted with the laws of the real world, learn to apply theoretical knowledge in practice. At the same time, students develop observation and thinking [3].

Robotics starts with design. Teaching students to design based on a target system plays an important role in teaching. It helps to form the ability to learn, to achieve results, to acquire new knowledge about the world around us, it sets the initial conditions for educational activities. Today, the use of robotics belongs to the category of multifunctional equipment that develops five directions: social-communicative, cognitive, speech development, artistic-aesthetic and physical. According to pedagogues, the essence of students' developing design is that it is not a ready-made toy. That is, the student can independently create a game program and later change it. Working with a designer gives the student complete freedom of movement in creating an image-toy, and it is a good simulator for imagination.

The presence of the creative component of this game encourages the student's all-round development. During the game, the student develops figurative and spatial thinking, mental abilities and logic. By paying attention to the designer's details and the process of the game, making decisions about the selection of parts and the sequence of connecting them, the student gains independence, determination and patience. In addition, the construction helps the student to form an idea about the size and shape of the object, to study the views, to identify and correct his mistakes [4].

To achieve a high level of design culture, students must go through all stages of construction. It should be remembered that the tasks of designing robots are set when students have a certain level of knowledge and experience in constructive activities with modern educational designers.

The goals and objectives of the robot project:

The goal is to develop a design culture in students with the help of robotics and to form a scientific and technical professional direction.

Achieving this goal includes solving the following tasks:

1. Forming primary ideas about robotics, its importance in human life, professions related to the invention and production of technical tools.

2. Involvement in scientific and technical creativity, formation of skills to set a technical problem, work with information, find a specific solution to a problem, and implement one's own creative idea in practice.

3. To develop effective (project) activities, to ensure that students master the basic methods of assembling and programming robotic devices, to develop the ability to analyze and display the obtained data.

4. Formation of knowledge about the basics of the safety of one's life, rules of safe behavior when working with a computer, forming an idea about the materials and parts necessary for the design of robot models.

5. Cultivating a valuable attitude to one's own work, other people's work and its results.

6. Forming the skills of cooperation, working in a team, team, small group (in pairs).

The introduction of LEGO technologies is one of the modern ways to develop the design culture. Implementation of the idea of developing design culture in students using LEGO technology is carried out in two directions.

The first direction is implemented as a mandatory part of the educational program.

Robotics - building working models based on the LEGO Education WeDo series project. This building set includes a motor, sensors, a LEGO switch, a gearbox and LEGO parts to build functional robots. Because robots are so technologically complex, one might think that creating and programming them requires deep specialized knowledge and skills.

However, the LEGO series is easy and fun for robotics students. Students are introduced to the subtle possibilities of programming in the LEGO Education WeDo program. Constructors of this type are designed to begin to form a holistic picture of the world of technology, the

location of structures, mechanisms and machines, their place in the surrounding world.

School age is the age when students explore the world around them, make new discoveries for themselves every day. The knowledge that the teacher imparts to the students during the learning process is successfully mastered by the students if the students act with the objects.

In her research, K.S. Nenasheva states that "the use of information technologies in a casual game easily and comprehensively develops students' cognitive interest, creativity, and observation, which helps to identify and develop talent tendencies."

In specially created situations, the student learns mental calculation, the composition of numbers, performs simple arithmetic operations, and talks about the things he has created. Students learn to analyze the results of their activities, analyze and determine the cause of mistakes, achieve goals, and enjoy success. Working with a robot project allows students to develop creativity and communication skills, adapt to new methods of interaction, synthesize acquired knowledge, gain experience, and also arouse interest, the ability to solve problem situations. , also develops design such as problem-solving, problem-solving, ideation, planning and implementation of solutions. The orderly and systematic conduct of classes increases students' motivation for self-development, interpersonal relations in groups, the ability to assume roles, distribute responsibilities, and clearly follow the rules of behavior. improves, which increases the efficiency of activity.

The main teaching methods used in robotics were developed by D.A. Kashirin:

1. Model development - a demonstration of the technique of building a robot toy (or structure). In the initial state, the robot to be created is considered and the main parts are collected. Then, the student selects the necessary details of the project according to the size, shape, color, and only then all the details are assembled together. All actions are performed based on teachers' explanations and instructions.

2. Design by model. Many of the elements that make it up are hidden. The student must independently determine from which parts the robot (construction) should be assembled. As a model, you can offer a form (construction) made of cardboard or present it in a picture. Analytical and figurative thinking is activated when designing according to the model. But before offering students a model build, it's important to help them master different designs of the same object.

3. Design according to the given conditions - the student is offered a set of conditions that he must fulfill without showing the work methods. The teacher does not offer design methods, but only talks about the practical application of the robot. Students will continue to analyze samples of ready-made handicrafts, identify important features in them, group them according to the similarity of their main features, understand that differences in the main features of shape and size depend on the purpose (given conditions). In this case, the creative abilities of the school-aged student develop.

4. Design according to the simplest drawings and visual schemes - at the initial stage of design, the diagrams should be very simple and detailed in the drawings. With the help of schemes, students develop the ability not only to build, but also to correctly choose the sequence of actions. Later, the student can not only design according to the scheme, but vice versa - draw a diagram according to the visual project. Thus, school-age students learn to independently identify and analyze future construction stages.

5. Design by vision - students of school age who have mastered the previous methods of robotics can implement their project. They themselves determine the topic of the project and the requirements that it must meet, and find ways to create it. Also, creatively uses previously acquired knowledge and skills in the project. Students develop not only their thinking, but also their cognitive independence and creative activity. Students freely experiment with building materials. Buildings (robots) are becoming more diverse and dynamic.

References:

1. Юсупов, Р., & Абдуғаниев, Б. (2022). Maktab informatika va axborot texnologiyalari darslarini o‘qitishda trik studio dasturlash muhitidan foydalanish. Zamonaviy Innovatsion Tadqiqotlarning Dolzarb Muammolari va Rivojlanish Tendensiyalari: Yechimlar Va Istiqbollar, 1(1), 229–231. Retrieved from https://inlibrary.uz/index.php/zitdmrt/article/view/5180
2. Тарапата В.В., Самылкина Н.Н. Робототехника в школе: методика, программы, проекты. - Москва: Лаборатория знаний, 2017. - 109 с.
3. Андреев Д.В., Метелкин Е.В. Повышение мотивации к изучению программирования у младших школьников в рамках курса робототехники // Педагогическая информатика. 2015. № 1. С. 40-48.
4. Власова О.С. Техническое конструирование как средство активизации освоения дисциплин естественнонаучного цикла младшим школьниками: автореф.дисс. на соиск. учен. степ. канд. пед. наук (13.00.02) / Власова Ольга Сергеевна; ФГ.БОУ ВПО ≪Челябинский гос. пед.ун-т≫. – Челябинск, 2015. – 24 с.