

USE OF VIRTUAL ROBOTICS IN THE DEVELOPMENT OF STUDENTS' ENGINEERING AND CREATIVE ABILITIES

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Educational robotics is one of today's current trends. Robotics is especially important in the development of students' STEAM education. This article describes the issues of developing engineering and creativity skills by teaching virtual robotics.

INTRODUCTION

Many international robotics competitions are held in the world, in which it is very important to teach robotics from a young school age so that our children can successfully participate and take high places. Currently, you can find many ready-made kits for building and making robots on sale abroad, or you can buy the necessary components separately and assemble your own design. Usually, the cost of such kits is expensive and it is a bit difficult for students in remote areas to afford such kits. When we conducted an online survey on the matter, most young people expressed an interest in robotics and, unfortunately, many cited a lack of equipment as the reason they were unable to explore the field. But it is possible to teach robotics using virtual software platforms that replace such equipment.

I. MAIN PART

The purpose of the study is to determine the educational effectiveness of studying virtual robotics as a factor in the development of engineering and creative abilities of students. In order to conduct a pedagogical experiment, the authors organized control and experimental groups of children interested in robotics (15 people each) from 9 to 12 years old in the 2019/2020 school year. First, an online survey was organized and the opinions of the participants were determined. Based on the results of the survey, a training plan was determined for those interested in virtual robotics. Robotics education is the main type of activity that develops engineering thinking and technical creativity in children. When studying robotics, it is necessary to use different technical sets. But it is difficult to find such collections in some schools. The kits used to teach robotics include the following components: beginning robotics, design engineering, reasoning, coding, testing, and development. STEAM education is based on LEGO construction, and LEGO constructive academic studies focus on the development of verbal, creative and engineering skills. The teacher organizes the virtual robotics education and teaches students to design constructions and models using the three-dimensional constructive LEGO Digital Designer tools with the help of a computer. In this part, the development of general educational

skills in robotics is achieved. Students can develop their engineering and creative abilities by continuing the development of the next stage through the control unit of the Arduino microprocessor. In this process, schoolchildren can master STEAM subjects well and start independent small electronic projects. Students can acquire programming skills by working in a "learning by doing" system, and learn the basics of circuit technology using these software platforms. In order to solve this problem, today's modern educational direction "Robotics" is described in the research work through virtual simulation programs such as Lego Digital Designer, TinkerCAD, Scratch, Arduino, 3D TinkerCAD.

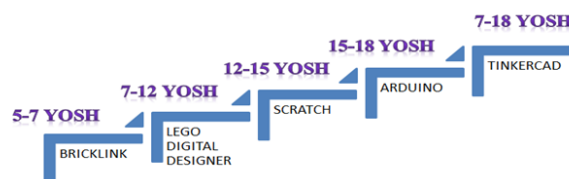


Figure 1 – Use of age appropriate programs

Through this research project, students can actually create the projects of their imagination using virtual software tools and demonstrate their capabilities. As a result, the child will be able to analyze the principles of operation of household appliances and begin to better understand robotics and related sciences. Implementation of projects in the virtual circle program is explained step by step in simple language. The student creates his own robot using virtual applications. In the process of creating a virtual project through Minecraft Education Edition, Bricklink, and Lego digital designer programs, the development of the following aspects was observed in students aged 5 to 7 years:

- development of cognitive thinking;
- development of small motor skills;
- speech development;
- development of correct perception of color;
- development of perseverance, patience.

Introduction to robotics (working with Lego Mindstorms sets based on the Lego Digital Designer simulation program) from 10 to 12 years old:

- development of programming skills for robotic devices;
- development of IT competence;

- development of thinking logic;
- formation of analytical thinking;
- development of engineering and construction skills;
- development of spatial imagination;
- forming a natural and scientific outlook;
- formation of knowledge, skills and qualifications about the environment of the subject;
- development of small motor skills;
- speech development.

It is important to prepare informational products and use them in order to organize creative activity of students based on interactivity in the educational process. In this process, artificial intelligence or imitation learning model can be used effectively. Knowledge modeling is carried out in different scientific areas and for different purposes. In the theory of expert systems, this method is used to solve intellectual tasks by means of a computer. In the learning environment, the teacher appears as both a physical and a virtual expert model. It is very important to acquire generalized abilities for the science of pedagogy. Because it ensures the assimilation of new knowledge. As a result, students acquire basic computer skills. Then every student will have the desire to create the necessary information base for themselves. In this process, group members begin to act together. Each student gets the opportunity to enrich his knowledge with the help of the knowledge acquired by his peers. Educational materials enriched with new knowledge will help them in this. To do this, the teacher is able to create a cooperative learning environment with a wider use of intellectual tasks. Based on mastering robotics knowledge, a new tool of activity is created. In robotics circles, students begin to perceive social reality together. The student is provided with cognitive and creative activities. The educational process using ICT tools is effective in many ways and serves to open the abilities of a person in various directions. In this process, the student also demonstrates the ability to learn independently. The best governance is self-governance. What is important is not the transfer of knowledge, but the acquisition of methods of supplementing knowledge. In other words, mastering the ways of independent learning is of particular importance. Since education is developmental in nature, in this process there is an opportunity to rapidly move to a new state. The learner's knowledge and behavior will take on a new look. In a word, the content of knowledge acquired

by students is updated. Education begins to gain a new power for students.

II. CONCLUSION

Directions, methods and techniques for using robotics tools for students in high school have not yet been fully developed. This is a new direction of polytechnic education, which combines the knowledge and experience of teaching a number of school subjects. In its development, as a new object of the modern technological environment, it is necessary to take into account the specific characteristics of robotic devices, the development opportunities of each discipline, the characteristics of different levels and educational content. Inadequacy of instructional and methodological manuals intended for the use of robotics by students of different ages in the educational process. In the composition of existing educational literature, issues related to computer science courses are covered. More attention is being paid to training students in robotics club classes. Creation of working groups for the creation of textbooks and training manuals for students on robotics based on the educational and regulatory documents of general education schools of our republic and launching their activities. Dissertation research related to the problem of organizing the educational process using robotics elements in general secondary schools is still at an early stage. The publications of the authors of these studies mainly include the specific experience of using robotics tools in the secondary school educational process. Literature on the general pedagogical and methodological problems of using robotics tools in extracurricular and extracurricular activities with schoolchildren can be found.

III. REFERENCES

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