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USING MODERN METHODS IN TEACHING PHYSICS: ELEMENTS OF ROBOTICS AS TEACHING TOOLS

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Abstract
In this article, the possibilities of using robotics elements in the teaching of physics, the use of robotics elements as a means of developing and educating students, serving to fully master the educational materials, to strengthen knowledge in science, and to form practical skills and competencies information is provided. Also, the levels of teaching robotics educational materials to school students are highlighted.

Keywords: modern pedagogical technologies, robotics, integration, tool, motivation, technical knowledge.

INTRODUCTION

As one of the directions of polytechnic training in physics, the assimilation of educational materials related to robotics serves to strengthen knowledge in science, and to form practical skills and competencies. Students will have modern knowledge. Robotics plays an important role in interdisciplinary integration. Knowledge gained from robotics technology, physics, informatics, mathematics, drawing and other disciplines is remembered [1].

This knowledge plays an important role in understanding the principles of operation of robots and in their independent design and construction by students. The integration of knowledge gained from mathematics, informatics and technology has a special place in the implementation of many projects. Doing robotics is an effective "tool" for developing individual and collective creativity of children and adolescents [2].

Methodology

We will consider the components of the methodology of applying robotics elements as a means of developing and educating students in physics education.

1. Educational tasks of robotics. The didactic potential of robotics is very high. Being engaged in robotics, schoolchildren acquire modern polytechnic knowledge and skills, in which the necessary technical-technological competencies are formed for life activities enriched with various objects [3].

The creation and appearance of an interactive construction through the means of a virtual environment are understandable to children and schoolchildren of almost any age today. Here, the school student applies his ideas and evaluates the suitability of the created robots, creating additional conditions for their verification. The task of the teachers is to identify and apply the

components of science using the elements of robotics in the students' activities, to show the importance of related fields of scientific knowledge;

2. Robotics is a new visual medium. It is known that it has a stimulating effect on the perception of educational material by students and effective absorption [3,4]. Educational physics experiments and robotic demonstrations of physics technical applications are interesting not only for schoolchildren. They help to improve the quality of educational demonstrations. For example, in the setting of a robotic experiment, small quantitative changes are observed to become significant and well-observable changes as they manifest.

Robotics is considered to be an effective tool for individualization of teaching (taking into account the level of interest and readiness of students) [5,6]. It provides a variety of robotics educational kits and educational materials aimed at developing children's technical creativity. An important factor in this regard is the selection and organization of competitions in robotics;

3. Developmental and educational tasks of robotics. The ability to put forward one's idea and independently determine the robot construction and various tasks is an important condition for satisfying the important psychological needs of the child: it is understood in the choice, in obtaining the result "here and now", in independent self-application, in the achievements [7,8]. In this case, discussion of possible robot construction options, analysis of advantages and disadvantages of these options, determination of the best of them, creation of a moving robot model, definition of the prepared project, and teaching with the use of design results in the educational process of physics methods, robotics contests or competitions

Completion of various tasks (educational and creative) on educational robotics ensures the active development of all cognitive processes in students. Pupils' perception, imagination, thinking, memory and speech improve. Dealing with robotics has a special effect on the development of educational activity motivation. The effect of its formation is at least related to the direct interest of students in robotic devices as a new innovative direction of the development of modern technology. Dealing with robotics develops personality traits in students (motivation, independence and initiative, hard work, responsibility for the quality of the obtained results, openness to communication and tolerance, ensuring the formation of striving for achievements and self-confidence, and b.). A robotics system cannot be implemented qualitatively in isolation, especially given the need for interdisciplinary integration in lesson development. Undoubtedly, this is teamwork, which is an important condition for the development of a complex of personal qualities, united into two large groups ("hard skills" and "soft skills") [6,7,8].

The use of robotics educational materials in school is a project-oriented teaching tool that affects the entire personality of students. The level of teaching robotics educational materials to schoolchildren is determined by the basic, advanced, and in-depth levels. These levels determine the educational impact of robotics in physics education. We will get acquainted with the features of using robotics elements in teaching physics.

a) It reflects the general idea and sources of the formation of the content of polytechnic education in physics classes. It is based on the social order of society in the form of polytechnic educational goals. The organization of the educational process using robotics educational materials in the physics lesson includes:

– to fully reveal the possibilities of robotics as a direction of technical innovation in

changing the modern technological environment;

– demonstrate the role of robotics elements of physical science in the development and creation of various types of robots;

– formation of ideas about modern physical research methods and technologies in the development of robotics, physics as a field of scientific knowledge;

– improving the quality of education:

b) The development of robotics in the physics course is carried out following the paradigm of modern polytechnic education and includes students who have mastered specific and generalized knowledge and skills in the field of technical activity.

c) In high school, learning the basics of robotics is organized based on a three-component approach.

Robotics in the educational process of physics is the following: the object of study is a field of modern technical knowledge that allows demonstrating the place of science in the development of robotics; means of knowledge in the modern scientific and scientific-technical research method; educational tools to support the formation of technical knowledge, organization of educational technical activities and development of technical skills.

d) Physical science is related to solving specific educational problems in polytechnic training in the field of robotics. Its content should not conflict with the goals of teaching science, however, it should serve to enrich the physics education program with the necessary practical knowledge and types of educational activities and to create additional conditions for its better mastery.

e) In physics, the following conditions are necessary for the effective introduction of robotics tools into the educational process:

– Incorporating robotics into polytechnic training sessions in a step-by-step manner or distribution based on the principles of equivalent didactic replacement (studying the scientific basis of the operation of the element base of robotics objects in the topics and sections of the high school physics course; laboratory exercises in physics and organization of educational activities using robotics objects as examples of modern scientific and scientific-technical knowledge as part of practical training, technical activities on modelling and designing robotic devices as an application of physics to technology);

– Presentation of the three-component structure of the robotics science teaching methodology (Robotics as an educational object; Robotics as a means of knowledge: as a means of development and education);

– Implementation of inter-object communications as a means of implementing components of the robotics curriculum;

– Creation of didactic and methodological conditions for the use of robotics tools in education;

– the level of didactic support of the educational process of the constructors' base of elements, software and robotics educational tools in accordance with the development indicators of students;

– interrelationship of elements of robotics with curricular and extracurricular activities;

– Robotics serves to provide flexibility in educational practices and ensure students'

interests and readiness for technical activities.

f) The level of involvement of students in the process of mastering robotics depends on many factors (cognitive and technological interest, professional motivation, etc.).

g) Main learning outcomes: 1) development of student's interest in studying physics; 2) achieving growth of knowledge and skills in polytechnic education; 3) formation of the initial professional aspirations of students, students who will be directed to consciously choose a profession within the framework of physics [7].

Taking into account modern science and technology achievements, students need to have sufficient knowledge, skills and abilities in robotics to increase their interest in mastering science. Educational tool of robotics elements in physics classes. It helps students to understand the application of the laws of physics to technology, increase their interest in technical fields, choose a career in technical fields, to increase their mastery of science, and make them qualified specialists in the future.

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