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REVUE EUROPEENNE D ETUDES EUROPEAN JOURNAL OF MILITARY STUDIES
Social Science Journal

Methodology of Developing Technical Creativity of Students Through Training of Robotics Elements in Physics Lessons

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Abstract

To provide modern knowledge of scientific-technical, economic and production bases to every young generation entering an independent life in today's modern scientific and technical conditions, to further develop their intellectual potential, to educate them to react creatively to the events and phenomena around them. is important [1, p. 16]. Today, it is necessary to solve various problems in the production process. Naturally, there are many problems related to the technical and technological spheres in production, and it is impossible to increase the efficiency of production without eliminating them. The inclusion of robotics educational elements in the content of physics taught in general secondary schools is of great importance in the development of students' polytechnic competencies [9, p. 341]. Development of the necessary competences of students about the importance of robotics tools in the development of modern production is an important part of new technological systems. In the implementation of these tasks, it was mentioned that it should be implemented by ensuring the integration of subjects in the programs of physics and other sciences. In the robotics club, it was shown that most subjects can be taught on the basis of interdisciplinary integration with the subjects of physics. In the use of robotics elements in the teaching of physics subjects, students must master the educational materials related to science, acquire knowledge in accordance with state educational standards, and develop technical creativity competencies based on them. Educational and regulatory documents; it is important that it is implemented in accordance with the requirements of 'curriculum'.

Keywords: technical creativity, technique, technology, modern tool, robotics elements, Arduino board.

I. Introduction

Currently, technological knowledge is one of the important aspects of economic development trends. In this situation, it is a requirement of the time to widely introduce and develop the achievements of technical education in the educational process of general education schools [4, p. 7]. In this sense, it should be noted that the application of the achievements of robotics, widely used in the education system of developed countries, to the educational process of the comprehensive schools of our Republic is one of the most urgent issues today. Forming a person capable of setting independent educational goals by applying modern scientific and technical achievements in the educational process, developing methods of education, monitoring and evaluating scientific and technical achievements, working with

various information sources, evaluating them, on this basis, the task of educating a creative student capable of independent thought and observation is solved.

II. Literature review

The structure and operation of robotic devices are based on the laws of physics. It is possible to achieve significant results in the development of students' technical creativity competencies by using elements of robotics in physics classes [10, p. 360]. In general secondary and secondary special, vocational educational institutions, it is envisaged that they will have the necessary knowledge about modern equipment and tools, using them in everyday life, in the goals and tasks of physics and astronomy.

One of the goals of teaching physics and astronomy in general secondary and secondary special, vocational educational institutions: the ability to think logically about the role of physics education in the development of science and technology, in the fields of production and in life, mental development, formation of self-awareness potential, formation of national and universal values in them, acquisition of knowledge necessary for continuing social life and education, teaching to use them in everyday life.

One of the tasks of the subject of physics and astronomy in general secondary and secondary special vocational education institutions is to observe and analyze natural processes and phenomena, to be able to use tools correctly in the study of physical phenomena, physical to be able to express concepts and quantities with mathematical formulas, to develop the scientific worldviews of students through the achievements made in the field of science, their practical application, to respect the creators of science and technology in the correct use of the achievements of science and technology for humanity in the future, spiritual and cultural it is emphasized that it consists of carefully preserving the heritage and educating the elements of universal culture.

III. Analysis

It ensures the active development of all cognitive processes in students as a result of performing various tasks on robotics in class and extracurricular activities. Students' imagination, thinking, memory and speech improve. Dealing with robotics has a special effect on the development of educational motivation. As a result of this influence, students' interest in robotic devices as a new innovative direction of the development of modern techniques and technologies increases.

The components of the methodology of applying robotics elements as a means of developing and educating students in physics education will consist of the following.

1. Educational tasks of robotics. The didactic potential of robotics in organizing training is very high. As a result of studying robotics, students will acquire modern polytechnic knowledge and skills, in which technical and technological competencies necessary for life activities related to the process of working of various objects will be formed [2, p. 34].

The creation, operation process and appearance of an innovative construction through the use of virtual tools in the educational process are understandable to children and schoolchildren of almost any age today. Here, the school student evaluates his ideas, technical creativity and suitability of the created robots, creates additional conditions for their verification. The task of teachers is to identify and apply the components of science, using the

elements of robotics in the students' activities, and to show the importance of related fields of scientific knowledge.

2. Robotics is a new demonstration tool. It has a positive effect on the complete assimilation and perception of the educational material by students and helps to conduct the educational process effectively [3, p. 40]. Physical experience, explaining the structure and operation of devices with the help of demonstration tools, the use of robotic devices in the educational process is not only interesting for schoolchildren, but also guides them to choose technical professions. They help to improve the quality of the educational process. For example, experiments using robotic devices can lead to the manifestation of quantitative changes.

Robotics is an effective means of individual organization of education, in which it is important to take into account the level of interest and readiness of students [7, p. 15]. The use of various training sets in robotics classes ensures the development of technical creativity competencies of students, assimilation of educational materials related to science. 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 own idea and independently determine the robot construction and various tasks is an important condition for satisfying the child's psychological needs: it is understood in the choice, in obtaining the result "here and now", in independent self-application, in the achievements [3, p. 35]. In this case, it is possible to discuss the construction options of the robot, to analyze the advantages and disadvantages of these options, to determine the best of them, to create a moving robot model, to defend the prepared project, and to apply the design results in the educational process of physics. teaching methods, participation in robotics contests or competitions with one's own project.

IV. Discussion

Through the implementation of interdisciplinary integration, it allows students to familiarize themselves with the physical foundations of robotics, to design robots of various new constructions, to use the base of robotics parts consciously and effectively, and to create modern improvement robot models.

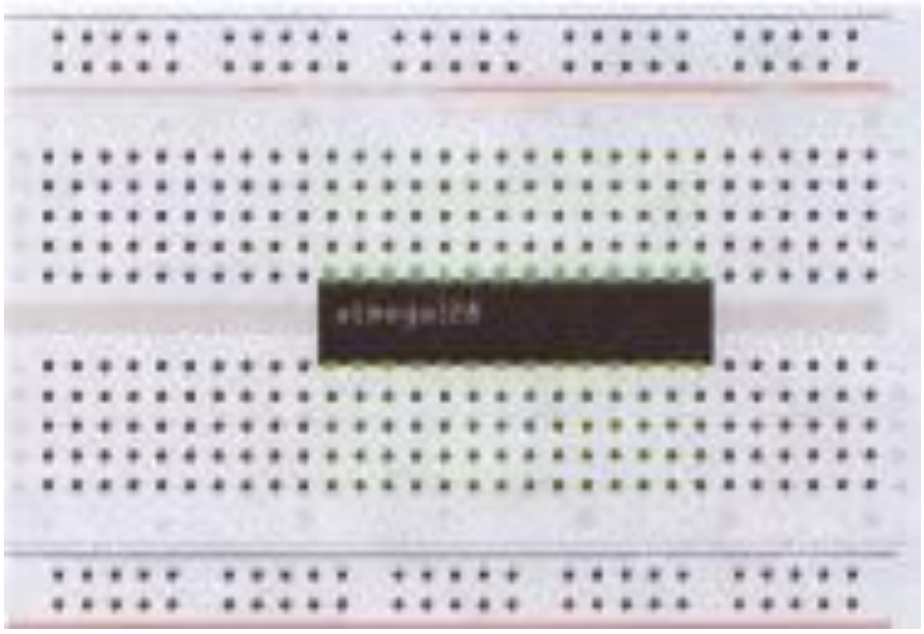
The study of the basics of robotics as a direction of technical innovation should be included in the curriculum of physics, informatics, mathematics, technology, and other subjects in general secondary schools, as well as in the calendar-thematic plans of extracurricular activities; in each school, taking into account the material and technical base and personnel, a comprehensive program should be developed to include elements of robotics in the technical training of students of that school. The purpose of such a program is to help school graduates to form the technical culture necessary for a productive life in the robotics environment in the near future.

The use of robotic experiment devices, creation of their improved models, robotic observations, and demonstration experiments on the implementation of physics achievements in the field of technology in the physics class will serve the development of students' technical creativity.

"Resistors" in 8th grade physics. Rheostats. Potentiometers." after providing information about the educational materials given in the textbook on the topic, the following

robotics educational materials and tools suitable for this topic can be used. Let's get acquainted with the preparation of a microcontroller using the ARDUINO platform.

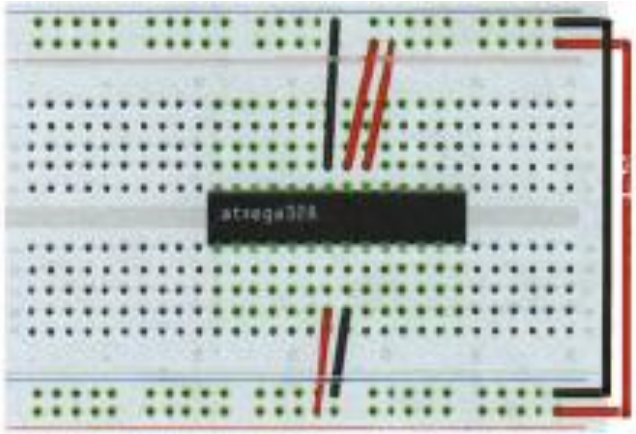
Required components: ATMEL ATmega328P microcontroller, layout board, green LED, red LED, 3 resistors with a resistance of 220 Ohm, a quartz generator with a frequency of 16 MHz (NS-495), a 5-volt voltage stabilizer L7805cv, 2 electrolytic capacitors of 100 μF, 9 Terminal for V voltage battery (Crown type), 2 disk capacitors of 22 pF, 4-contact tact switch [5, p. 36].



Picture 1: Installing the microcontroller on the board

The board needs some space on both sides to accommodate the components, so it is placed as shown in Picture 1. Pin 1 of the ATmega328P microcontroller is located next to a small semicircular recess on the chip. From then on, the contacts are installed in a counterclockwise direction. This should be taken into account when correctly placing the microcontroller being designed. The semicircular recess should be on the left side as shown in the diagram.

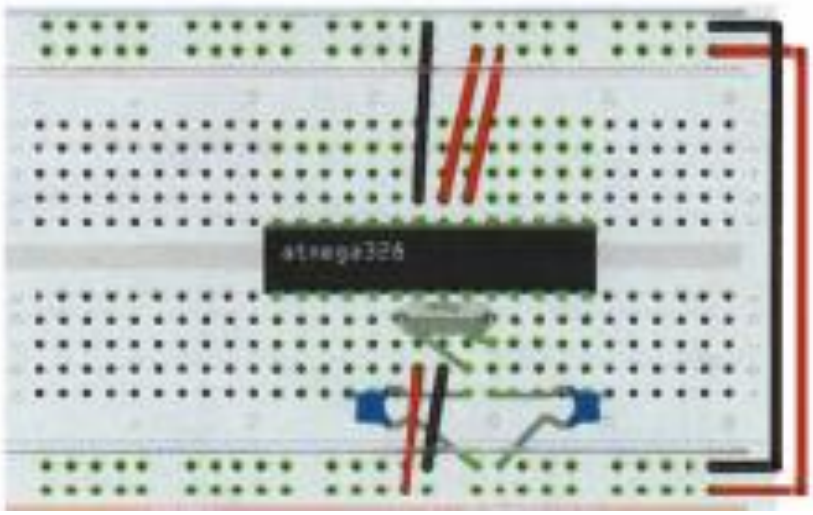
The ATmega chip should be placed so that it covers the breadboard slot. Connect pins 20 and 21 of the ATmega microcontroller to the nearest power bus of the breadboard, and pins 8 and 23 should be connected to the ground bus. Use the tool (peremichka) connecting the two parts to connect the support bus and the ground bus, both sides of the board, as shown in Picture 2 [5, p. 37].



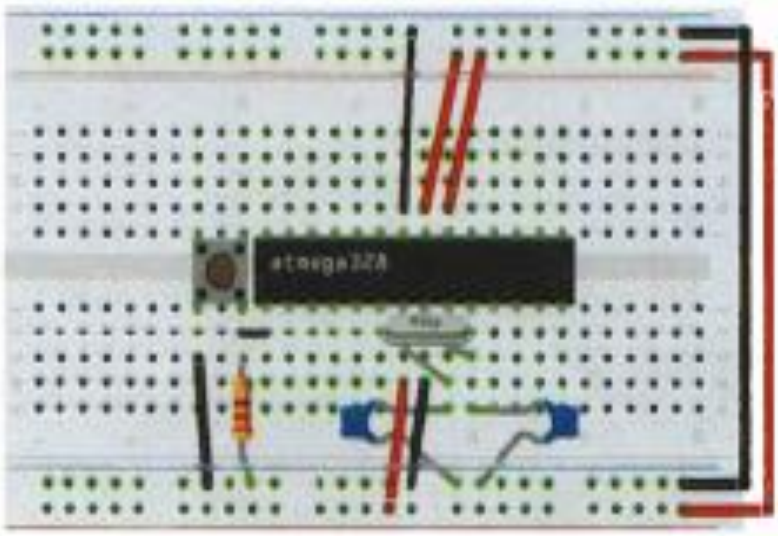
Picture 2.

The connection of the power bus and the ground bus is carried out in the following order.

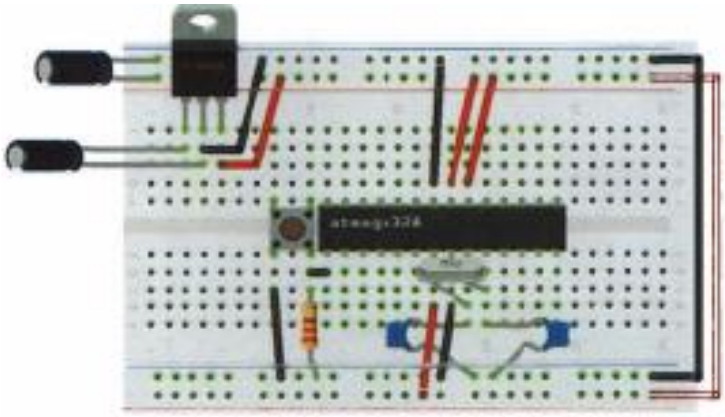
Connect one leg of the quartz generator to pin 9 of the ATmega chip, and the second leg to pin 10. Connect the legs of the 22 pF disk capacitor to the 9 and GND contacts, and connect the legs of the second one to the 10 and GND contacts, as shown in Picture 3.



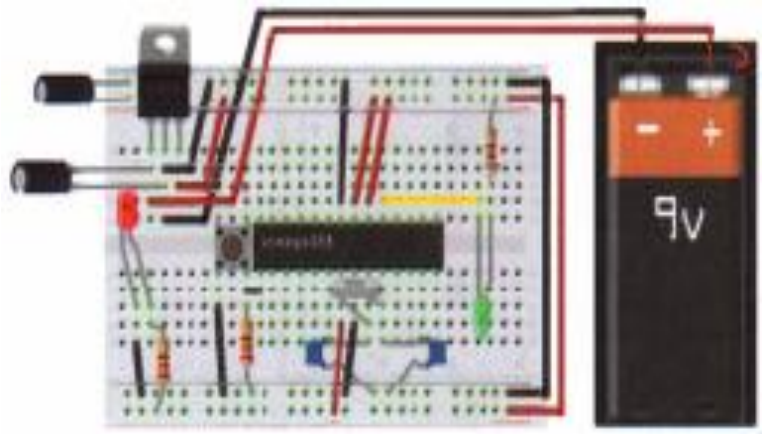
Picture 3.



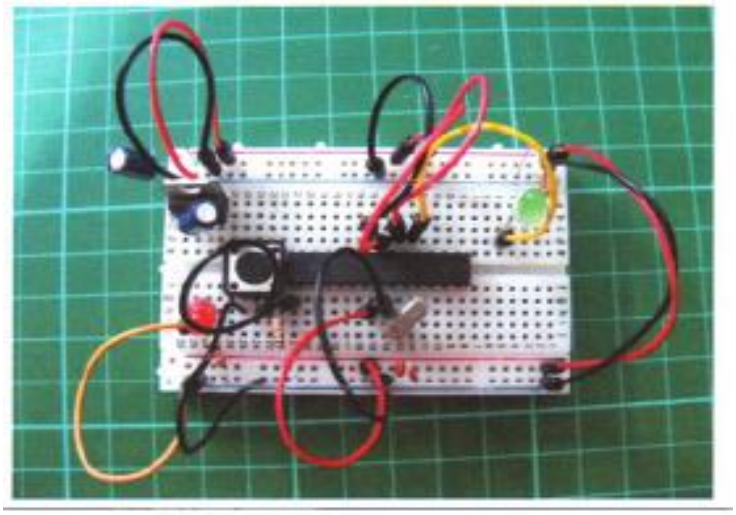
Picture 4.



5-расм



Picture 6.



Picture 7

Installation of quartz generator and disc capacitors

Place the button on the breadboard, to the left of the ATMEGA chip, so that the gutter is closed. Using the jumpers, connect the bottom right pin of the button to Pin 1 of the ATmega microcontroller, and the bottom left pin to the GND pin, as shown in Figure 4. Connect a 220 Ohm resistor to the lower right contact of the button, and the other contact of the resistor to the ground bus. This button acts as a discard.

Place the 5-volt voltage stabilizer L7805cv in the upper left corner of the layout board so that its number is facing you, its contacts 1-3 are numbered from left to right, as shown in Picture 5. Place the first 100 µF electrolytic capacitor on the top of the breadboard with one leg going to the power bus and the other leg going to the ground bus. Connect the second capacitor of 100 µF to contacts 1 and 2 of the voltage stabilizer [5, p. 38]. After that, connect the 2nd contact of the voltage stabilizer to the ground bus, and the 3rd contact to the power bus. Connecting a 100 µF electrolytic capacitor and a 5-volt voltage stabilizer L7805cv.

Install a red LED on the breadboard, its long leg (anode) should be connected to the power bus through a 220 Om resistor, and its short leg (cathode) should be connected to the ground bus. Then install a green LED, its short leg (cathode) should be connected to the ground bus, and its long leg (anode) should be connected to the charging bus through a 220 Om resistor as shown in Picture 6. Connect the contact + 9 V batteries to the 1 contact of the voltage stabilizer, and the contact to the 2 contact of the voltage stabilizer.

Connect the 9V batteries and LEDs. When power is applied to the breadboard buses, the red LED lights up, indicating that the Arduino is on and working, and the green LED lights up when the ATmega is loaded into the microcontroller, and the "Lipillab LED" lights up. The completed circuit is shown in Pic. 7 [6, p. 56].

From the Arduino Uno, this circuit can be used by connecting components to the pins of the ATmega chip.

Development of students' interest in inventive and research activities in the process of engaging in technical creative activities is one of the urgent issues today [8, p. 12].

In order to fulfill these tasks, it is necessary to create the necessary environment in the educational process, develop the skills of analyzing the current situation, acquire the necessary theoretical knowledge and be able to apply them in practice. At the present time, when science and technology are progressing and various innovative technologies are being applied in the educational process, along with providing students with the necessary knowledge, development of technical creativity competencies based on modern scientific achievements is of urgent importance.

V. Conclusion

From the examples given above, it can be seen that the teacher should not be limited to the examples given in the textbook, but should use educational materials and teaching tools related to robotics to make the subject more interesting and understandable, to develop students' interest in science and technical creativity. It also helps students to apply the knowledge they have acquired in physics while performing various design tasks in extracurricular robotics classes.

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