STRUCTURE AND COMPONENT ELEMENTS FOR DEVELOPING ROBOTICS KNOWLEDGE IN GENERAL EDUCATION SCHOOL STUDENTS

Teshaboyeva Iroda Joraboy qizi
Master's Student, 2nd Year, Department of
Physics and Technological Education
Andijan State Pedagogical Institute
https://doi.org/10.5281/zenodo.20139255

Abstract: This article highlights the importance of teaching robotics for developing technical thinking in secondary school students. The pedagogical process of developing robotics knowledge and its main components (cognitive, motivational, active, and creative) are scientifically substantiated.

Keywords: school, component, cognitive, motivational, design, modeling, student, game, mechanism.

Introduction. One of the primary demands of our time is the development of the education system, which involves not only providing students with ready-made knowledge but also equipping them with high-tech skills.

Robotics serves as a universal platform that unites the fields of physics, mathematics, computer science, and engineering. Forming knowledge in this area among schoolchildren is a complex process that requires a specific, systematic structure. The process of developing robotics skills in students has the following phased structure; Theoretical Foundation (Cognitive Stage): In this stage, the student learns the fundamental principles of mechanics, electronics, and algorithmization. The next process is Design and Modeling, a field currently in high demand: the ability to assemble a robot's appearance and structure based on drawings. Programming and Control: Bringing the assembled mechanisms to life, that is, giving them commands using logical code [2,10]. Structural Components. For robotics education to be effective, the following four components must work in harmony: Motivational Component: This involves fostering a student's interest in the field of engineering. This component is reinforced through competitions and "gamification" methods (self-learning through games). The Cognitive Component: This is a set of initial knowledge about the robot's operating principles, various sensors, and controllers [3,8,10]. Activity-based, i.e., Practical Component: These are the student's skills in working directly with construction kits, integrating various parts, and independently correcting errors and shortcomings. Creative Component: This is the ability to design robots with new and unconventional functions by deviating from standard designs [4,8].

Currently, practical work in this field is also being carried out in various schools; for example, in secondary school No. 44 of the Shakhrikhan district of the Andijan region, as well as in secondary school No. 73 of the Shakhrikhan district of the Andijan region, weekly extracurricular sessions are organized for student youth on the most effective methods of the "5E" model (Engage, Explore, Explain, Elaborate, Evaluate) regarding methodological models for organizing robotics classes, and effective club work is being conducted by teachers and mentors. Below is the structure of the one-hour session based on this model: Lesson topic: Being a smart barrier, where we teach how to work with sensors. During our work, he asks students various questions, including how blind people move. Then he raises the problematic

question of whether a robot can also see [5,9,10]. In the second stage, students are divided into groups and the ultrasonic distance sensor is installed on the robot. They test the sensor's operation (sound wave reflection) in practice. During the explanation process, the teacher explains how to write the logical operator "If the distance is < 20 cm, stop" in a programming environment. Stage 4 is the stage of enrichment of knowledge, in which the task is complicated. When the robot sees an obstacle, it must not only stop but also turn back and turn left. This stage helps develop the student's algorithmic abilities. The 5th stage consists of an evaluation stage, where each group tests its robot on a path consisting of special obstacles. Errors are discussed [5, 8]. How can the components of the above data be measured? To answer this question, we decided to provide the following Table 1 in our article.

Table 1.

The content of the components, as well as the indicator and essence of their formation

№	Name of components	Content and essence	Formation index
1	Cognitive	A set of theoretical knowledge related to robotics, electronics, and programming.	Knowledge of terms, ability to read diagrams, and understanding of algorithmic logic.
2	Motivational	Interest in the field, aspiration for the engineering profession, and internal need.	Enthusiasm for participating in competitions, a desire to independently study new technologies.
3	Active	Skills in designing, assembling, and programmatic control of robots.	Ability to work with designers, write code, and eliminate technical malfunctions.
4	Creative	To abandon standard models and come up with unique and new technical solutions.	Modernization of the existing model and the ability to create their own author's project.

In conclusion, based on the foregoing, developing systematic robotics instruction in general education schools enhances students' logical and critical thinking. The structure and components presented in our article serve as a guide for teachers in properly planning the lesson process and in applying their knowledge to future modeling tasks across various fields

References used:

1.Ziyomuhammedov, B. (2020). Pedagogik texnologiyalar va pedagogik mahorat. Toshkent.
2.Reshetnikov, A. S. (2018). Metodika obucheniya robototexnike v shkole. Moskva: Prosveщenie.
3.Ismoilov, T. I. (2021). “Robototexnika fanini o’qitishda innovatsion yondashuvlar”. O’zbekiston Milliy universiteti xabarlari.
4.Papert, S. (1980). Mindstorms: Children, Computers, and Powerful Ideas.

5.Vygotskiy, L. S. (1978). Mind in Society: Development of Higher Psychological Processes. Harvard University Press. (Muammoli va ijtimoiy ta'lim asoslari uchun).
6.Berdiyev, G‘. I. (2022). "Maktablarda STEM ta’limini joriy etish metodikasi". Xalq ta’limi jurnali. (5E modeli va datchiklar bilan ishlash qismi uchun foydalanildi).
7.Khalimov, A. A. (2023). "Arduino platformasi yordamida o‘quvchilarning muhandislik tafakkurini rivojlantirish". Pedagogika va Psixologiya. (Amaliy mashg'ulotlar ketma-ketligi uchun).
8.https://scholar.google.com/scholar?q=related:DZTEQG3dAYgJ:scholar.google.com/&scioq=Robototexnika&hl=ru&as_sdt=0,5
9.https://scholar.google.com/scholar?q=related:OHrVY3XjcasJ:scholar.google.com/&scioq=Robototexnika&hl=ru&as_sdt=0,5
10.https://scholar.google.com/scholar?q=related:3FtnDWq1BWoJ:scholar.google.com/&scioq=Robototexnika&hl=ru&as_sdt=0,5