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ВОЗМОЖНОСТИ ОБРАЗОВАТЕЛЬНОЙ РОБОТОТЕХНИКИ КАК СРЕДСТВО РАЗВИТИЯ АЛГОРИТМИЧЕСКОГО МЫШЛЕНИЯ МЛАДШИХ ШКОЛЬНИКОВ НА УРОКАХ ТЕХНОЛОГИИ¹

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Аннотация

В статье рассматривается использование образовательной робототехники в начальной школе как инструмента для развития алгоритмического мышления у младших школьников. В условиях растущей значимости цифровой грамотности и навыков программирования акцентируется внимание на уроках технологии, где формируются универсальные учебные действия (УУД). Выделяются ключевые аспекты, связанные с планированием, анализом и оценкой действия, отражающие целостный подход к обучению. Авторская позиция поддерживается исследованиями, подтверждающими высокую эффективность применения активных методов обучения в контексте робототехники. Рассматривается внедрение современных программных средств и платформ, таких как LEGO Education и Scratch, что позволяет учащимся постепенно осваивать образовательную робототехнику.

Ключевые слова: образовательная робототехника, алгоритмическое мышление, младшие школьники, уроки технологии, универсальные учебные действия, цифровая грамотность.

OPPORTUNITIES OF EDUCATIONAL ROBOTICS AS A MEANS OF DEVELOPING ALGORITHMIC THINKING OF YOUNGER SCHOOLCHILDREN IN TECHNOLOGY LESSONS

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ABSTRACT

The article discusses the use of educational robotics in primary schools as a tool for developing algorithmic thinking in younger students. In the context of the growing importance of digital literacy and programming skills, attention is focused on technology lessons, where universal learning activities (UMS) are formed. Key aspects related to planning, analyzing, and evaluating actions that reflect a holistic approach to learning are highlighted. The author's position is supported by research that confirms the high efficiency of using active learning methods in the context of robotics. The introduction of modern software tools and platforms, such as LEGO Education and Scratch, is considered, which allows students to gradually master educational robotics.

Keywords: educational robotics, algorithmic thinking, primary school students, technology lessons, universal learning activities, digital literacy.

In the modern educational process, the tasks of developing algorithmic thinking in younger schoolchildren come to the fore, taking into account the importance of programming skills and digital literacy.

Technology is an academic subject that teaches you how to properly make products from different materials using tools. Technology lessons develop algorithmic thinking in younger students. A step-by-step description of the process is available for children. Creating an algorithm helps you find the right answers and control your actions. Participation in the algorithm design makes the process of step-by-step actions fun and reduces the number of errors [6].

In the Federal Work Program of Primary general Education, it is presented that technology lessons in primary schools contribute to the formation of regulatory universal learning activities (UMS) related to algorithmic thinking. These actions include:

- «1) plan your work, correlate your actions with the set goal;
- 2) establish causal relationships between the actions performed and their results, predict actions to obtain the necessary results;
- 3) perform monitoring and evaluation actions, make necessary adjustments to the action after its completion based on its assessment and taking into account the nature of mistakes made» [4].

Algorithmic thinking involves the ability to develop, analyze, and apply step-by-step instructions to solve various problems. For younger students, the formation of such skills requires the use of active teaching methods, which include practical activities and interaction with educational material at different levels. According to a study by Swiss psychologist J.R. R. Tolkien,

According to Piaget, children of primary school age learn the material better through visual and practical experience, which confirms the effectiveness of using robotics in technology classes.

The Federal work program on the academic subject «Labor (Technology)» for grades 5-9 reveals content that adequately reflects the change in life realities and the formation of a space for professional orientation and self-determination of the individual, including: «computer drawing, industrial design, 3D modeling, prototyping, digital production technologies in the field of material processing, additive technologies nanotechnologies, robotics and automatic control systems; technologies of electrical engineering, electronics and electric power engineering, construction, transport, agro-and biotechnologies, food processing» [5].

In the Robotics module, the idea of convergence of material and information technologies is most fully implemented. The significance of this module lies in the fact that when it is mastered, skills of working with the cognitive component (actions, operations, and stages) are formed. The module "Robotics" allows you to integrate knowledge about engineering and technical devices, electronics, programming, fundamental knowledge obtained in the framework of academic subjects, as well as additional education and self-education in the process of designing and creating working robot models.

In the modern educational process, there is an active introduction of technologies that contribute not only to the assimilation of knowledge, but also to the development of key competencies among students. One of these technologies is educational robotics. In many ways, it meets modern requirements for education aimed at developing logical and algorithmic thinking, especially in younger schoolchildren.

Educational robotics is the integrated use of various robotic devices and training software. According to D. G. Zenkevich: «robotics is not only a way to create physical objects, but also a way to form logical thinking and programming skills» [1, p. 46].

According to researchers I. Y. Sokolova and D. V. Ivanov, interaction with robots contributes to the formation of logical thinking skills, attention to detail, and consistent problem solving. The originality of the approach lies in the integration of modern technologies into the educational process, which increases the motivation of students and creates conditions for an active cognitive experience. Thus, the authors emphasize that: «educational robotics provides the development of key competencies necessary for the successful development of information technologies and contributes to the formation of the fundamental foundations of algorithmic thinking from junior classes» [3, p. 51].

In addition, according to international studies presented in the works of K. Bright and E. Bennett, educational robotics increases the motivation of younger schoolchildren to study technologies and natural science disciplines. The ability to see the results of your actions in real time helps strengthen the link between theoretical knowledge and practical skills. This is especially important in the context of developing algorithmic thinking, which requires the ability to analyze and correct your decisions.

One of the advantages of educational robotics is the possibility of a differentiated approach. Teachers can choose tasks of different levels of difficulty, which allows you to take into account the individual characteristics of students. Also, working in groups encourages the development of communication skills and the ability to work collectively, which is important for the formation of a holistic approach to solving complex problems.

The introduction of educational robotics in technology lessons is accompanied by the use of modern software tools and platforms, such as LEGO Education, Scratch, and others, adapted to the age characteristics of younger students. This allows you to create tasks aimed at gradually mastering algorithmic thinking—from the simplest sequences to applying loops and conditions. Practical training with robots contributes to the formation of logical thinking, development of

creative abilities and programming skills, which creates a stable basis for further training in the field of information technology.

Algorithmic thinking includes the ability to plan and develop a sequence of actions to achieve a specific goal. An important aspect is the formation of skills to divide tasks into subtasks and solve them consistently. According to E. V. Kulikov: «algorithmic thinking is formed on the basis of practical activities, when students dynamically interact with the environment» [2, p.25].

In technology lessons, the use of robotics significantly activates the pedagogical process, which allows younger students to show their skills in solving practical problems. For example, children can create simple algorithms for robot movement, which directly contributes to the development of logical thinking skills.

Educational robotics is a powerful tool for developing algorithmic thinking in younger students. Immersion in practical activities, working with robots and programs contributes to the development of creativity and critical thinking necessary in the modern world. Given these advantages, the introduction of robotics in the school curriculum can be considered one of the key steps towards modernizing education.

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