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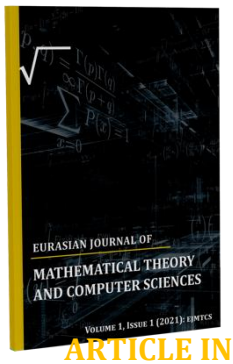

USING VR TECHNOLOGIES IN TEACHING COMPUTER SCIENCE AND IT TO FIRST-GRADE STUDENTS

Yaxiyaxonova Muxiba Maxmudjonovna
Senior teacher of Shahrisabz State Pedagogical Institute.
ORC ID: 0009-0009-5083-2511
E-mail: muhiba8083@mail.ru
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ABSTRACT

This study explores the possibilities and benefits of using virtual reality (VR) technologies in teaching computer science in primary schools. VR technologies make the learning process more interactive and engaging, which increases student's interest in computer science. The study introduces VR-based learning environments, how they are used, and how they can improve the learning effectiveness of primary school students. It also examines the role of VR technologies in developing student's cognitive skills, problem solving, and encouraging creative thinking. The results of this study are expected to open up new areas for the effective use of VR technologies in teaching computer science, as well as provide practical recommendations for teachers and educational institutions.

INTRODUCTION

In the modern education system, innovative technologies, including virtual reality (VR) technologies, play an important role in updating and increasing the effectiveness of the educational process. Computer science occupies an important place in the education of Uzbekistan, introducing students to modern information technologies and teaching them practical skills. However, traditional teaching methods often limit their students to theoretical knowledge, which can become an obstacle to the development of their practical skills. In this context, the use of virtual reality technologies is considered, in other words, as an effective way to make the learning process exciting and interactive.

Virtual reality technologies allow students to present complex computer science concepts in a simpler and more understandable way. For example, students can practice basic programming elements, algorithms, data structures, and many other concepts in a virtual environment. This allows them to connect theoretical knowledge with practice and develop their creativity and problem-solving skills.

In addition, VR technology can be used to attract student's attention and make the learning process more engaging. Through interaction and multifaceted challenges in a virtual environment, students can further strengthen their knowledge. For example, by completing programming projects, running simulations, and solving real-world problems in virtual

classrooms, students can gain real-world experience. On the other hand, VR technology can also be of great benefit to teachers in the learning process. Teachers can conduct their classes in an interactive manner, capturing student's attention and increasing their engagement. Teachers will also have the opportunity to present complex topics in a more understandable and engaging manner using virtual reality.

In addition, another important advantage of VR technologies is that they can also be successfully applied in the distance learning process. Teachers and students can communicate, work together and share knowledge with each other in a virtual environment. This situation has become even more important, especially with the development of the distance learning system during the pandemic.

In this regard, the use of VR technologies in teaching computer science in primary grades serves not only to develop the knowledge and skills of students, but also to increase their interest. And for teachers, this allows them to create new opportunities, update the educational process and create an educational environment that meets the needs of students. Thus, virtual reality technologies are a modern approach to teaching computer science in the main class and serve to make the learning process more effective and exciting.

Research Methodology (Методология исследования).

It is important to use virtual reality technologies to provide students with an interactive and engaging learning experience, increase their concentration, and make the learning process more fun. By updating the educational process and introducing innovative approaches, opportunities are created to improve the effectiveness of teaching younger students. Many studies have been conducted in the field of using VR (virtual reality) technologies in the educational process. Below, foreign and Uzbek researchers have focused their research work on studying the impact of virtual reality technologies on the learning process of students, as well as the negative and positive impact on motivation and creative thinking.

A study conducted by Huang and his colleagues analyzed the impact of virtual reality technology on the educational process. According to the study, "VR technology provides immersive Experiences that enhance student engagement and motivation, leading to Deeper Understanding of complex Concepts." This research paper examines the importance of using virtual reality technology in teaching computer science in elementary grades, as students are given the opportunity to apply their knowledge in a realistic and interactive environment. [1]

Liu and his colleagues studied student engagement in virtual reality. They claim that "Students who learned through VR showed significantly higher engagement levels compared to those in traditional learning environments". These results suggest that using VR technology in elementary classrooms can increase student engagement and improve mastery. [2]

Samatov's research shows the importance of innovative approaches to teaching computer science, including virtual reality technologies. He notes that "with the help of virtual reality technologies, students master the theoretical foundations of computer science in a practical form, which develops their creative abilities and analytical skills". This shows the benefits of teaching computer science in classrooms using virtual reality. [3]

Abdullaev's research is dedicated to the benefits of using virtual reality technologies in the educational process. Here is how he writes: "Education through virtual reality improves

interaction and makes the thinking process of students more interactive". This opinion highlights the effectiveness of virtual reality technologies in teaching computer science in elementary grades and how they can help students develop thinking skills. [4]

VR devices, software, and applications are necessary for the implementation of VR technologies in primary school education.

VR devices. Required to create a VR experience in the learning process. These include devices such as Oculus Quest, HTC Vive, and Google Cardboard. The use of VR glasses for the use of VR technologies in education corresponds to the intended use. VR glasses (virtual reality glasses) are widely used in modern education and gaming. Their main purpose is to allow the user to enter a virtual environment.

Programs and Applications. Virtual reality programs used in education, such as Google Expeditions, Engage, Tilt Brush, ClassVR, and zSpace, allow students to explore a variety of topics.

– *Google Expeditions.* Allows students to take a virtual journey. Very useful for learning different topics.
– *Engage.* A platform designed for interactive and collaborative work with students.
– *Tilt Brush.* Allows students to create 3D art that is useful in art classes.
– *ClassVR.* A collection of VR applications and resources for educational purposes.
– *zSpace.* A platform that allows you to work with interactive 3D content.
– *YouTube VR.* Allows you to watch educational videos in 360 degrees.
– *Nearpod.* Can be used to create interactive lessons.

The following methods can be effective for using VR technologies in teaching the discipline "Computer Science and Information Technology" to first-graders.

1. *Interactive lessons.* Introduce a 3D model of a computer or mobile device in a VR environment. Students can explore each part by moving around inside the virtual device.

2. *Games and simulations.* By organizing games through VR, such as writing code using blocks or solving problems, students can complete algorithm-based tasks, learn programming and algorithms, and increase their interest in robotics (Figure 1).

Figure 1. Using VR glasses in robotics classes.

3. *Virtual Labs.* Use VR software in a virtual environment, such as drawing or performing simple calculations. Show students various programs and applications in practice.

4. *Work with Textbooks and Materials.* By creating interactive textbooks through VR, students can use these textbooks to visually present information to students.

5. *Role Play.* Introduce students to IT professions by introducing them to different professions (e.g. programmer, graphic designer) and giving them tasks in a VR environment.

6. *Collaborative Learning.* To encourage students to work in groups, they can work together on projects in a virtual environment and learn from each other.

7. *Virtual Community.* Connect students with other students or teachers through discussions or activities on VR platforms.

8. *Tests and Assessment.* Conduct interactive tests or quizzes in a virtual environment that will engage students. As a result, it becomes easier to assess student's knowledge (Figure 2).

Figure 2. Using VR technologies to conduct interactive tests or quizzes in computer science lessons.

With these methods, the process of teaching “Computer Science and Information Technology” to first-graders will become more interesting, interactive and effective. Students will have the opportunity to turn their knowledge into practical skills while learning in a virtual environment.

Results and Discussions (Результаты и обсуждения).

Using VR (virtual reality) technologies, it becomes easier for primary school students to learn the basics of computer science. With these technologies, students will have the opportunity to enter a virtual environment and learn computer technologies and algorithms in a visual form.

VR technologies bring lessons closer to real processes. Students see and interact with computer parts, robotics and programming using 3D models. For example, writing code using

blocks, visual implementation of algorithms through VR increases student's interest in the learning process and encourages them to actively participate.

In addition, with the help of VR technologies, complex concepts can be taught in a simple and interesting way. For example, explaining algorithms, computer parts and their working mechanisms in an animated environment will increase student's imagination and their interest in technology. This process facilitates student's learning and develops their technological skills.

Using VR technologies in teaching computer science in the first grades not only introduces students to modern technologies, but also strengthens their fundamental knowledge in the field of programming, algorithms and computer technologies. Including:

– Increased interest and motivation of students. The use of VR technology makes lessons interactive and interesting. Through a virtual environment, students can actively participate in the learning process, gain practical knowledge, seeing software coding and algorithms with their own eyes. This increases their interest in the lesson.

– Easy mastering of complex concepts. In the field of computer science, students usually have a hard time mastering complex concepts such as programming, algorithms, and technical components. Virtual reality technologies make this process much easier to understand, making it visual and interactive. For example, learning virtual coding using blocks develops algorithmic thinking skills.

– Increased practical knowledge. VR technologies provide students with not only theoretical knowledge, but also practical experience. For example, in the process of studying computer parts or programming using virtual robotics, students consolidate their technical knowledge.

– Increased interest in technology among students. Learning programming and robotics using virtual reality will increase students' interest in technological areas. This can positively influence their choice of IT professions in the future.

– Development of collaboration and teamwork skills. VR environments often require teamwork. Students develop teamwork skills and help each other by solving problems together.Didaktik vositalardan unumli foydalanish.

– VR technologies are used as a didactic tool in the educational process. The virtual environment provides a visual and practical approach, making the student learning process more effective.

Figure 3. Use of VR technologies in teaching natural science.

Conclusion/Recommendations (Выводы и рекомендации).

Thus, by using VR technologies in education correctly and wisely, we can raise a generation that not only has knowledge, but also has creative and practical skills. For schools, this approach becomes an important tool for improving the quality of education and supporting the intellectual and social development of students.

The use of VR technologies in teaching primary school students brings great innovations to the educational process. Virtual reality tools allow students to study a subject not only theoretically, but also interactively and practically. A virtual tour of ancient cities in literacy classes, a close-up look at the internal organs of the human body in natural science classes, or the experience of “flying” into space arouse student's interest and help consolidate their knowledge. At the same time, role-playing games and team projects through virtual reality serve to develop student's communication, cooperative, and creative skills.

However, the introduction of these technologies also causes some limitations and problems. The cost of equipment and software, the need for maintenance, and factors affecting children's health should not be overlooked. Excessive use of technology in education risks displacing traditional teaching methods. Therefore, it is necessary to implement VR technologies as a means of improving the quality of education with a balanced approach. In order for the use of VR technologies to be effective in the educational process, it is advisable to implement the following suggestions:

– A cautious approach is required when introducing VR technologies into school curricula. Technologies should be used only as a tool to achieve a goal and used only for necessary topics.

– Special modules and manuals for the curriculum on the use of VR tools for each subject should be developed.

– VR equipment should be placed in schools in central laboratories or IT rooms and made available for public use.

– It is important to improve the skills of teachers to effectively use VR technologies. Special training should be organized for teachers on how to operate VR devices and use them correctly during the lesson. Schools should work in cooperation with training centers that constantly introduce teachers to new technologies.

– It is necessary to limit the time children use VR technologies and observe safety rules. Classes should not exceed 10-15 minutes, since prolonged use of VR devices in the classroom can cause eye strain or dizziness. In order to comply with sanitary rules, special eye relaxation exercises are recommended at school.

– The impact of VR technologies on education must be constantly monitored. To do this, it is necessary to implement systems for assessing success in the educational process. For example, effectiveness can be determined by assessing students' knowledge before and after VR lessons.

Schools and educational organizations should exchange best practices in using VR technologies. Thanks to this, it will be possible to introduce innovations into the educational process and use technologies more effectively. For the consistent implementation of innovations, it is advisable to organize various projects jointly with the state and research centers.

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