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Use Of Virtual (Vr) And Augmented (Ar) Reality Technologies In The Learning Process

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Abstract: This article is devoted to the study of the use of virtual reality (VR) and augmented reality (AR) technologies in the educational process and their impact on the level of student learning. VR and AR technologies enrich education interactively and visually, help to easily understand complex concepts, arouse interest in students and make their learning process more effective. The article considers the advantages of these technologies, their application in practice, their role in the modernization of curricula, and strategies for their integration into the educational process. The impact of these technologies on the development of scientific and creative abilities is also discussed.

Keywords: virtual reality (VR), augmented reality (AR), educational technologies, interactive learning, visual educational materials, technological innovations, modernization of the educational process, creative thinking, development of scientific abilities, STEM education.

INTRODUCTION.

The development of modern technologies has brought the educational process to a new level. Virtual reality (VR) and augmented reality (AR) technologies are creating an opportunity to introduce new approaches in the education system. With the help of these technologies, it is possible to organize the educational process in an interactive and interesting way, easily explain complex topics, and involve students in active engagement with the subject. VR and AR technologies serve to increase the level of students' mastery, develop their scientific and practical abilities.

The introduction of VR and AR technologies into the educational process not only increases the effectiveness of teaching, but also helps to present new educational materials in a more visual and understandable way. For example, through VR technology, students can virtually explore historical sites or bring complex processes in the natural sciences to life. AR technology, on the other hand, enriches the real environment with digital elements and allows for a deeper study of real-life objects.

This topic discusses the advantages of VR and AR technologies in the educational process, experiences in their application, and the impact of these technologies on the development of student knowledge. The issue of modernizing the education system through these innovative technologies remains one of the most pressing issues today.

Method. This study used qualitative and quantitative research methods to determine the effectiveness of VR (virtual reality) and AR (augmented reality) technologies in the educational process. The study was carried out in the following stages:

1. Establishment of experimental groups: two groups were divided for the study: the experimental group (those who participated in the educational process using VR and AR technologies) and the control group (those who were taught in the traditional way).

2. Preparation of educational resources: interactive educational materials based on VR and AR technologies were developed for the experimental group. For example, for biology lessons, the structure of organs was shown using 3D models, and in geography lessons, the opportunity to study historical and natural objects virtually was created.

3. Organization of the lesson process: the same topics were selected for both groups, and an interactive approach using VR and AR technologies was used in the experimental group, and traditional teaching methods were used in the control group.

4. Data collection: students' participation during the lesson, level of understanding, and thinking skills were analyzed. Also, at the end of the study, both groups were given tests and questionnaires.

5. Analysis: the results obtained were qualitatively and quantitatively analyzed, and the impact of VR and AR technologies on educational effectiveness was assessed.

Results. The results of the study showed that the introduction of VR and AR technologies into the educational process led to the following positive changes:

1. Increased student interest: 87 percent of students in the experimental group noted that studying with the help of VR and AR technologies was more interesting.

2. Improved knowledge acquisition: students in the experimental group showed 20% higher results in mastering the subject compared to the control group. In particular, clear differences were observed in understanding complex concepts.

3. Development of creativity and scientific abilities: It was found that through VR and AR technologies, students studied the subject visually and experimentally and formed their own creative approaches.

4. Increased collaboration: Organizing group activities using AR technologies has become an important tool for developing students' communication and collaboration skills.

5. Better understanding of educational materials: 3D models and interactive visual materials have enabled students to understand the subject more deeply.

The results of the study show that VR and AR technologies offer great opportunities for organizing the educational process in an interactive, interesting and effective way. Their impact on the development of students' knowledge and skills has been clearly observed. The widespread use of these technologies shows that the education system of Uzbekistan has great potential for innovative development.

Discussion. The use of virtual (VR) and augmented (AR) reality technologies in the educational process is opening up new possibilities for the modern education system. These technologies not only present educational materials in a visual and interactive way, but also significantly increase students' interest and motivation to learn.

The following aspects should be emphasized during the discussion: VR technology allows students to study complex processes and concepts in an animated 3D environment. For example, learning through a virtual study of the structure of the human body in biology lessons or "traveling" to ancient cities in history lessons is significantly more effective. AR technology enhances students' interaction with real objects in the environment. This can be especially widely used in lessons in the natural sciences, technology, engineering and mathematics (STEM). With the help of these technologies, students develop creativity, analytical thinking and problem-solving skills.

The insufficient development of technological infrastructure makes it difficult to

introduce VR and AR technologies in some educational institutions. The lack of sufficient skills of teachers in the use of new technologies is also an important issue. This creates the need to organize special training and courses for the effective use of VR and AR tools. High costs at the initial stage of technology introduction can also create certain obstacles for the education system. Through the large-scale introduction of VR and AR technologies, it is possible to bring the education system into line with global standards and prepare students as competitive personnel in the international arena. There is an opportunity to increase the effectiveness of the use of these technologies by developing innovative educational materials, retraining teachers, and improving technological infrastructure. As a result of the discussion, it was determined that the role of VR and AR technologies in the educational process is incomparable.

However, for their successful use, the need to combine technological, methodological, and pedagogical approaches is also important. These approaches serve as an important factor in improving the quality of education and increasing students' interest in the educational process.

Conclusion. The use of virtual (VR) and augmented (AR) reality technologies in the educational process creates great opportunities for increasing the effectiveness of education. These technologies involve students more deeply in educational materials and significantly improve their level of mastery. Through VR technology, students can learn complex concepts visually, while AR technology provides the opportunity to interact interactively with real-life objects.

The results of the study showed that VR and AR technologies bring about the following positive changes in the educational process:

• Increasing students' interest in the subject;

• Easier understanding of complex and abstract concepts;

• Development of creative thinking and scientific abilities;

• Strengthening teamwork and communication skills.

At the same time, for the effective use of VR and AR technologies, it is necessary to train teachers, develop technological infrastructure, and develop appropriate educational materials. The widespread introduction of these technologies into the educational process will serve to bring the education system of Uzbekistan into line with international standards and promote innovation. The use of VR and AR technologies in education is not only important for today's education system, but also creates the foundation for organizing future educational processes based on modern technologies. Therefore, the development and wider implementation of this innovative approach is one of the promising tasks.

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