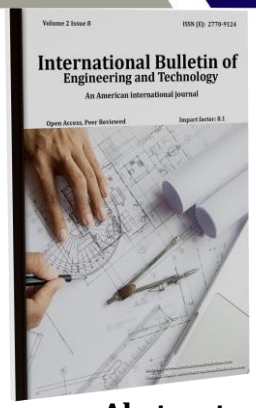

THE IMPORTANCE OF VR/AR IN CHILDREN'S EDUCATION

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Abstract. Interest in technology is well founded: scientists believe that the digitalization of education will make it possible to simplify the presentation of complex material, facilitate the memorization process and motivate children to study harder. And these are not empty guesses, but arguments supported by the results of the first scientific research, as well as the practice of foreign educational programs.

Keywords: Virtual and augmented reality, virtual space, consciousness, artificial intelligence, big data, cloud computing, Internet of things, intelligent systems.

We at Modum Lab have been developing VR/AR for more than five years - then the first modern virtual reality helmet from Oculus was released. And this year we launched a direction dedicated to children's education - Modum Education.

Virtual and augmented reality are completely new tools for education. They are not yet able to completely replace existing teaching methods, but today these technologies can qualitatively complement learning, make it more accessible, simpler and more fun.

Active implementation of augmented reality (AR) in teaching is also predicted. For example, the international company Epson conducted a study on the use of modern technologies in various areas of everyday life and business. The authors identified five main areas of human activity in which the use of augmented reality is most effective and will help save millions of dollars. According to the authors, the main and most promising area of application of augmented reality in the next 10 years will be children's and corporate education. Analysts also note that by 2023, global investment in AR technologies will reach $61.39 billion.

The main feature of AR technologies is amazing visibility. AR educational aids do not just convey certain facts; they, for example, expand the functionality of familiar educational materials or teach you to understand anatomy and veterinary medicine literally “by touch.”

«In teaching, object-based visualization is extremely important for a child. The ability not only to see and hear, but also to feel and understand an object in space is important,” says a study of Russian foreign language teachers.

Research on the applicability of augmented reality in learning was conducted, for example, by Mindshare Futures and Zappar. The effectiveness of implementing augmented reality in different areas of life was determined through user surveys, expert interviews, experiments with tracking brain reactions and other tools.

And here are some fascinating facts from the study:

• Across the entire series of cognitive function measures, AR produced nearly twice (1.9 times) greater levels of engagement compared to non-AR equivalents;

• Between a third (36%) and a half (50%) of respondents aged 18 to 34 agreed that they can think of many ways that AR could fit into their lives, especially in the areas of entertainment, education, and communications.

"We've studied the brain's response to many different types of media, and this study shows that AR provides exceptionally high levels of attention—45% higher than what we average when watching TV or simply surfing the Internet," says the framework. research by Heather Andrew, CEO of Neuro-Insight UK.

To summarize the above examples, scientists say that the main advantages of introducing virtual and augmented reality technologies are visibility, realism and practice-orientedness. And it is precisely these features of technology that today can close a large layer of gaps in modern education.

Compared to the early period of time, in the last 2-3 years the integration of technological projects has been happening more systematically and meaningfully. Probably the fact is that from the stage of experimentation with VR/AR, the state and private organizations have moved to practice-oriented integration. Another trend is the rapid formation of a digital environment around children and adolescents. There is even an opinion that it is easier for modern schoolchildren to assimilate information in familiar, technological ways - such as their favorite programs for smartphones.

Experts and developers of VR/AR today agree that these technologies are at the initial stage of their development, but this process is very fast. Most likely, in a couple of years we will be able to see a large number of new technological projects for education in schools.

As developers of digital educational materials, we understand the importance of new learning content being easily integrated into the school ecosystem and harmonizing with existing implementations - computers, tablets, interactive panels. To combine real space with accessible, interesting and understandable technologies, we at Modum Lab have created projects for interactive whiteboards. AR technologies make it possible to supplement the real space with exciting materials for conducting a lesson, increase children's attention, and also synchronize the process of working with the board with all lesson participants.

Modum Education lessons for interactive whiteboards and virtual and augmented reality devices (which can be tablets, smartphones, AR glasses, VR headsets) are a set of tools for teachers to independently supplement their lessons. We understand that each teacher covers the same topic differently, and therefore technology does not replace the teacher.

The task of innovation is not to become a stimulus for changing the traditional order, but to provide new opportunities in the presentation of material.

Children like the opportunity to examine the human heart from all sides, interacting with a realistic model, much more than pictures in a textbook or 2D video. To take advantage of interactive content, the student expends some effort and takes a step towards knowledge.

The American developer The Body VR has created a kind of educational platform that includes lessons on biology and anatomy for schoolchildren, students, doctors and even patients.

By wearing a virtual reality headset in biology class or at home, students can "shrink" hundreds of thousands of times and take an exciting journey inside the human body, walking through blood vessels and learning how blood cells work to distribute oxygen throughout the body.

On one of the exhibition days, a second-grade student from a St. Petersburg high school approached the Modum Lab stand. According to the school curriculum, it is too early for the boy to study physics; the virtual journey into the topic of the eighth grade captivated him so much that his parents could not take the child away from the stand for more than an hour. After watching several lessons, the little physicist told mom and dad the rule of the left and right hands, and described the forces of Lawrence and Ampere in a simplified form.

By the way, this year Microsoft conducted a study in which they found that virtual reality helps low-achieving students overcome difficulties. It turned out that with the use of technology in teaching, the difference in test results between poor students and excellent students decreased significantly.

Also in this study, teachers reported that using VR/AR in the classroom contributed to a more inquiry-based environment that maximized learning opportunities by instilling a greater sense of autonomy while encouraging students to think creatively about subject matter.

Implementing VR/AR technologies is especially relevant for understanding technical and natural sciences, where visualization is very important for understanding many processes. Already today, projects in surgery, physics, chemistry, and biology are very popular in schools and universities. Technology is used especially actively in the education system of the United States and China. According to Venture Capital, the key driver for the growth of investments in technological education is China, which will account for more than 50% of all investments in VR in 2018.

The game format of learning is of particular interest to children and adolescents of school age. Education provides ample opportunities for memorizing and acquiring skills that usually require long-term routine practice, because the child enjoys studying. At the same time, involvement in the educational process does not occur through force, but naturally.

A famous example of a project for engaging learning is the chemistry of the human brain's emotions. In the VR game, the student becomes a teenager named John, who will become an adult and help shape the future by evoking emotions at key moments in his life. The game clearly explains material from the field of anatomy and cognitive sciences at a level accessible to schoolchildren.

I would also like to say something about communication skills and empathy. We do not underestimate the role of live human communication, but we also want to talk about alternatives - digital tools. Today they are able to expand the range of communication and help many people become a little more open to the world. For example, VR technologies help autists, introverts, or simply shy, introverted children.

“Transferring” the user to another person’s place through VR develops a sense of empathy, teaches empathy, compassion, and how to show and recognize emotions. The approach of seeing the world through another person's eyes teaches us what it's like to be old, weak, defenseless, or under the yoke of other people's prejudices. Due to this, virtual reality is even often called an “empathy machine.” For example, last year Stanford researchers conducted an experiment to test how media, 2D and VR technologies can affect emotional intelligence and empathy for homeless people. It turned out that those who were “immersed” in VR expressed significantly more positive attitudes towards homeless people in their lives, compared to those who read text material or interacted with 2D videos or information from the press. By the way, the development of empathy today is useful not only for the

comprehensive development of a child's personality. The effectiveness of the technology has already been proven by example by large corporations that have introduced innovation into corporate training.

Conclusion. Virtual and augmented reality technologies today are already capable of taking education to a new level: making learning equally balanced in different regions, instilling in schoolchildren an interest in learning and simplifying many complex processes or phenomena for children to understand. It is important that augmented and virtual reality also help reduce inequality between metropolitan schools and remote regional educational institutions.

The trend of interest in technologies on the part of the state is a good sign, but there is still not enough funding for a more widespread introduction of VR/AR solutions in schools, as well as educational activities in the regions and support for developers of new technologies. This process, however, has been launched and, probably, soon virtual reality for Russian schools will become the same familiar tool as, for example, for educational institutions in America and China. At the same time, we have a lot to learn from foreign colleagues and adopt the experience of those countries where VR/AR lessons are not something fantastic and futuristic, but are already fully integrated into the educational process.

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