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**USING VIRTUAL AND AUGMENTED REALITY TECHNOLOGIES IN GEOGRAPHY
LESSONS**

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INTRODUCTION

The main goal of teaching geography is to educate a person who fully understands the geographical picture of the world, has developed geographical thinking, knows, and uses the methods and language of geography. Also, the main goal of education is to increase the effectiveness of various technologies and teaching methods.

One of the most promising areas for the development of geographical thinking of schoolchildren is the use of virtual and augmented reality technologies in geography lessons. Over the past few years, a great leap has been made in the development and expansion of the field of application of virtual and augmented reality technologies. Virtual reality is a technology for creating an artificial environment that completely replaces the real one. Augmented reality allows the user to see the real world around them, and virtual objects are superimposed or embedded in reality. Additional information can be in the form of text, images, video, sound, or three-dimensional objects. Tags are scanned using special programs, tablets, or smartphones to get updated content later [1].

Virtual and augmented reality allows students to study subjects more deeply, analyze the consequences of world events, and can also make the student's perception of information much easier and clearer. At the same time, it contributes to the development of creative potential and improving the quality of education.

While researching these technologies in geography classes, I would like to evaluate the effectiveness of using virtual and augmented reality.

The object of research is the subject of the geography of secondary schools.

The purpose of the research is to study the possibilities of improving students' natural science literacy using virtual and augmented reality technologies in geography lessons.

The goal set in the work revealed the need to solve the following tasks:

- determination of the theoretical and methodological foundations of the use of virtual and augmented reality technologies in the educational process;
- Identify ways to use virtual and augmented reality technologies when studying the section "lithosphere, atmosphere" in grades 7-8.

Virtual and augmented reality technologies can make learning interactive and fun. Let's look at the effectiveness of virtual and augmented reality technologies in geography lessons. When studying the topic "tectonic movement of the lithosphere" following the educational goals of the topic, the student should be able to analyze the tectonic movements of the earth's crust: drift, collision, subduction, spreading. The content of the topic in the textbook is represented by theoretical text and drawings. If these images are presented using augmented reality technology, students have the opportunity to study the processes of tectonic plate movement, i.e. drift, collision, subduction, propagation in the form of 3D models, video animation. When considering the atmosphere and its components, students should graphically depict and explain the features of the structure and layers of the atmosphere. I think that students will be able to fully achieve the learning goal when the atmosphere and phenomena in the layers are given using virtual and augmented reality technologies. For example, you can visually show weather events in the troposphere, features of the ozone layer in the stratosphere, silvery clouds in the mesosphere, the Aurora formed by the sun at polar latitudes in the thermosphere. In virtual reality, students can use a stylus to zoom in on each layer of the atmosphere, rotate it in a 360° direction, and highlight each object in the structure. Virtual and augmented reality in the learning process performs several functions: cognitive, formative, didactic, motivational, informational, and optimization. In any case, technologies are an effective tool for improving the learning environment and developing students' memory, as they provide them with immersion in a multimedia environment enriched with many sensory functions. It is shown that mixed learning using technologies has advantages over traditional learning and e-learning [2].

AR and VR technologies can be used in other subjects as well. Below you will find examples of using AR and VR in the classroom.

Table 1

№	Subject	Features of use
1	Chemistry	Children will be able to conduct experiments on their own, mix substances, and learn about chemistry first-hand. This is not only safer but also cheaper than

		traditional laboratory experiments because schools will no longer have to pay for various chemicals.
2	History	Virtual tours take less time than traditional tours-usually from 30 minutes to an hour. They also require less planning and less money.
3	Physics	It's important to teach kids classical mechanics and Newton's law of motion, but what if you could give them a chance to put theory into practice in the VR environment? AR technology can make it happen in a matter of years, so our kids will experience more impressive studying methods than us.
4	Languages	The easiest language learning method is going abroad and talking to native speakers. So far, this type of studying was the privilege of individuals coming from wealthy families but even they couldn't spend too much time abroad. Tomorrow, everyone will have the opportunity to 'visit' France or Japan and learn foreign languages and local cultures on-site.

I surveyed to find out the most common technologies used by teachers in the educational process. As a result, it was found that problem-based learning uses 15%, modular learning-18%, game technologies-29%, virtual and augmented reality technologies-5%, and other technologies-33% (Fig.1).

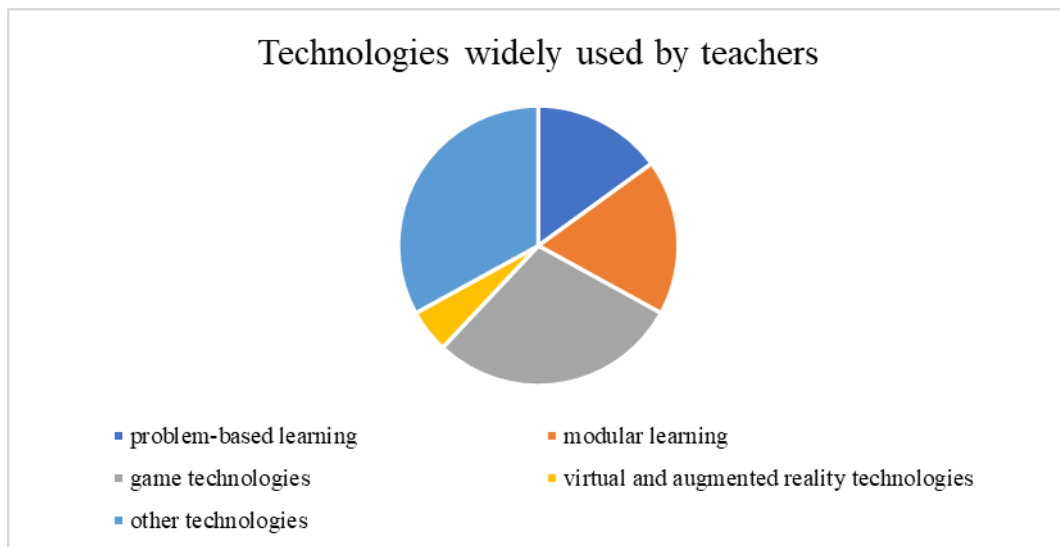


Figure 1 - Technologies widely used by teachers

Taking into account the advantages of these technologies, it is necessary to implement them in the educational sphere. The introduction of technology as a Basic element in ordinary education consists of six stages (Fig. 2).

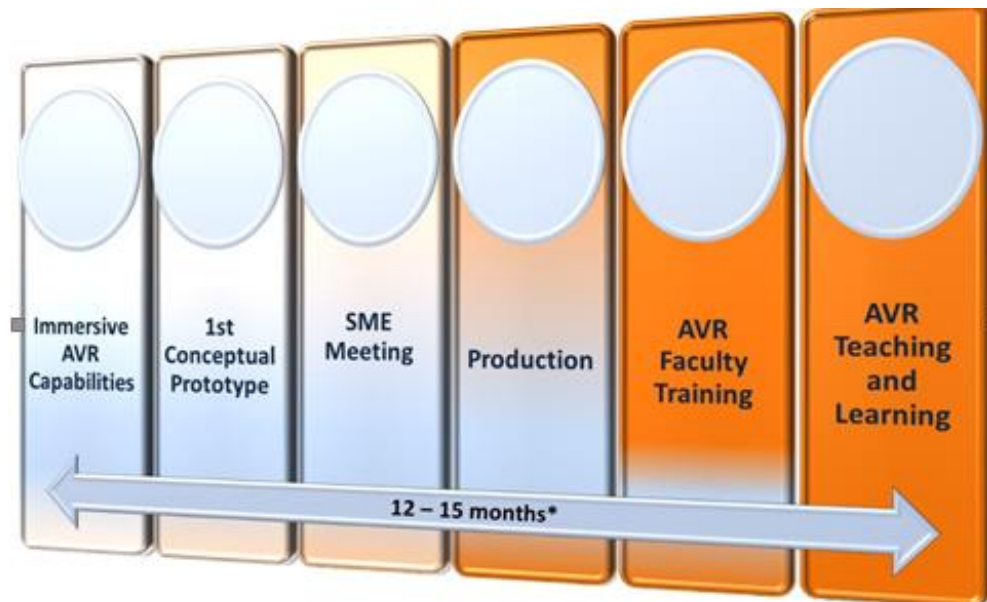


Figure 2 - Six stages of implementing virtual and augmented reality in education

The first stage involves training teachers in these new technologies. Because of their novelty, the vast majority of faculty members do not have sufficient knowledge of the technology and therefore do not know the potential applications associated with teaching. After completing this first stage, teachers will be able to understand and explore the potential of both technologies in education.

The second stage will be the first conceptual prototype of the experience that the teacher wants to use in the course. The result will consist not only of the functional needs of the experience in terms of software, but also of the methodology that will be used for the introduction to the course, the learning goals that will be achieved, and even a rubric that will allow you to evaluate the learning achieved through this experience.

The third stage takes place through activities related to the joint work of the team. This group will be formed by a teacher who is an expert in the subject, a technical programmer who is an expert in developing and adapting solutions using the technology in question, and finally an educational architect.

The fourth stage will produce results in two stages. First, it is a variant of tests that will be evaluated by a small group of students in a controlled environment. At this first stage, you need to debug possible programming errors, as well as details that allow you to adjust the technical interpretation of functional requirements with the conceptual design proposed by the teacher. The second stage will feature a fully functional version that can be used as an experience within the subject it was developed for.

In the fifth stage, teachers should be trained to use these types of solutions in their teaching methodology. For this purpose, individual courses will be created based on active methods using new technologies.

The sixth stage is the use of experience implemented in a regular subject with students. It is important to explain to students the goal of improvement set by these new technologies. Also, it is important to have feedback to adjust and improve the experience in question [3, 4].

Conclusion

The main goal of this work was to test how effective the use of AR and VR technologies in the field of education is. Research has shown that AR and VR will become quite reliable educational platforms soon. This promises radical changes and new models of teaching and learning that must meet the needs of a 21st-century student who no longer thinks the same way as in the 20th or 19th century. The actual integration of these technologies requires many improvements and changes. Teachers should create more advanced educational programs that are well suited to the nature of these technologies and meet the needs of the student. When applied correctly, these

technologies can create an improved modern educational environment and enrich learning opportunities for students. In any case, there is no doubt that in the next few years, AR and VR will revolutionize the way we interact with the real world and will be widely accepted in all areas. What has been said so far about these technologies does not show their real potential. This is just a scratch on the surface of what they will allow us to do shortly.

References

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